THE OKOMU OIL PALM COMPANY PLC

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA) OF THE PROPOSED EXTENSION TWO OIL PALM DEVELOPMENT PROJECT AT OVIA-NORTHEAST AND UHUNMWODE LOCAL GOVERNMENT AREAS, EDO STATE, NIGERIA

FINAL REPORT

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Environmental and Social Impact Assessment (ESIA) of the Proposed Extension Two Oil Palm Development Project at Ovia- North East and Uhunmwode Local Government Areas, Edo State, Nigeria

Final Report

Prepared by

Foremost Development Services Limited

21 Mercy Eneli Street, Surulere, Lagos. Tel: 01-8981250, 08033314800.
Email:foremost.development@gmail.com, Website: www.foremostdevelopmentservices.com

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LIST OF ABBREVIATIONS AND ACRONYMS

AGO	-Automotive Gas Oil
ALARP	-As low as reasonably practical
ANC	-Antenatal Care
APHA	-American Public Health Association
BOD	-Biochemical Oxygen Demand
BS	-Base Saturation
BSR	-Basal Stem Rot
CBD	-Convention on Biological Diversity
CBR	-Crude Birth Rate
CEC	-Cation Exchange Capacity
CDR	-Crude Death Rate
CITES	-The Convention for the Prevention of International Trade in Endangered Species
Cm	-Centimeter
COD	-Chemical Oxygen Demand
CSR	-Corporate Social Responsibility
dB(A)	-Decibel
DO	-Dissolved Oxygen
EC	-Electrical Conductivity
ECEC	-Effective Cation Exchange Capacity
EER	-Environmental Evaluation Report
EFB	-Empty Fruit Bunch
EHS	-Environmental Health and Safety
EIA	-Environmental Impact Assessment
EIS	-Environmental Impact Statement
EMP	-Environmental Management Plan
ENDC	-Eastern Nigerian Development Corporation
ERP	-Emergency Response Plan
ESAs	-Environmentally Sensitive Areas
ESMP	-Environmental and Social Management Plans
FAO	-Food and Agriculture Organization
FEPA	-The Federal Environmental Protection Agency
FFB	-Fresh Fruit Bunch
FGD	-Focus Group Discussions
FMEnv	-Federal Ministry of Environment
FMP	-Forest Management Plan
FPIC	- Free Prior Informed Consent
GC-FID	-Gas Chromatography with flame ionization Detector

GPS	-Geographic Positioning System
Ha	-Hectare
HCVF	-High Conservation Value Forest
HIA	-Health Impact Assessment
HIV/AIDS	- Acquired Immune Deficiency Syndrome
HSE	-Health Safety and Environment
IEE	-Initial Environmental Examination
IFC	-International Finance Corporation
ITD	- Inter Tropical Discontinuity
IUCN	-International Union for the Conservation of Nature and Natural Resources
KII	-Key Informant Interviews
LC	-Least Concern
LGA	-Local Government Area
MDG	-Millennium Development Goals
MgO	-Magnesium Oxide
MOP	-Muriate of Potash
MOU	-Memoranda of Understanding
NCF	-Nigerian Conservation Foundation
NES	-Nigerian Environmental Society
NESREA	-National Environmental Standards and Regulations Enforcement Agency
NGO	-Non Governmental Organization
NIFOR	-Nigerian Institute for Oil Palm Research
NIMET	-Nigeria Meteorological Agency
NPK	-Nitrogen Phosphorus Potassium fertilizer
OOPC	- Okomu Oil Palm Company
PAT	-Profit After Tax
PKC	-Palm Kernel Cake
POME	-Palm Oil Mill Effluent
POPs	-Persistent Organic Pollutants
PPE	-Personal Protective Equipment
PRA	-Participatory Rural Appraisal
PS	-Performance Standards
RAMSAR	-Convention on the Protection of Wetlands of International Importance
RSPO	-Roundtable on Sustainable Palm Oil
SIA	-Social Impact Assessment
SME	-Small and Medium Enterprise
SMP	-Social Management Plan
SPC	-Standard Plate Count
SPM	-Suspended Particulate Matter

SSP	-Single Super Phosphate
STD	-Sexually transmitted diseases
TBA	-Traditional Birth Attendants
TCPC	- Technical committee on Privatization and Commercialization
TDS	-Total Dissolved Solid
THC	-Total Hydrocarbon Content
TN	- Total Nitrogen
TOC	-Total organic Carbon
TOR	-Terms of Reference
UNCCD	-United Nation Convention on Combating Desertification
UNDP	-United Nation Development Programme
UNFCCC	-UN Framework Convention on Climate Change
UTM	- Universal Transverse Mercator
VOC	-Volatile Organic Compound
WHO	-World Health Organization
XRF	-X-Ray Fluorescence

WEIGHTS AND MEASURES

kVA (kilovolt-ampere) – 1,000 volt-amperes

kW (kilowatt) – 1,000 watts

kWh (kilowatt-hour) – 1,000 watts-hour

MW (megawatt) – 1,000,000 watts

W (watt) – unit of active power

T (Ton) – 1,000 kilogram

EIA STUDY TEAM AND REPORT PREPARERS

The EER study and report were carried out and prepared by Foremost Development Services' multi-disciplinary team of consultants including:

Names of Consultant	Qualification	Role Played
Mr. F.A. Afolabi	M.Sc. Development Planning	Overall job execution and delivery
Professor Kokunre Eghafona	PhD, Socio-Cultural Anthropology Rural sociology	Team Leader, Social Impact Assessment (EIA).
Professor Chris Oke	PhD. Forestry Management	Biodiversity studies, Flora and Fauna.
Mr. A. A. Olanigan	M.Sc. Environmental Management & Protection	Environmental Monitoring; Determination of Sampling Control Point, Air Quality, Water Quality, Noise Measurement, Field work coordinator.
Professor Salako	PhD. Soil Science	Team Leader, Soil Survey.
Nigeria Institute for Oil Palm Research	Research Institute	Soil Survey
Mr. Abiodun Makinde	B. Sc. Soil Science	Community Liaison Officer and Field Assistant, Team member; Soil Survey,
Mr. Henry Okeke	M.Sc.	GIS Expert
Benin-Owena River Basin/University of Benin Joint Analytical Research Laboratory (Ugbowo Campus, UNIBEN, 0803 391 4394)	Federal Ministry of Environment Accredited Laboratory	Technical and Laboratory Services
Phemolab Environmental Service (No. 15A, Niyi Ayeye street off channels TV Avenue, OPIC Estate (Via Berger), Isheri, Ogun-state)	Federal Ministry of Environment Accredited Laboratory	Technical and Laboratory Services

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Mr. Billy Ghansa;	*Agric Cordinator*
Mr. Mikle George;	*HSE Manager*
Paulyn Ojukwu;	*Managing Director's Secretary*

2. Federal Ministry of Environment Staff:
   a. Abuja:

      Mr. J. Alonge; Head; EIA Division
      Mr. A. Mohammed

   b. Benin City, Edo State:

      Mr. Bagudu; Controller, Edo State
      Mr. Chris Aiwuyo

3. Edo State Ministry of Environment
   a. Mrs. Eunice Ekhator
   b. Mr. Charles Enoyoze

4. The host and adjoining communities.

EXECUTIVE SUMMARY (ES)

ES 1.0 History and Business of Okomu Oil Palm Company Plc

The proponent of the proposed Extension Two oil palm development project; The Okomu Oil Palm Company Plc (OOPC Plc) is an agricultural and food-processing company located at Okomu-Udo, Ovia Southwest Local Government Area, Edo State, Nigeria. The company specializes in plantation development and production of special palm oil, palm kernel oil and palm kernel cake.

The Okomu Oil Palm Company Plc was established in 1976 as a Federal Government pilot project aimed at rehabilitating oil palm production in Nigeria. At inception, the pilot project covered a surveyed area of 15,580 hectares out of which 12,500 hectares could be planted with oil palm. It was incorporated on December 3, 1979 as a limited liability company. In 1990 the Technical committee on Privatization and Commercialization (TCPC) privatized the company on behalf of the Federal Government of Nigeria.

The privatization of The Okomu Oil Palm Company has been a great success and a huge encouragement for the Nigerian agricultural sector, with profound positive consequences of stable socio-economic growth for the region where it is located. The company has consistently posted profits in the last 15 years and is the only agri-business in the NSE's top 18 companies with the largest turnover.

In 2014 OOPC Plc acquired a partly developed plantation of 11,416,673 ha at Uhunmwonde and Ovia Northeast Local Government Areas of Edo State. This latest acquisition is referred to as Extension Two. The company intends to develop Extension Two in strict conformity to the principles and criteria of the Roundtable on sustainable palm oil and best management practices that is reputed for. The company also plans to establish a 60 tonnes/hr mill at Extension Two when the plantation development has progressed considerably.

Okomu Oil Palm Company Plc benefits from the quality management provided by its main shareholders and technical partner, Socfinco SA, with a 62% shares in Okomu Oil Palm Plc. Socfinco SA is the biggest single shareholder that brings into Okomu a little under a century of sound acclaimed technical expertise in the world stage on tropical agriculture.

Socfinco SA is a global player in the cultivation of oil palm, rubber, coffee and tropical flower. Socfinco SA founded in 1912 was the first industrial company to plant oil palm in Africa and Indonesia. It has ongoing plantations in Cote D'ivoire, Liberia, Guinea, Cameroun, Indonesia, Kenya Sierra Leone and Congo.

ES 2.0 Purpose and Need for the Project

The Okomu Oil Palm Company Plc (OOPC) has been planting oil palm since 1978. The company has recently expanded the capacity of its palm oil mill from 35tons FFB/Hr to 60 tons FFB/Hr and has plans to increase the capacity further. In spite of the acquisitions and expansion, the present situation of local supply of industrial grade crude palm oil (CPO) supply is that of gross inadequacy. Suffice it to say that the company is the number one producer of premium grade CPO in Nigeria and the demand for its products has continued to rise over the years.

In order to satisfy the yearnings of its customer, OOPC Plc proposes to rapidly develop its new acquisition (Extension Two). By so doing, the company would be able to produce more CPO to meet the demand of its customers and increase the prospect of Nigeria closing the national CPO supply-demand deficit. This attainment would also increase the total annual income and help to meet the company's financial obligations to its shareholders, as well as corporate social responsibilities.

ES 3.0 Proposed Location and Description of Project

The proposed Extension Two oil palm development project is located within Latitudes $6^0$38' 37''N and 6^0 47' 31''N and Longitudes 5^0 48' 5''E and 5^0 54' 39''E. The total project area is about 11, 416.673 hectares and stretches across two local government areas. The eastern part lies in Uhunmwonde Local Government Area, while the western part lies in Ovia Northeast Local Government Area, Edo State, Nigeria.

The proposed Extension Two oil palm development project land is covered by statutory Certificate of Occupancy (C of O). The 11,416 ha concession was originally allocated to Iyaye Brothers by the State Governor for a period of 99 years for agriculture development. The original Certificate of Occupancy(C of O) with Number EDSR 15666 is dated 3rd May 2006 and registered as No 40 at Page 40 in Volume B. 237 in the Land Registry at Benin City in the Edo State of Nigeria. The previous lease holder of the land, Iyaye Brothers and A & Hatman Ltd planted only 760 ha of the land with oil palm before re-assigning the land to Okomu Oil Palm Company on 28th November 2013. Upon acquisition of the concession, Iyaye Brothers allowed independent farmers to use the land acquired for agriculture development, mainly subsistence farming. This resulted in conversion of most part of the concession for food crop production. The company intends to fully develop it into an oil palm estate that will comprise majorly oil palm plantations. The other ancillary components will include earth road network, workshop, powerhouse, housing units and office buildings.

The vegetation of the project site is degraded forest. The proposed plantation development will therefore not involve the clearing of natural forests. The northern half of the land has a few rivers traversing it. The plantation development will ensure that the watersheds are protected and the riparian forest strips will be conserved. All identified natural habitats on the land will also be conserved as contained in Table 7-6; Summary of Forest Management Plan for the Proposed Extension Two Oil Palm project.

OOPC Plc is a member of the Roundtable on Sustainable Palm Oil (RSPO) and is committed to implementing the principles and criteria of the RSPO in the development and operation of the proposed Extension Two oil palm development project to ensure that it achieves the complementarities of economic, environmental and social factors.

The fresh fruit bunches (FFB) to be harvested from the plantation will initially be processed with the existing mill. However, given that the mill is of low capacity, the company will later upgrade or install a new mill with the appropriate capacity to match the FFB production capacity of the plantation.

ES 4.0 EIA Study Procedure

The EIA study was carried out after due consultation with the Federal Ministry of Environment (FMEnv), and in accordance with the Ministry's Procedural Guidelines, and Terms of Reference (TOR) and scope of work, approved by the Ministry.

ES 5.0 Verification by the FMEnv

The FMEnv visited the proposed extension project site in order to verify the proposals and statements in the OOPC Plc's application for an environmental impact assessment permit.

ES 6.0 Consultations with and Participation by Stakeholders

The Stakeholders identified were: (i) Federal Ministry of Environment (FMEnv), Abuja (ii) Ministry of Environment and Public Utilities, Edo State; (iii) Uhunmwonde Local Government Area; (iv) Ovia Northeast Local Government Area; (v) Project host communities.

The objective of the consultation was to inform and educate stakeholders on details of the project, its justification, discuss the scope of study and the project's potential and associated environmental impacts, and obtain their views and comments. The summary

of the communities' assessment of the likely environmental impacts of the proposed project was that the proposed project would largely have insignificant adverse impacts.

ES 7.0 Project Justification

The proposed project will complement considerably both the Agricultural Transformation Agenda (ATA) and the economic transformation strategy and plans of the country. Justification is therefore found for the proposed Extension Two oil palm development project in its potential to: i) Add value to the existing production of the company, ii) Provide direct employment, iii) Create additional jobs, iv) Contribute to the socio-economic development of neighboring communities, and iv) Increased economic benefits to the nation.

ES 8.0 Envisaged Sustainability

In order to achieve the desirable sustainability of the proposed Extension Two oil palm plantation project, OOPC Plc will develop and operate the project based on industry best practices, applying especially the IFC Performance Standards and the Principles and Criteria of the Roundtable on Sustainable Palm Oil (RSPO).

Technically, best hands and agricultural practices shall be employed to carry out the project to ensure its technical sustainability while environmental sustainability will be attained through the OOPC Plc Environmental Management System (EMS) that is already in place. The life span of an oil palm plantation is about 30 years or more after which the palm trees are felled and then replanted. With proper upkeep, the oil palm can produce for more than two decades. The envisaged upkeep practices include routine ring weeding, pruning, slashing and fertilizer application.

The project will be financed from the company's yearly turnover and profits. The financial performance of the company has improved considerably. OOPC Plc is listed on the Nigerian Stock Exchange. The financial performance of the company over the years would enable it to execute and sustain the project operations. The estimated cost of the project is about N6.3 billion Nigerian Naira.

ES 9.0 Relevant Environmental Laws, Decrees, Regulations and Edicts

The following laws and regulations apply to the proposed project: (i) National Policy on Environment (FEPA, 1989); (ii) Environmental Impact Assessment Act 86, 1992; (iii) National Guidelines and Standards for Environmental Pollution Control in Nigeria,

(FEPA,1991); (iv) National Effluent Limitations Regulations S.I.8 (FEPA,1991); (v) National Pollution Abatement in Industries and Facilities Generating Wastes Regulations S.I.9 (FEPA,1991); (vi) Waste Management and Hazardous Waste Regulations S.I.15 (FEPA,1991); (vii) National Environmental Standards and Regulations Enforcement Agency (NESREA), 2007. (viii) Environmental Edicts of Edo States' Ministry of Environment and Public Utilities; (ix) Edo State Environmental Waste Management Board Edicts/Mandate; (x) Local Government Area Mandate on environmental sanitation and solid waste management; (xi) Factory Act 1990; (xii) Nigerian Land Use Act, 1978; (xiii) The Nigerian Urban and Regional Planning Laws.

ES 10.0 Existing Baseline Environment

The biophysical and human socio-economic environments that might be impacted by the proposed project were ascertained from field data gathering, previous natural resources and environmental studies and in-house environmental records of the company spanning both the dry and wet seasons.

The project site falls within the rain forest region of southwestern Nigeria which experiences a hot and humid tropical climate. The climate is characterized by seasonal rainfall, high temperatures and high relative humidity. The environment is noted for two distinct seasons of rainy and dry periods in a year, characterized by the southwest moisture laden monsoon wind and the northeast dry cold harmattan wind respectively. The Southwest trade wind predominates over the area, usually between March and November, while the northeast trade wind has greater influence between December and February/March. The Southwest monsoon wind originates from the Atlantic Ocean; hence it is moisture laden, warm and brings rain to the area. The north east trade wind is characterized by cold, dry and dusty weather, often referred to as harmattan. The occurrence of these trade winds is determined by the North-South migration of the zone of demarcation between them, known as Inter-Tropical Discontinuity (ITD). The movement is usually gradual, steady and consistent, hence, the regular pattern of rainfall and dry periods in the year. It directly and indirectly controls other climatic parameters apart from rain like temperature, relative humidity, cloud cover, wind direction and speed, etc. These in turn moderate and determine crops to be grown, farming systems and operations, etc.

According to Muller-Samanu *et al.* (1994), the area falls between humid and semi humid climate zone of the tropics with about 8-9 months of rainfall, and having an average of 8.5 humid months in a year. The rainfall is more than 1,500 mm per annum for most years, and the driest months have less than 60 mm of rain.

The rainfall pattern (amount, intensity and distribution) is greatly influenced by the movement of ITD. The annual total rainfall for the area ranges from 1595 – 2127.2mm (NIFOR meteorological station). The rains are said to have been established when at least 100mm have fallen in a year. Thus, for most years, this is not attained until April. The amount of rainfall increases from April through to June/July when it peaks and then reduces during the month of August before it peaks again in the months of September/October. Thereafter, it tapers-out towards the end of the year.

The total amount of rainfall, its distribution and intensity are very important factors in determining the suitability or otherwise of a land, apart from the quality of soil for any particular agricultural enterprise. The host communities of the project site are essentially agrarian, hence highly influenced by the pattern of rainfall in their activities. The rains, usually, at the onset of the season are noted for thunderstorms which at times can be destructive, traveling at very high speed exceeding 48km/hr. These are torrential and windy rains, usually referred to as line squall. It should be noted that the amount of rainfall in a month can vary widely from one year to another. This is not unconnected to the global phenomenon of climate change which is becoming more and more apparent in recent years.

The mean air temperature of the project area, like most of the tropical environment is generally high throughout the year. It is characterized by minimal fluctuations, usually less than 5^{o}C throughout the year. It is referred to as isohyperthermic temperature regime. The highest mean monthly temperatures are recorded in the months of February and March 34.57°C to 33.76°C, while the lowest mean air temperatures are 20.83°C to 20.97°C in the months of January and July respectively.

On a general note, the temperature is high throughout the year. Hence, temperature is not a limiting factor to the good performance of crops. It is thus feasible to have an all-year round crop production where moisture is not a limiting factor.

The groundwater quality is good and free from pollution. Except for the pH that is generally low, all the water samples from the project's water sources have all physico-chemical and microbiological parameters within the permissible limits recommended by WHO and FMENV for wholesome water.

The results of laboratory analyses of two groundwater water and control samples over two (wet and dry) seasons are presented in Table 4-3 in the report.

Surface Water quality varied from one location to another within the proposed project area. The pH varied from 5.6 – 6.7, Conductivity 20 – 50(uscm-2), Turbidity 6-303, Suspended solids 3-208 mg/l, Dissolved oxygen 1.2-3.2, Biological oxygen demand 0.5-2.6 mg/l, Alkalinity 2-6, Hardness 4-14, Chloride 10.6-14.12, Phosphate 0.15-2.17, nitrate 4.5-9.5 mg/l, Sulphate 6-43 mg/l, calcium 1.6-3.21mg/l, Magnesium 0.49-1.95mg/l. All the values determined for heavy metals in the water bodies occurred in low concentration much below the recommended limits by FMENV and WHO. Water temperature was 27ºC± 0.4. Water movement could only be determined for Jemide River because other streams were seasonal. The speed of the water ranged from 0.5 to 0.7m/sec; with a mean of 0.603±0.054 m/sec. Secchi disc turbidity for Jemide River was 80cm.

The planktonic community was represented by 29 species of phytoplanktons and 2 species of zooplankton. The phytoplankton consist of Bacillariohyta (7 species), Chlorophyta (10 species) Euglenophyta (4 species) Cyanophyta (1 species), and Dinophyta (7 species) while the zooplankton was up of 2 species of Cladocera and Copepoda. There was no evidence of eutrophication (alga bloom).

The benthic fauna of the Jemide and Owan rivers is made up of eleven (11) species; decapods, crustacean and larval forms of Coleoptera, Diptera, Tricoptera and Odonata. These species are indicative of the absence of organic pollution.

The results of the laboratory analyses of the bottom sediment samples collected during the field exercise are presented in Table 4-13. The pH value of the sediment samples was within the range of 6.50 and 6.74 with an average of 6.62. Results of grain size analyses showed that the sediment samples were predominantly made up of sand with an average content value of 85.0% followed by silt having an average content value of 2.15% and lastly clay with 2.0% average content value.

Automatic reading equipment was employed to determine the air quality of the project site. The concentrations of SO_2, H_2S, CO, CO_2, NO_X, were all below the limits set by FMEnv. The concentrations of particulates are also below the set limit, showing clean,

unpolluted ambient air in the locations. The noise level was well below the community noise exposure level of 60dB(A). The groundwater quality is also good and free from pollution.

The project is within the Zone Q (Very Humid Lagos to Benin to Asaba Low land) of the agro-ecological zones of Nigeria. This zone is essentially the western Nigeria lowland, a relatively flat to gently undulating plain developed on sedimentary rocks and littoral deposits. The project site is underlain by Tertiary and Cretaceous sedimentary rocks (mainly sandstones).

Most of the soils in the study area were developed from undifferentiated igneous, metamorphic and Pre-Cambrian basement complex rocks with shale underneath.The rocks are fairly deeply weathered and occurrence of rock-out-crops in the survey area is fairly widespread.

The natural vegetation of the area has been greatly modified. Human interference through annual uncontrolled bush burning and intensive small scale farming has reduced the original forest to secondary ones and bush re-growth. The vegetation in the northern part of the proposed site consists of a mosaic of fallow lands, farms, and riparian wetlands along the streams located within the site. The commonest crops under cultivation in the farms include *Manihot esculenta* (cassava), *Musa sapientum* (Plantain), *Zea mays* (corn), and *Dioscorea alata* (yams).

Trees within the fallow area of the northern region of the proposed project area include *Baphia nitida, Trema orientalis, Pycnanthus angolensis, Musanga cecropioides, Alchornea cordifolia, Alstoni aboonei, Milicia excelsia,Nauclea spp., Voacanga spp, Terminalia ivorensis,Ricinodendron africanum ,Irvingia gabonensis* and *Bombax* spp. The riparian wetland areas along the streams and *Jemide* River are dominated by swamp loving plants such as *Hallea ciliata, Ancistrophyllum seccundiflorum, Uapaca spp., Musanga cropioides, Anthostema aubryanum, Danielia ogea, Pandanus togoensis,* and *Alchornea cordifolia*.

The terrestrial wildlife fauna of the region consist of mammals, birds, reptiles, amphibians and invertebrates. A total of 27 species of mammals (excluding bats) were recorded in the area during the period of study. These species belong to 6 mammalian Orders, 16 Families, and 24 Genera. They include the rodents (Rodentia), primates

(Primates), pangolins (Pholidota), carnivores (Carnivora), insectivores (Insectivora), and ungulates (Artiodactyla).

A total of 49 avifauna species were recorded. Birds, characteristic of primary forest or old growth secondary forest such as hornbills, turacos, various bulbuls, flycatchers, and eagles were found in the primary forest fragment near the *Jemide River*. Seed and insect eating birds dominated the farmlands and oil palm plantation in the southern part of the concession within the proposed project area. They include bulbuls, barn swallows, swift, wagtails, waxbills, pin-tailed whydahs, common thrush, kingfishers and sunbirds. These species gives a clear indication of habitat change.

The textures of these soils were predominantly sand to loamy sand in the epipedon while the subsurface horizons were predominately sand to sandy clay loam in texture. Three profiles had no textural change with increasing soil depth. These profiles had sand textural class throughout the profile.

The soil structural classes of the soils ranged from weakly formed fine-crumbs in the surface horizons to moderately developed medium and coarse sub-angular blocky structures in the subsurface horizons. The consistencies were loose – friable in the surface and firm in the sub surface horizons.

The organic carbon content of the soils was moderate to high in the surface but low in the subsoil. In all the profiles the organic carbon content of the horizons deeper than 30 cm were below the critical requirement of 0.8% recommended for sustainable production of oil palm.

The total Nitrogen (TN) status of the soils varied linearly with the soil organic carbon content. Thus the TN content of the soil was moderate in the surface horizons with moderate OC contents and very low in the subsurface horizons where the OC content was low. Available P was low in the surface and subsurface horizons of the soils. All the pedons were deficient in available P and thus application of P fertilizer will be required for sustainable production of oil palm.

The result of baseline situation in relation to the project communities shows that the ten communities have similar culture in the way of greetings, marriage, tradition and other norms and values and they tend to be more bonded by the common interests they share as farmers. One of the major problems in some of the communities is soil erosion and flooding.

Some of the potential positive socio-economic benefits of Extension Two include creation of employment, introduction of high yielding varieties of oil palm and sustainable management of palm plantation practices, training and capacity building for employees and smallholders, revenue to local communities through royalties payment to landlord communities, tax revenue for the Edo state government and commercial opportunities for small and medium scale enterprises including petty trading.

While some of the potential negative impacts envisaged by community stakeholders include; Loss of farmlands, community conservation and forest products collection areas, Impacts on food insecurity and prices of food products, Influx of plantation workers and potential impacts on family structures and social networks, Water pollution due to agro-chemical application, sewage from worker's camps and Pollution from hazardous substances, Exposure to health risks (e.g. HIV), Adulteration/destruction of indigenous cultural values. However, the intended use of agrochemical is minimal and not in the banned list of chemicals allowed by the FMEnv.

The suggested measures to mitigate the potential social impacts include: proper community engagement, Implementation of FPIC, Avoidance of displacement of communities and people, Ensuring proper participatory disengagement and payment of compensation to farmers using the land, Prevention of pollution of water resources and corporate social services to communities and diligent implementation of social impact management plan.

ES 11.0 Alternatives Considered

The alternatives considered were: (i) Do nothing alternative"; (ii) Alternative project location; (iii) Alternative plantation development methods; (iv) Smallholder development alternative. Of all the alternatives considered, the full development of the project as planned is favoured.

ES 12.0 Significant Potential and Associated Environmental and Health Impacts

The major/significant anticipated impacts arising from the development and operation of the proposed oil palm development project were examined and considered at four phases including: (i) Pre Construction; (ii) Construction; (iii) Operation and Maintenance; (iv) Decommissioning and Abandonment.

It is envisioned that land based traffic will also increase as a result of the proposed project. Land based traffic is expected to increase mainly during the operation phase to allow the FFB collected in the field to be processed at Main estate (headquarters). Activities at the project site during construction will however be varied and limited to the construction phase. The proposed project will result in a negligible impact on traffic, circulation and parking at the project site and its vicinity. It would be unlikely that the

rate of motor vehicle accidents would increase due to the project. No additional cumulative transportation impacts would result from the proposed action. Therefore it is anticipated that no long term environmental impact will be forthwith in considering the land based traffic.

Based upon the findings of social impact assessment, the proposed Extension Two project showed generally positive social consequences in the affected communities. However, there are considerable adverse social impacts enumerated by community stakeholders and perceived by the study team, which require urgent attention and mitigation measures in order for Okomu Oil Palm Company Plc to achieve social security in the project area.

As a result of this, the following management and mitigation measures are proposed for adoption and implementation to address the significant potential social and environmental impacts in order to make the proposed Extension Two project socially acceptable and beneficial:

- Implement FPIC
- Develop and implement community engagement plan
- Avoidance of displacement of communities and people.
- Identification, demarcation and appropriate management of traditional conservation areas and other high conservation values in the landscape.
- Prevention of pollution of water resources.
- Ensuring proper participatory disengagement and payment of compensation to farmers using the land.
- Fire prevention programs and zero or controlled burning.
- Corporate social services to communities.
- Provision of healthcare services and HIV prevention.
- Diligent implementation of social impact management plan

For health impact assessment of the proposed extension two oil palm development project, the main negative impacts are health, safety, and pollution of air and surface water. However, mitigation measures will be put in place for health and safety through the provision of adequate and appropriate PPE. Similarly, there will be a buffer zone (50-150m) between planting areas and the water bodies and there will be minimal application of fertilizer and agrochemicals.

ES 13.0 Proposed Environmental, Social and Forest Management Plans, (EMP, SMP and FMP) to be put in Place

All mitigation measures will be adhered to by the Environment, Health and Safety (HSE) department of the company; (i) Emissions testing and reporting will be done in accordance with the regulatory requirements and record submitted to FMEnv; (ii) Fire prevention precautions will be in place as required by the State Fire Service; (iii) All firefighting equipment will be inspected and maintained regularly; iv) Regular inspections will be conducted to verify the integrity of the fuel tanks. v) Written procedures governing the operation of the fuel tanks and precautions to be taken will be developed; (vi) The occupational health, safety and environmental policies shall be implemented; vii) Capacity building programme for plantation staff including awareness, in-plant training, seminars, workshops and short courses shall be undertaken regularly to enhance the implementation of the EMP.

For the proposed plantation project, the environmental monitoring programme would cover a number of parameters including meteorology, ambient air quality, surface water quality, groundwater quality and noise levels. All these would be monitored by the Federal Ministry of Environment.

The schedule of EMP detailing impact, mitigation measures, actions to be taken and the persons responsible for mitigation actions has also been drawn. It will equally be monitored for compliance.

ES 14.0Decommissioning

The approaches to the decommissioning of the plantation project would involve the combination of assets recovery, dismantling, demolition, decontamination and remediation.

ES 15.0 Conclusion

The EIA process demonstrates that the plantation extension project will fully comply with legislative requirements in Nigeria and other relevant international regulations applicable to the planned activities and operations. The proposed project will result in substantial economic benefits for Nigeria through Employment opportunities generation in particular during the construction and operation phases.

This EIA also indicates that discharges including gaseous emissions and noise are expected from the operation of the plantation project. However, any such discharges, which can be considered as potential sources of adverse environmental effects, can be fully managed through preventive actions and mitigating measures. This means that no significant negative impact on the natural, health and social environmental sensitivities of the project area is expected to result from discharges, let alone the occurrence of a residual impact.

There would appear to be no legal, administrative, natural and socio-economic limitations to prevent the proposed plantation project from going ahead as proposed by OOPC Plc. The project shall be implemented in accordance with the proposed environmental management plan (EMP).

An EMP involving environmental management and supervision organizations, and environmental monitoring has been established to ensure theenvironmental performance of the Project. To ensure successful implementation of thesemeasures, the EMP covers major relevant aspects such as institutional arrangement forenvironmental management and supervision and environmental monitoring. Withimplementation of the mitigation measures defined in the EIA and EMP, and SMP, all the likely adverseenvironmental impacts associated with the project will be prevented, eliminated, or minimizedto an environmentally acceptable level.

The Project is environmentally and socially sound, and willpromote balanced and environmentally sustainable operation of OOPC Plc. It is therefore recommended that OOPC Plc should implement the proposed Extension Two oil palm project by fulfilling its obligations as outlined in the respective social and environmental management plans in this report.

CHAPTER ONE

1.0 INTRODUCTION

1.1 History and Business of Okomu Oil Palm Company Plc

The proponent of the proposed Extension Two oil palm development project; The Okomu Oil Palm Company Plc (OOPC Plc) is an agricultural and food-processing company located at Okomu-Udo, Ovia Southwest Local Government Area, Edo State, Nigeria. The company specializes in plantation development and production of special palm oil, palm kernel oil and palm kernel cake.

The Okomu Oil Palm Company Plc was established in 1976 as a Federal Government pilot project aimed at rehabilitating oil palm production in Nigeria. At inception, the pilot project covered a surveyed area of 15,580 hectares out of which 12,500 hectares could be planted with oil palm. It was incorporated on December 3,1979 as a limited liability company.

In 1990 the Technical committee on Privatization and Commercialization (TCPC) privatized the company on behalf of the Federal Government of Nigeria. At the turn of the millennium, the company acquired a 6,000 hectares property known as Extension One to further boost its available hectarage.

The Okomu Oil Palm Company Plc has since grown to become one of Nigeria's leading agricultural companies. Presently Okomu has almost 10,000 ha of oil plam of which 8713 ha are mature and 7500 of rubber of which around 5000 ha is mature. It has also expanded its milling capacity from a meagre 1.5 tonnes FFB/hr in 1985 to 30 tonnes FFB/hr and further to its present capacity of 60 tonnes FFB/hr, thus making the company to operate the largest mill in Nigeria.

In 2014 OOPC Plc acquired a partly developed plantation of 11,416.673 ha at Uhunmwonde and Ovia Northeast Local Government Areas of Edo State. This latest acquisition is referred to as Extension Two. The company intends to develop Extension Two in strict conformity to the principles and criteria of the Roundtable on Sustainable Palm Oil and best management practices that is reputed for. The company also plans to establish a 60 tonnes/hr mill at Extension Two when the plantation development has progressed considerably.

The privatization of The Okomu Oil Palm Company has been a great success and a huge encouragement for the Nigerian agricultural sector, with profound positive consequences of stable socio-economic growth for the region where it is located. The company has consistently posted profits in the last 15 years; a period during which most other similar establishment in the country have either folded up or performing sub-optimally.

What is most inspiring is not just the growth and profitability of the company, but the fact that it is the only agri-business in the NSE's top 18 companies with the largest turnovers.

Today, what is now known as The Okomu Oil Palm Company Plc has transformed into an economic success, earning presidential recommendation and recording over 300 percent rise in profit-after-tax (PAT). The excellent quality of the palm oil and crumb rubber produced by the company, guarantees premium selling prices on the local and international markets.

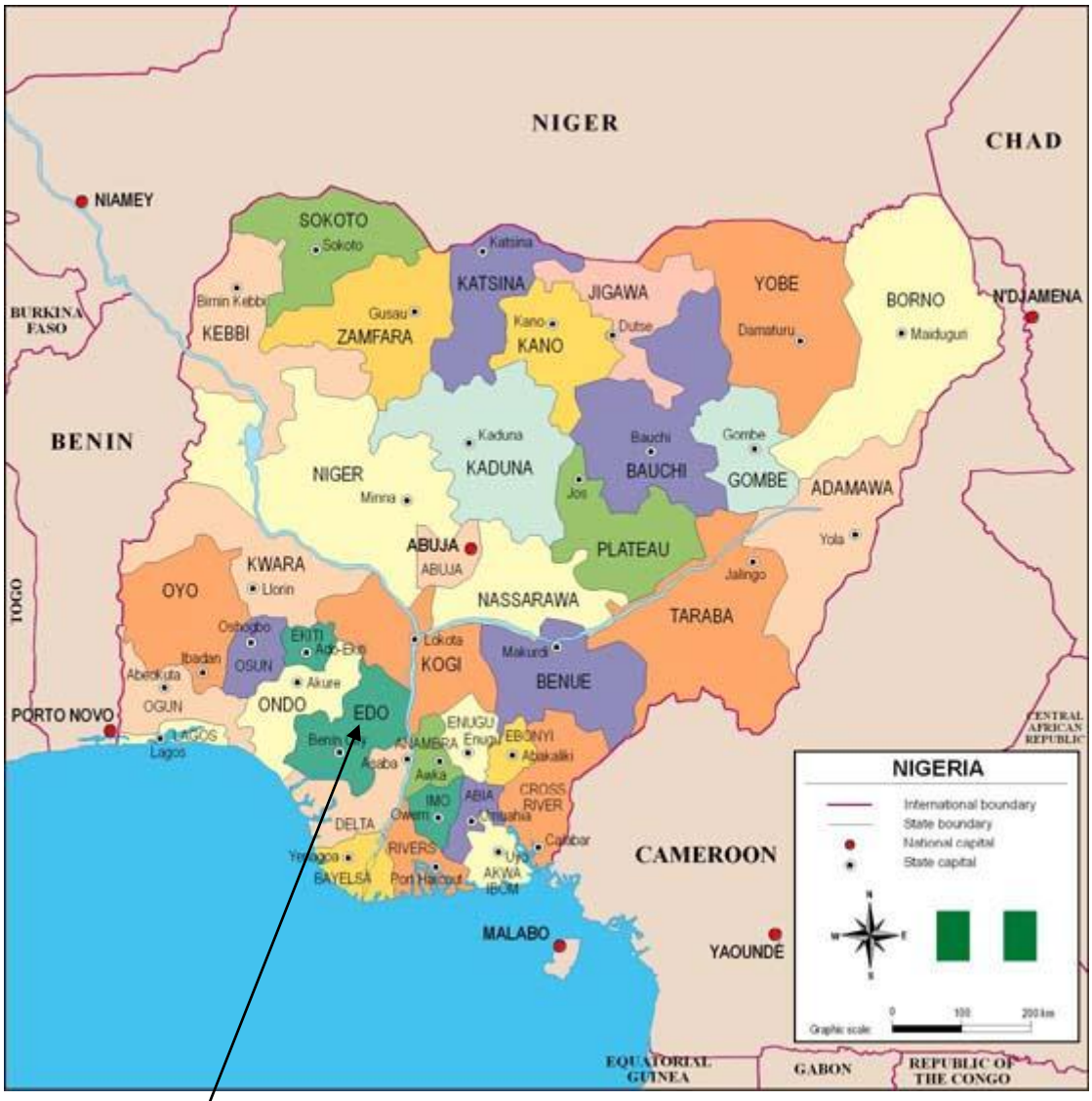
Just as the company is expanding in size, its corporate environment is also expanding. The Company has over 12,000 individual and institutional shareholders, both Nigerian (40%) and foreign (60%). Currently, the company employs over 2000 permanent staff and several independent sub-contractors. All these have added up to place Okomu Oil Palm Company Plc on top in the burgeoning oil palm business and to position it as an emerging leader in rubber production.

Okomu Oil Palm Company Plc benefits from the quality management provided by its main shareholders and technical partner, Socfinco SA, with a 62% shares in Okomu Oil Palm Plc. Socfinco SA is the biggest single shareholder that brings into Okomu a little under a century of sound acclaimed technical expertise in the world stage on tropical agriculture.

Socfinco SA is a global player in the cultivation of oil palm, rubber, coffee and tropical flower. Socfinco SA founded in 1912 was the first industrial company to plant oil palm in Africa and Indonesia. It has ongoing plantations in Cote D'ivoire, Liberia, Guinea, Cameroun, Indonesia, Kenya Sierra Leone and Congo.

1.2 Location and Access

The headquarters of OOPC Plc is located at Okomu-Udo in Ovia Southwest Local Government Area of Edo State, Nigeria. The company is accessible through a network of roads from Lagos and Benin City. It lies between latitude $5^0$07' and $5^0$25' E and longitude $6^0$18' and $6^0$26' N. (see Maps 1-1 and 1-2)



Source: Google.com

Edo State

Map 1-1: Map of Nigeria indicating Edo State

Source: Google.com

Map 1-2: Map of Edo State showing Ovia North-East and Uhunmwonde LGA

1.3 Activities

The company undertakes plantation agriculture involving the growing of oil palm (*Elaeis guineensis*) and the processing of Fresh Fruit Bunches (FFB) into special palm oil. The company is also involved in the planting and tapping of rubber (*Hevea Brasiliensis*). The major activities of the company include the operations in the oil palm plantation, palm oil mill, rubber plantation and rubber factory.

1.4 Mission Statement of The Okomu Oil Palm Company Plc

"To be Nigeria's leading agribusiness, through the efficient and effective management of our various plantations by a highly motivated workforce, working in harmony with other stakeholders, and continuously returning favourable results to our shareholders".

1.5 Literature Review on the Oil Palm Industry

1.5.1 The Oil Palm

The oil palm is one of the agricultural tree crops in Nigeria. It is the highest yielding oil crop in the World. It produces on the average 4-5 tonnes of oil per hectare per year, about 10 times the yield of soyabean. There are two definite species namely; *Elaeise guineensis* **Jacq.** from Africa and E. *Melanococa* **Gaertner** from South America. Palm oil is also produced from specie called *Attalea maripa* **Carl Friedrich Philipp von Martius** from South America and Trinidad and Tobago.

The oil palms (*Elaeis*) comprise two species of the Arecaceae, or palm family. They are used in commercial agriculture in the production of palm oil. The African Oil Palm *Elaeis guineensis* is native to west Africa, occurring between Angola and Gambia, while the American Oil Palm *Elaeis oleifera* is native to tropical Central America and South America. The generic name is derived from the Greek for oil, *elaion*, while the species name refers to its country of origin.

Mature trees are single-stemmed, and grow to 20 m tall. The leaves are pinnate, and reach between 3-5 m long. A young tree produces about 30 leaves a year. Established trees over 10 years produce about 20 leaves a year. The flowers are produced in dense clusters; each individual flower is small, with three sepals and three petals.

The palm fruit takes five to six months to mature from pollination to maturity. The palm fruit is reddish, about the size of a large plum and grows in large bunches. Each fruit is made up of an oily, fleshy outer layer (the pericarp), with a single seed (the palm kernel), also rich in oil. When ripe, each bunch of fruit weighs 40-50 kilogrammes.

Oil is extracted from both the pulp of the fruit (palm oil, an edible oil) and the kernel (palm kernel oil, used in foods and for soap manufacture). For every 100 kilograms of fruit bunches, typically 22 kilograms of palm oil and 1.6 kilograms of palm kernel oil can be extracted. The high oil yield of oil palm trees (as high as 7,250 liters per hectare per year) has made it a common cooking ingredient in southeast Asia and the tropical belt of Africa. Its increasing use in the commercial food industry in other parts of the world is buoyed by its cheaper pricing, the high oxidative stability of the refined product and high levels of natural antioxidants.

Since palm oil contains more saturated fats than oils made from canola, corn, linseed, soybeans, safflower, and sunflowers, it can withstand extreme deep-frying heat and resists oxidation.

Planting

For each hectare of oil palm, which is harvested year-round, the annual production averages 10 tonnes of fruit, which yields 3,000 kg of pericarp oil, and 750 kg of seed kernels, which yield 250 kg of high quality palm kernel oil as well as 500 kg of kernel meal. Palm fronds and kernel meal are processed for use as livestock feed.

All modern, commercial planting material consists of tenera palms or DxP hybrids, which are obtained by crossing thick-shelled dura with shell-less pisifera. Although common commercial pre-germinated seed is as thick-shelled as the dura mother tree, the resulting tree will produce thin-shelled tenera fruit. An alternative to pre-germinated seed, once constraints to mass production are overcome, is tissue-cultured or “clonal” palms which provide “true copies” of high yielding DxP palms.

It is essential for an oil palm nursery to have an uninterrupted supply of clean water and topsoil which is both well-structured and sufficiently deep to accommodate three rounds of on-site bag-filling. Approximately 35 ha can grow enough seedlings over a three-year period to plant a 5,000 ha plantation. Pre-nursery seedlings must be watered daily. Whenever rainfall is less than 10 mm per day, irrigation is

required, and the system must be capable of uniformly applying 6.5 mm water per day.

Pre-nursery seedlings in the four-leaf stage of development (10 to 14 weeks after planting) are usually transplanted to the main nursery, after their gradual adjustment to full sunlight and rigid selection process. During culling, seedlings that have "grassy", "crinkled", "twisted", or "rolled" leaves are discarded.

Weeds growing in the polybags must be carefully pulled out. Herbicides should not be used. Numerous insects (e.g., ants, armyworm, bagworm, aphids, thrips, mites, grasshoppers, mealybugs) and vertebrates (e.g., rats, squirrels, porcupine, wild boar, monkeys) are pests in oil palm nurseries and must be carefully identified before control measures are implemented. After eight months in the nursery, normal healthy plants should be 0.8–1 m in height and display 5 to 8 functional leaves.

1.6 Oil palm plantations development

The proper approach to oil palm development begins with the establishment of leguminous cover plants, immediately following land clearing. It helps prevent soil erosion and surface run-off, improve soil structure and palm root development, increase the response to mineral fertilizer in later years, and reduce the danger of micronutrient deficiencies. Leguminous cover plants also help prevent outbreaks of Oryctes beetles, which nest in exposed decomposing vegetation. Both phosphorus and potassium fertilizers are needed to maximize the leguminous cover plants' symbiotic nitrogen fixation potential of approximately 200 kg nitrogen/ha/yr and are applied to most soils at 115 to 300 kg phosphorous oxide/ha and 35 to 60 kg potassium oxide/ha. Young palms are severely set back where grasses are allowed to dominate the inter-row vegetation, particularly on poor soils where the correction of nutrient deficiencies is difficult and costly.

Crop Nutrient

Nutrient uptake is low during the first year but increases steeply between year one and year three (when harvesting commences) and stabilizes around years five to six. Early applications of fertilizer, better planting material, more rigid culling has led to a dramatic increase in early yields in third to sixth years from planting. In regions without any serious drop in rainfall, yields of over 25 tonnes of fresh fruit bunches per hectare have been achieved in the second year of harvesting.

Nitrogen deficiency is usually associated with conditions of water-logging, heavy weed infestation and topsoil erosion. Symptoms are a general paling and stiffening of the pinnae which lose their glossy lustre. Extended deficiency will reduce the number of effective fruit bunches produced as well as the bunch size.
Phosphorous deficient leaves do not show specific symptoms but frond length, bunch size and trunk diameter are all reduced.

Potassium deficiency is very common and is the major yield constraint in sandy or peaty soils. The most frequent symptom is "confluent orange spotting". Pale green spots appear on the pinnae of older leaves; as the deficiency intensifies, the spots turn orange or reddish-orange and desiccation sets in, starting from the tips and outer margins of the pinnae. Other symptoms are "orange blotch" and "mid-crown yellowing". In soils having a low water holding capacity (sands and peats) potassium deficiency can lead to a rapid, premature desiccation of fronds.

Copper deficiency is common on deep peat soils and occurs also on very sandy soils. It appears initially as whitish yellow mottling of younger fronds. As the deficiency intensifies, yellow, mottled, inter-veinal stripes appear and rusty, brown spots develop on the distal end of leaflets. Affected fronds and leaflets are stunted and leaflets dry up. On sandy soils, palms recover rapidly after a basal application of 50 grams of copper sulphate. On peat soils, lasting correction of copper deficiency is difficult, as applied copper sulphate is rendered unavailable. A promising method to correct copper deficiency on peat soil is to mix copper sulphate with clay soil and to form tennis-ball sized “copper mudballs” that are placed around the palm and that provide a slow-release source of available copper.

Healthy, well selected seedlings are a pre-condition for early and sustained high yield. In most cases granular multi-nutrient compound fertilizers are the preferred nutrient source for seedlings in the nursery. Where sub-soil is used to fill the polybags, extra dressings of Kieserite may be required (10-15 g every 6 to 8 weeks). Where compound fertilizers are not available, equivalent quantities of straight materials should be used.
To maintain good fertilizer response and high yields in older palms (selective) thinning is often necessary.

Disease

Basal stem rot, caused by the fungus ganoderma, is the most serious disease of oil palm in Malaysia and Indonesia. Previously, research on basal stem rot was hampered by the failure to artificially infect oil palm with the fungus. Although Ganoderma had been associated with BSR (Thompson, 1931), proof of its pathogenicity to satisfy Koch's postulate was only achieved in the early 1990s by inoculating oil palm seedling roots (Ariffin and Idris, 1991) or by using rubber wood blocks (Khairuddin, 1990). A reliable and quick technique for testing the pathogenicity of the Ganoderma fungus by inoculating oil palm germinated seeds. This fatal disease can lead to losses as much as 80% after repeated planting cycles.

Ganoderma produces enzymes that degrade the oil palm tissue and affect the infected oil palm xylem thus causing serious problems to the distribution of water and other nutrients to the top of the palm tree. Ganoderma infection is well defined by its lesion in the stem. The cross section of infected palm stem shows that the lesion appears as a light brown area of rotting tissue with a distinctive irregularly shaped darker band at the borders of this area. The infected tissue becomes as an ashen-grey powdery and if the palm remains standing, the infected trunk rapidly becomes hollow.

In a 2007 study in Portugal, scientists suggest control of ganoderma on oil palms would benefit from further consideration of the process as one of white rot. Ganoderma are extraordinary organisms capable exclusively of degrading lignin to carbon dioxide and water: celluloses are then available as nutrients for the fungus. It is necessary to consider this mode of attack as a white rot involving lignin biodegradation, for integrated control. The existing literature does not report this area and appears to be concerned particularly with the mode of spread and molecular biology of ganoderma. The white rot perception opens up new fields in breeding/selecting for resistant cultivars of oil palms with high lignin content, ensuring the conditions for lignin decomposition are reduced, and simply sealing damaged oil palms to stop decay. It is likely that spread is by spores rather than roots. The knowledge gained can be employed in the rapid degradation of oil palm waste on the plantation floor by inoculating suitable fungi, and/or treating the waste more appropriately (e.g. chipping and spreading over the floor rather than windrowing).

Endophytic bacteria are organisms inhabiting plant organs that at some time in their life cycle can colonize the internal plant tissues without causing apparent harm to the host. Introducing endophytic bacteria to the roots to control plant disease is to manipulate the indigenous bacterial communities of the roots in a manner, which leads to enhanced suppression of soil-born pathogens. The use of endophytic bacteria should thus be preferred to other biological control agents as they are internal colonizers, with better ability to compete within the vascular systems, limiting Ganoderma for both nutrients and space during its proliferation.

Two bacterial isolates Burkholderia cepacia(B3) and Pseudomonas aeruginosa(P3) were selected for evaluation in the glasshouse for their efficacy in enhancing growth and subsequent suppression of the spread of BSR in oil palm seedlings.
Little leaf syndrome has not been fully explained but has often been confused with Boron deficiency. The growing point is damaged, sometimes by Oryctes beetle. Small, distorted leaves that resemble Boron deficiency emerge. This is often followed by secondary pathogenic infections in the spear that can lead to spear rot and palm death.

1.7 Palm oil production

1.7.1 Fruit of oil palm tree

The oil palm originated in West Africa but has since been planted successfully in tropical regions within 20 degrees of the equator. There is evidence of palm oil use in Ancient Egypt. In the Republic of the Congo, or Congo Brazzaville, precisely in the Northern part, not far from Ouesso, local people produce this oil by hand. They harvest the fruit, boil it to let the water part evaporate, then they press what is left in order to collect the reddish, orange colored oil.

In 1995, Malaysia was the world's largest producer of Palm Oil with 51% of world production. Since 2007, Indonesia emerged the world's largest producer of palm oil producing approximately 50% of world palm oil volume. Worldwide palm oil production during the 2005-2006 growing season was 39.8 million metric tons, of which 4.3 million tons was in the form of palm kernel oil. It is thus by far the most widely produced tropical oil, and constitutes thirty percent of total edible oil production worldwide.

1.8 The Oil Palm Sector in Nigeria

Nigeria is a major producer and exporter of fossil fuel (that is, petroleum and natural gas). Besides crude oil production in the Nigeria oil province, the country is also endowed with several mineral resources such as tin, iron ore, coal, lead, zinc, limestone. Soil and climate particularly in the southern oil – palm growing belt is suitable for the cultivation of oil palm, rubber, cocoa and other food crops. Oil palm cultivation and processing is a major sector in Nigeria and its economic importance is receiving increasing attention.

Presently, Nigeria is the fifth largest producer of oil palm in the world behind Indonesia, Malaysia, Thailand and Columbia. Indonesia and Malaysia contribute between 80 to 86% of the total global oil palm output. Thailand and Columbia are two countries that have witnessed massive growth in the oil palm sector in recent years. Nigeria being the country that dominated oil palm production and export before 1972 have witnessed only slight growth compared to the four largest producing nations.

The Nigeria oil palm growth pattern (fig1), indicate that Nigeria oil palm growth rate is 10,000 metric tonnes per annum from 2004 to 2007 and from 2008 to 2011 the country's productivity was constant. Currently, the government and stakeholders are attempting to revitalize the sector. Nigeria crude palm oil production rate stood at 930,000 metric tonnes in 2013 economic year (USDA, 2013).

1.8.1 Smallholder Oil Palm Production

The term smallholder is now common currency in dialogue on sustainable palm oil. Some observers use the term to mean a broad spectrum of local residents involved in the palm oil industry in some way, including (DTE, 2006);

- Peasant farmers who have chosen to grow oil palm on their own plots
- Settlers and trans-migrants in areas under large-scale plantation often brought in specifically to provide labour
- Indigenous people whose customary land rights have been overridden by land rights granted by the government to a plantation company
- Farmers in debt to company established cooperatives

The roundtable on sustainable palm oil (RSPO) defines smallholders more tightly as family-based enterprises producing palm oil from less than 50 ha of land.

Global production of palm oil has doubled in the past ten years. A major opportunity exists to meet the rising demand in an environmentally and socially sustainable manner through expansion and improvement of both smallholder and large estate production. Small holders already play a significant part in the oil palm industry. In the two countries responsible for over 80 to 86% of world oil palm production, Indonesia and Malaysia, smallholders account for 35-40% of the total area of planted oil palm and up to 33% of the output. Other countries such as Nigeria, considerable numbers of smallholders producer are present, but are often less well linked to the world markets. In Nigeria, smallholders account for about 80% of the total area under oil palm.

1.9 Social and environmental impacts

The social and environmental impacts of oil palm cultivation are highly controversial topics. There are multiple sources highlighting the positive and negative aspects of this industry. Oil palm is a valuable economic crop and provides a major source of employment. It allows many small landholders to participate in the cash economy and also often results in the upgrade of the infrastructure (schools, roads, and telecommunications) within that area.

However, there are cases where native customary lands have been appropriated by oil palm plantations without any form of consultation or compensation, leading to social conflict between the plantations and local residents. In some cases oil palm plantations are dependent on imported labour or illegal immigrants, and there are some concerns about the employment conditions and social impacts of these practices.

Biodiversity loss (including the potential extinction of charismatic species) is one of the most serious negative effects of oil palm cultivation. Large areas of already threatened tropical rainforest often need to be cleared to make way for plantations, especially in South-East Asia where there is a lack of enforcement of forest protection laws. The impact of oil palm plantations on the environment is dependent on multiple factors, including the existence and compliance to environmental legislation, the pre-establishment habitat and corporate responsibility. In some states where oil palm is established there had been little

enforcement of environmental legislation leading to encroachment of plantations into protected areas, encroachment into riparian strips, open burning of plantation wastes and release of palm mill pollutants such as palm oil mill effluent (POME) in the environment. Some of these states have recognized the need for increased environmental protection and this is resulting in more environmental friendly practices. Among those approaches is anaerobic treatment of POME. POME can be a good source for biogas (CH_4) production and electricity generation. Anaerobic treatment of POME has been practiced in Malaysia, Indonesia and in Presco Plc, Edo state, Nigeria. Like most wastewater sludge, anaerobic treatment of POME results in domination of *Methanosaeta concilii*. It plays an important role in methane production from acetate and the optimum condition for its growth should be considered to harvest biogas as renewable fuel.

Demand for palm oil has increased in recent years due to its use as a biofuel, but recognition that this increases the environmental impact of cultivation as well as causing a food versus fuel issue has forced some developed nations to reconsider their policies on biofuel to improve standards and ensure sustainability. However, critics point out that even companies signed up to the Roundtable on Sustainable Palm Oil continue to engage in environmentally damaging practices and that using palm oil as biofuel is perverse because it encourages the conversion of natural habitats such as forests and peat lands, releasing large quantities of greenhouse gases.

1.9.1 Carbon Balance

Oil palm production has been documented as a cause of substantial and often irreversible damage to the natural environment. Its impacts include: deforestation, habitat loss of critically endangered species, and a significant increase in greenhouse gas emissions.

The pollution is exacerbated because many rainforests in Indonesia and Malaysia lie atop peat bogs that store great quantities of carbon that are released when the forests are cut down and the bogs drained to make way for the palm oil plantations.

Environmental groups such as Greenpeace claim that the deforestation caused by making way for oil palm plantations is far more damaging for the climate than the benefits gained by switching to biofuel. Fresh land clearances, especially in Borneo, are contentious for their environmental impact. NGOs and many international bodies are now warning that, despite thousands of square kilometres of land

standing unplanted in Indonesia, tropical hardwood forests are being cleared for palm oil plantations.

Furthermore, as the remaining unprotected lowland forest dwindles, developers are looking to plant peat swamp land, using drainage that unlocks the carbon held in their trees, and begins an oxidation process of the peat which can release 5,000 to 10,000 years worth of stored carbon. Drained peat is also at very high risk of forest fire, and there is a clear record of fire being used to clear vegetation for oil palm development in Indonesia. Drought and man-made clearances have led to massive uncontrolled forest fires over recent years, covering parts of Southeast Asia in haze and leading to an international crisis with Malaysia. These fires have been variously blamed on a government with little ability to enforce its own laws while impoverished small farmers and large plantation owners illegally burn and clear forests and peat lands to reap the developmental benefits of environmentally-valuable land.

Many of the major companies in the vegetable oil economy participate in the Roundtable on Sustainable Palm Oil, which is trying to address this problem. In 2008 Unilever, a member of the group, committed to use only oil palm oil which is certified as sustainable, by ensuring that the large companies and smallholders that supply it convert to sustainable production by 2015.

Meanwhile, much of the recent investment in new palm plantations for biofuel has been part-funded through carbon credit projects through the Clean Development Mechanism; however the reputational risk associated with unsustainable palm plantations in Indonesia has now made many funds wary of investing there.

1.9.2 Palm Biomass as Fuel

Some scientists and companies are going beyond using just the oil, and are proposing to convert fronds, empty fruit bunches and palm kernel shells harvested from oil palm plantations into renewable electricity, cellulosic ethanol, biogas, biohydrogen and bioplastic. Thus, by using both the biomass from the plantation as well as the processing residues from palm oil production (fibers, kernel shells, palm oil mill effluent), bioenergy from palm plantations can have an effect on reducing greenhouse gas emissions. Examples of these production techniques have been registered as projects under the Kyoto Protocol's Clean Development Mechanism.

By using palm biomass to generate renewable energy, fuels and bio-degradable products, both the energy balance and the greenhouse gas emissions balance for palm biodiesel is improved. For every tonne of palm oil produced from fresh fruit bunches, a farmer harvests around 6 tonnes of waste palm fronds, 1 tonne of palm trunks, 5 tonnes of empty fruit bunches, 1 tonne of press fiber (from the mesocarp of the fruit), half a tonne of palm kernel endocarp, 250 kg of palm kernel press cake, and 100 tonnes of palm oil mill effluent. Oil palm plantations incinerate biomass to generate power for palm oil mills. Oil palm plantations yield large amount of biomass that can be recycled into medium density fibreboards and light furniture. In efforts to reduce greenhouse gas emissions, scientists treat palm oil mill effluent to extract biogas. After purification, biogas can substitute for natural gas for use at factories.

Anaerobic treatment of palm oil mill effluent, practiced in Malaysia, Indonesia and Nigeria, results in domination of *Methanosaeta concilii*. It plays an important role in methane production from acetate and the optimum condition for its growth should be considered to harvest biogas as renewable fuel.

Unfortunately, palm oil has detrimental effects on the environment and is not considered to be a sustainable biofuel. The deforestation occurring throughout Malaysia and Indonesia as a result of the growing demand for this plant has made scarce natural habitats for Orangutan and other rainforest dwellers. More carbon is released during the life cycle of a palm oil plant to its use as a biofuel than is emitted by the same volume of fossil fuels.

1.10 Legal and Administrative Policy Framework

Nigeria has enacted a comprehensive policy and legal framework for environmental assessment and management. The country has policies, legislation, and strategies in place to manage the protected facilities, to satisfy its international obligations, and to protect the quality of the environment for the health and well-being of its citizens. The hierarchy of policies and legislative provisions for environmental management in Nigeria is comprised of different enactments ranging from the Constitution to international treaties, and to environment and resource protection laws.

A fundamental principle of the Nigerian environmental policy is that economic development must be in harmony with the extraction and utilization of natural resources and that air, water, and soil pollution will be controlled.

The applicable Domestic environmental laws and regulations are as follows:

1.10.1 National Legislation

The National legislation applicable to this project includes:

- Environmental Impact Assessment Act, No. 86, 1992
- The National Policy On Environment, 1989
- National Guidelines and Standards for Environmental Pollution Control in Nigeria, 1991
- Harmful waste (criminal provision) Act 42 of 1988
- National Effluent Limitations Regulations S.I.8, 1991
- National Pollution Abatement in Industries and Facilities Generating Wastes Regulations S.I.9, 1991
- National Guidelines for Environmental Audit in Nigeria, 1999
- National Guidelines on Environmental Management System in Nigeria 1999.
- National Environmental Standards and Regulations Enforcement Agency (NESREA), 2007.
- Hazardous and solid waste management Regulations S.1.9., 1991
- Waste Management and Hazardous Waste Regulations S.I.15, 1991
- Factory Act 1990
- Nigerian Land Use Act, 1978
- Forestry Law Cap 51, 1994
- The Nigerian Urban and Regional Planning Law
- National Policy on Renewable Energy Development
- National Park Service Act 1999

Environmental Impact Assessment Act 86 of 1992

EIA act was promulgated in 1992. It makes environmental impact assessment (EIA) mandatory for all new major projects. Therefore, an EIA is requested by the Federal Ministry of Environment for the proposed project.

National Guidelines and Standards for Environmental Pollution Control in Nigeria 1991

This schedule deals with the control of industrial effluent discharge, gaseous emissions and hazardous wastes, so also noise pollution control. This schedule established environmental guidelines and standards for the abatement and control of all forms of pollution.

The proposed project would therefore have to ensure that any discharges into the land, water and atmosphere are of acceptable quality to ensure that there are no legal repercussions under this schedule.

National Effluent Limitations Regulations S.I.8, 1991

These Regulations give the parameters in industrial gaseous emissions and wastewater (effluents) and their limitations, concentration and standards for discharge into land, atmosphere and receiving surface waters.

The proposed project would therefore have to ensure that any discharges into the land, water and atmosphere are of acceptable quality to ensure that there are no legal repercussions under this schedule.

National Pollution Abatement in Industries and Facilities Generating Wastes Regulations S.I.9, 1991

This regulation requires every industry to install anti pollution/pollution abatement equipment to treat effluent discharges and gaseous emissions to the standards and limits prescribed in Regulation S.I.8, 1991.

Waste Management and Hazardous Wastes Regulations S.I.15

This regulation requires that all steps that are necessary must be taken for the effective management of solid and hazardous wastes in order to safeguard public health, ensure that waste is collected, stored, transported, recycled, reused or disposed in an environmentally sound manner and promote safety standards in relation to such waste.

National Environmental (Sanitation and Waste Control) Regulations, 2009 (S.I.28)

The purpose of these regulations is the adoption of sustainable and environment friendly practices in environmental sanitation and waste management to minimize pollution. The provisions of the regulations state that a person in care, management or control of any industrial facility shall:

(a) Provide educational and pictorial signs to direct persons where they can drop waste.
(b) Provide receptacles for recyclable materials in appropriate and easily accessible locations.

(c) Keep the premises, drains and all public or private lands, street, lanes, walkways; beaches or docks within 5 meters of the boundary of the property free from litter at all times.
(d) Ensure that discarded materials are regularly collected and disposed of sanitarily.
(e) Ensure that recyclable materials are properly packed and neatly stacked.
(f) Ensure sorting and segregation of solid waste at source.

National Environmental (Noise Standards and Control) Regulations, 2009 (S.I.35)

The purpose of these regulations is to ensure maintenance of a healthy environment for all people in Nigeria, the tranquility of their surroundings and their psychological well-being by regulating noise levels and generally, to elevate the standard of living of the people. The regulations among others state the permissible noise levels to which a person may be exposed; control and mitigation of noise; permits for noise emissions in excess of permissible levels; and enforcement.

Factories Act 1990

The regulations for Health, Safety and Welfare are under this act. This act also requires that: Before any person occupies or uses as a factory any premises which were not so occupied at the commencement of this Decree, he shall apply for the registration of such premises by sending to the Director of Factory an application containing the particulars set out in Schedule 1 to this Decree.

Any person who has not been issued a certificate of registration as aforesaid occupies or uses as a factory any premises that have not been registered as a factory shall be guilty of an offence.

Nigerian Land Use Act, 1978

The Nigerian Land Use Act 1978 was promulgated in March 1978. It vests all land in each state of the federation (except land already vested in the Federal Government or its agencies) in the Governor of the state. It makes the state Government the authority for allocating land in all urban areas for residential, agricultural commercial and other purposes while it confers similar powers regarding non-urban areas on the Local Government in such area. The Governor of a state can revoke a Right of occupancy (statutory customary) for overriding public interest.

Forestry Law Cap 51, 1994

The Forestry Law Cap 51 is the only substantive legislation applicable to all parts of the federation. The law prohibits any act that may lead to the destruction of or cause injury to any forest produce, forest growth or forestry property. The law prescribes the administrative framework for the management, utilization and protection of forestry resources in Nigeria.

The Nigerian Urban and Regional Planning Law

Decree 88 of 1992 established a Development Control Department (DCD) charged with the responsibility for matters relating to development, control and implementation of physical development plans at Federal, State, and Local Government levels within their respective jurisdictions.

National Policy on Renewable Energy Development

The primary objective of the National Policy on Renewable Energy Development is to encourage the diversification of sources of energy supply through renewable energy, and as such improve the energy security of the country.

1.11 International Finance Corporation (IFC) Performance Standards (PS)

Other related international guidelines include IFC Performance Standards such as:

PS 1 − Social and Environmental Assessment and Management Systems
PS 2 − Pollution Prevention and Abatement
PS 3 − Community Health, Safety and Security
PS 4 − Land Acquisition and Involuntary Resettlement
PS 5 − Biodiversity Conservation and Sustainable Natural Resource Management
PS 6 − Cultural Heritage
IFC Environmental, Health and Safety Guidelines for Plantation Crop Production.

1.12 Roundtable on Sustainable Palm Oil – Principles and Criteria

RSPO is a not-for-pro-t association that unites stakeholders from seven sectors of the palm oil industry - oil palm producers, palm oil processors or traders, consumer goods manufacturers, retailers, banks and investors, environmental or nature conservation NGOs and social or developmental NGOs - to develop and implement

global standards for sustainable palm oil. This is achieved via eight principles as follows:

Principle 1: Commitment to transparency
Principle 2: Compliance with applicable laws and regulations
Principle 3: Commitment to long-term economic and financial viability
Principle 4: Use of appropriate best practices by growers and millers
Principle 5: Environmental responsibility and conservation of natural resources and biodiversity
Principle 6: Responsible consideration of employees, and of individuals and communities affected by growers and mills
Principle 7: Responsible development of new plantings
Principle 8: Commitment to continual improvement in key areas of activity

1.13 Forest Stewardship Council (FSC) Principles and Criteria

The FSC Principles & Criteria (P&C) describe the essential elements or rules of environmentally appropriate, socially beneficial and economically viable forest management. There are ten principles setting out this vision; each principle is supported by several criteria that provide a way of judging whether the principle has been met in practice. All the ten principles and criteria must be applied in any forest management unit before it can receive FSC certification. The Principles & Criteria apply to all forest types and to all areas within the management unit included in the scope of the certificate. The P&C are applicable worldwide and relevant to forest areas and different ecosystems, as well as cultural, political and legal systems. This means that they are not specific to any particular country or region.

The 10 Principles setting the rules for responsible forest management include:

Principle 1: Compliance with laws and FSC Principles – to comply with all laws, regulations, treaties, conventions and agreements, together with all FSC Principles and Criteria.
Principle 2: Tenure and use rights and responsibilities – to define, document and legally establish long-term tenure and use rights.
Principle 3: Indigenous peoples' rights – to identify and uphold indigenous peoples' rights of ownership and use of land and resources.

Principle 4: Community relations and worker's rights – to maintain or enhance forest workers' and local communities' social and economic well-being.

Principle 5: Benefits from the forest – to maintain or enhance long term economic, social and environmental benefits from the forest.

Principle 6: Environmental impact – to maintain or restore the ecosystem, its biodiversity, resources and landscapes.

Principle 7: Management plan – to have a management plan, implemented, monitored and documented.

Principle 8: Monitoring and assessment – to demonstrate progress towards management objectives.

Principle 9: Maintenance of high conservation value forests – to maintain or enhance the attributes which define such forests.

Principle 10: Plantations – to plan and manage plantations in accordance with FSC Principles and Criteria.

1.14 International Agreements and Protocols

Nigeria has acceded to a number of international environmental conventions and the key ones are presented in Table 1-1. The applicable international environmental agreements and protocols include:

- The Montreal Protocol
- The Basel Convention
- The Framework Convention on Climate Change
- The Convention for The Prevention of International Trade in Endangered Species (CITES)
- Convention on Biological Diversity (CBD)

The Montreal Protocol

This protocol discourages the use of substances that deplete the ozone layer and promotes the synthesis of new and environment-friendly products.

The Basel Convention

This convention deals with the control of Trans–boundary movement of Hazardous Waste and Substances among member countries.

The Framework Convention on Climate Change

This convention requires member countries to stabilize atmospheric concentrations of greenhouse gases at levels that will prevent human activities from interfering dangerously with the global climate change.

The Convention for the Prevention of International Trade in Endangered Species (CITES)

The trade involving certain wild animals and plants whose numbers are considered to be endangered is been regulated by this convention

Convention on Biological Diversity (CBD)

This convention deals with the conservation of biodiversity, the sustainable use of its component and the fair and equitable sharing of the resulting benefits.

Table 1-1: International Environmental Conventions Signed by Nigeria

Convention	**Year of Accession**
African Convention on the Conservation of Nature and Natural Resources	1968
Convention on Biological Diversity CBD)	1993
UN Framework Convention on Climate Change (UNFCCC)	1994
Kyoto Protocol	1999
UN Convention on Combating Desertification (UNCCD)	1996
Convention on the Protection of Wetlands of International Importance (RAMSAR)	1998
Vienna Convention for the Protection of the Ozone Layer	1996
Montreal Protocol (regulating substances that deplete the ozone layer)	1996
Convention on International Trade in Endangered Species of Fauna and Flora (CITES)	1996
Convention on Trans-boundary Movement of Hazardous Waste (BASEL)	1997
Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade	2000
Stockholm Convention on Persistent Organic Pollutants (POPs)	2004
World Heritage Convention	1990
Convention on the Conservation of Migratory Species of Wild Animals (BONN Convention)	1979
International Union for the Conservation of Nature and Natural Resources (IUCN)	1956
The Equator Principles	2003

1.15 Institutions and Regulatory Agencies

- Federal Ministry of Environment
- National Environmental Standards and Regulations Enforcement Agency
- Edo State Ministry of Environment and Public Utilities
- Edo State Environmental and Waste Management Board
- Ministry of Agriculture and Natural Resources, Edo State
- Ministry of Lands and Surveys, Edo State
- Edo State Fire Service
- Ministry of Health, Edo State
- Departments of Environment, Uhunmwonde and Ovia Northeast Local Government Areas of Edo State, Nigeria.

Federal Ministry of Environment

The Federal Ministry of Environment is the apex body with the broad mandate to regulate and protect the environment in Nigeria. The Ministry has enacted a number of environmental laws and regulations. In addition, Nigeria is party to some international agreements; protocols and conventions on Environment and is bound by their provisions and requirements.

National Environmental Standards and Regulations Enforcement Agency (NESREA)

NESREA is charged with the responsibility of enforcing all environmental laws, guidelines, policies, standards and regulations in Nigeria. It also has the responsibility to enforce compliance with provisions of international agreements, protocols, conventions and treaties on the environment.

Edo State Ministry of Environment and Public Utilities

The Edo State Ministry of Environment and Public Utilities is the arm of government responsible for regulating the environment in Edo State of Nigeria. Depending on certain peculiarities of the state, the Ministry has made and established its own laws and environmental standards, which are not inconsistent with Federal laws.

Edo State Environmental and Waste Management Board

This Board is under the Governor's Office with a mandate for waste management and environmental sanitation.

Department of Forestry and Natural Resources, Edo State

The Forestry Department of the Edo State Ministry of Environment and Public Utilities has responsibility for forest resources management, forest reserves and wildlife conservation in the state.

Ministry of Lands and Surveys, Edo State

The Ministry of Lands and Surveys deals with land issues, plans and controls development, establishes residential, commercial and industrial layouts and execute in the state the Nigerian Urban and Regional Planning law.

Uhunmwonde and Ovia Northeast Local Government Areas

The Departments of Environment, Uhunmwonde and Ovia Northeast Local Government Areas of Edo State, Nigeria is the tiers of government that are responsible for regulating and monitoring the environment at the local level especially the aspects of health and sanitation inspection of business premises to ensure that they conform to set standards.

1.16 Non-Governmental Organizations (NGOs)

- Nigerian Conservation Foundation (NCF)
- Nigerian Environmental Society (NES)

Nigerian Conservation Foundation (NCF)

The Nigerian Conservation Foundation (NCF) is Nigeria's foremost non-governmental organisation dedicated to the promotion of nature conservation. Formed in 1980 and registered in 1982 as a Charitable Trust (No. 1917), its ultimate goal is to stop and eventually reverse the accelerating degradation of Nigeria's natural environment and to help build a future in which humans live in harmony with nature.

Nigerian Environmental Society (NES)

The Nigerian Environmental Society (NES), with headquarters in Lagos, is incorporated in Nigeria as a professional, non-profit making, non-governmental Organisation which is committed to the protection, development and sustenance of

the environment and to the promotion of the profession of Environmental Science and Engineering, both in theory and in practice. The NES has been in forefront of the vanguard of environmental protection and resource conservation.

1.17 Environmental Impact Assessment Procedural Guidelines

In response to the promulgation of the EIA Act No. 86 of 1992, an Environmental Impact Assessment Procedure for Nigeria was produced by the former Federal Environmental Protection Agency (FEPA, 1995). The procedure provides the steps to be followed from project conception to commissioning in order to ensure that the project is implemented with maximum consideration for the environment.

The procedure for EIA involves the project proposal stage where the project proponent notifies the Ministry of Environment of the proposed project in writing. The project proposal is to contain all relevant information on the project and a land-use map.

This stage is followed by the screening phase, when the Ministry will carry out an Initial Environmental Examination and assign the project into categories based on the following criteria: magnitude; extent or scope; duration and frequency; risk; significance; mitigation measures available for associated and potential environmental impacts. The location of the project in Environmentally Sensitive Areas is also an important criterion in the project categorization. The area categorized as Environmentally Sensitive Areas (ESA_S) include: coral reefs, mangrove swamps, small islands, tropical rain forests, areas with erosion prone soils, natural conservation areas, watersheds, wetlands etc.

There are three categories (I, II and III) in Ministry of Environment's guidelines.

Category I projects are subjected to full scale EIA, and it consists among others: Petroleum projects such as Oil and Gas fields development; construction of offshore pipeline in excess of 50 kilometres in length; construction of Oil and Gas separation, processing, handling and storage facilities, and large scale construction of depots for storage of petroleum products.

Projects listed in category II may not require a full-scale EIA except when the project is located in an Environmentally Sensitive Area (ESA) and in this case the project will be assigned top category I. The requirement for category II projects is a

partial EIA. Also, mitigation measures or changes in project design (depending on the nature and magnitude of the environmental impacts) as well as further actions, may be required from the proponent. Category II projects include reforestation/afforestation projects, land and soil management, small scale irrigation and drainage, mini hydro-power development, small-scale development of petroleum or related activities, etc.

Category III projects are expected to have essential beneficial impacts on the environment. For projects in this category, the Ministry of Environment will issue an Environmental Impact Statement (EIS). Projects in this category include; family program, institutional development, environmental awareness projects, etc.

Another stage of erstwhile FEPA'$_S$ EIA procedure is the scoping stage, the main feature of which is that the proponent will be required to submit a Terms of Reference (ToR) for the proposed EIA study. In some cases, the Ministry may demand a Preliminary Assessment Report, and any additional information from the proponent to assist in vetting the scope and the ToR of the proposed EIA study. This stage is followed by actual implementation of the EIA study; Preparation of Draft Final and Final Reports; Review process and Approval/Certification.

The proposed project is oil palm plantation development of over 10,000 hectares at one location. Upon site verification and screening by the Federal Ministry of Environment, it has been placed in Category One; requiring mandatory EIA Studies and a Public Review Process. The fieldwork for data gathering was approved for two seasons.

1.18 Quality, Health, Safety and Environmental Policy of OOPC Plc

Integrated Management System (IMS) Policy Statement:

The **OKOMU OIL PALM COMPANY PLC** is determined to achieve sustained success by meeting the needs and expectations of our customers and other interested parties, over the long term and in a balanced way. To that end, OOPC is committed to:

- Providing customers with high Quality products and services, which meet requirements and are fit for their purpose.

- Compliance with all applicable laws, regulations, standards and other requirements related to our activities, products and services and their environmental aspects.
- Enhancing the skills of management and staff through review and actively pursuing an on-going training policy, the objective of which is to prepare staff to perform their work more effectively.
- Promoting the culture of continual improvement of the Quality and Environmental processes and the philosophy of getting things "right first time".
- Advocating the adoption of prudent Quality and Environmental principles to our vendors, suppliers and customers. Reduce and eliminate the generation of waste and emissions at the source and make all efforts to recycle when practical.
- Pledging ourselves to the prudent and sustainable use of the earth's resources and the protection of the natural environment while we strive to fulfill our corporate mission of contributing to enhance prosperity for all.
- Promoting the Integrated Management System and continually improving its effectiveness through the use of the Quality and Environmental Policy, Quality/Environmental objectives, audit results, analysis of data, corrective and preventive actions and management review.
- Communicating this policy to all persons working for or on behalf of the organization.

The Managing Director confirms the commitment and support, along with that of all employees and those working on behalf of the company, to the above policy statement and the effective application and continual improvement of the Integrated Management System.

1.19 Objectives of Environmental Impact Assessment

The main objective of the EIA is to principally identify the environmental consequences of the operations and activities of the proposed plantation development project. The EIA covers the whole environment from the biotic to abiotic (physical), socio-economic and health aspects of the resident company workers. In this circumstance therefore, and for the purposes of compliance with Federal Environmental Laws, it is required that OOPC Plc as a responsible

corporate organization should conduct an Environmental Impact Assessment on its proposed projects. This would serve to adequately analyze the sites, identify any environmental impacts and define framework for contingency plans and mitigation and abatement measures for impacts.

In Nigeria, the legal instruments relevant for the protection of the environment are contained in FEPA (now Federal Ministry of Environment) regulations. Some State governments also made few enactments that are not inconsistent with the Federal laws. In consonance with these laws, OOPC Plc should:

- Develop, Implement and maintain an environmental policy that would enhance the environmental performance of its corporate activities.
- Aim and pursue compliance with existing environmental legislation, identify any non-compliance and endeavour to remedy such non-compliance.
- Develop and maintain environmental awareness of its employees, contractors and any such external parties involved in their corporate activities.
- Improve its corporate image through environmental responsibilities.
- Work in partnership with regulatory agencies for better environment.
- Pay special attention to sustainable development through incorporation of environmental concerns into any development projects.
- Minimize litigation that may arise from environmental non-performance of its projects' activities.

1.20 Terms of Reference (ToR)

The detailed Terms of Reference as approved by the Federal Ministry of Environment are provided in Annexure I.

1.21 Structure of the Report

This report is presented in eight chapters. Chapter One; the introduction provides relevant information about the proponent, background information on the project and statutory regulatory requirements. Chapter Two presents the justification for the project and the project alternatives, while the detailed description of the proposed project is presented in Chapter Three. The baseline environmental and socio-economic statuses of the proposed project area as well as the stakeholders' consultation process are presented in Chapter Four, while the assessment of

potential environmental, social and health impacts and the mitigation measures are articulated in Chapters Five and Six respectively. The environmental management plan and decommissioning is presented in Chapter Seven, and lastly, the conclusion is presented in Chapter Eight.

1.22 Declaration

Okomu Oil Palm Company Plc as a corporate organization and the proponent of the proposed project on behalf of herself, the project contractors and other partners hereby declares her intention to undertake this oil palm development project, and in line with her corporate policy and compliance with all applicable national, state and local government laws, regulations and or bye-laws, Okomu Oil Palm Company Plc takes full responsibility for the protection of the environment within the project area.

This EIA report has been prepared by **Foremost Development Services Limited** on behalf of **Okomu Oil Palm Company Plc** in line with statutory requirements, guidelines, and standards for plantation crop development and the approved Terms of Reference, and the Federal Ministry of Environment is recognised as the sole regulatory authority on Environmental Impact Assessment in Nigeria.

CHAPTER TWO

2.0 PROJECT JUSTIFICATION

2.1 The Proposal

The Okomu Oil Palm Company Plc has been planting oil palm and rubber (Hevea) since 1978 and 1998 and has established over 12000 ha and 6000 ha plantations to each crop respectively. The company has recently upgraded the capacity of its palm oil mill from 35 tons FFB/hr to 60 tons FFB/hr and has also established a rubber processing factory of 6,000 tons per annum. In order to satisfy the expanded capacity of its mill, the company acquired and developed a 6,000 hectares plantation east of the main estate, called Extension One.

In its further expansion drive to increase the local supply of crude palm oil in Nigeria, the company recently acquired A & Hatman plantation of about 11,400 hectares. This new acquisition is called Extension Two. The company intends to rapidly develop it into an oil palm estate.

As a requirement of the environmental laws and regulations, a permit application and project description were submitted to the Federal Ministry of Environment. And based on the initial assessment by the Ministry, the proposed oil palm development project was classified as Category I requiring full EIA and a public review process.

This EIA will be conducted in accordance with the Terms of Reference approved by FMEnv (See Annexure I). It will cover the range of activities and undertakings at the different developmental stages of the project.

2.2 Purpose and Need for the Project

The Okomu Oil Palm Company Plc (OOPC) has been planting oil palm since 1978. The company in addition acquired an existing plantation with both mature and immature trees in 2000. This plantation is referred to as Extension One. At the time of acquisition, Extension One already had rubber trees planted and cup lumps harvested from it.

The company has expanded the capacity of its palm oil mill from 35tons FFB/Hr to 60 tons FFB/Hr and has plans to increase the capacity further. In spite of the

acquisitions and expansion, the present situation of local supply of industrial grade crude palm oil (CPO) supply is that of gross inadequacy. Suffice it to say that the company is the number one producer of premium grade CPO in Nigeria and the demand for its products has continued to rise over the years.

In order to satisfy the yearnings of its customer, OOPC Plc proposes to rapidly develop its new acquisition (Extension Two). By so doing, the company would be able to produce more CPO to meet the demand of its customers and increase the prospect of Nigeria closing the national CPO supply-demand deficit. This attainment would also increase the total annual income and help to meet the company's financial obligations to its shareholders, as well as corporate social responsibilities.

2.3 Objectives

As part of the Federal Government of Nigeria's effort to revamp the agriculture sector, ensure food security, diversify the economy and enhance foreign exchange earnings, the FMARD embarked on a Transformation Agenda with a focus on the development of agricultural value chains, including the provision and availability of improved inputs (seeds and fertilizer), increased productivity and production, as well as the establishment of staple crop processing zones. It also addresses reduction in post-harvest losses, improving linkages with industry with respect to backward integration, as well as access to financial services and markets. The Transformation Agenda targets rural communities particularly women, youth and farmers associations as well as improving rural institution and infrastructure. The transformation agenda sets out to create over 3.5 million jobs from rice, cassava, sorghum and cotton value chains, with many more jobs to come from other value chains under implementation.

The programme aims to provide over 300 Billion Naira (US$ 2 billion) of additional income in the hands of Nigerian farmers. Over 60 Billion Naira (US$ 380 million) is to be injected into the economy from the substitution of 20% of bread wheat flour with cassava flour. Nigeria would therefore be enabled to be food secure by increasing production of key staples.

An important component of the transformation agenda is the Oil Palm Transformation Agenda, which has the specific objectives of (i) Increase

vegetable oil production through the increase of oil palm production and processing in order to cancel the supply deficit which is annually met through import. (ii) Increase the yield and productivity of both the unorganized and organized plantings. (iii) Arouse greater interest and concern for engagement in competitive market activities within the oil palm value chain. (iv) Create employment for youth and reduce poverty in affected states.

The ongoing investments by the company, including the proposed Extension Two oil palm plantation/estate development could be seen as the company's contribution and support aimed at achieving the objectives of the Oil Palm Transformation Agenda in particular and the Economic Transformation Agenda of the Nigerian government in general.

2.4 Cost of the Project

The cost of the proposed Extension Two oil palm plantation project is estimated at about N6.3 billion excluding nursery irrigation equipment. The cost covers both capital and recurrent expenditures on boundary demarcation, land clearing, preparation, nursery, planting and upkeep as follows:

Activity	**Cost (Million Naira)**						
	2015	**2016**	**2017**	**2018**	**2019**	**2020**	**Total**
Boundary Demarcation	40,000,000	14,000,000	10,000,000				64,000,000
Land Clearing & Preparation	920,700,000	920,700,000	418,500,000	209,250,000			2,469,150,000
Nursery	280,000,000	400,000,000	240,000,000	60,000,000			980,000,000
Planting & Upkeep		38,000,000	740,000,000	1,078,000,000	708,000,000	264,000,000	2,828,000,000
Total	**1,240,700,000**	**1,372,700,000**	**1,408,500,000**	**1,347,250,000**	**708,000,000**		**6,341,150,000**

A large proportion of this fund will be injected into the local economy through various contracts and subcontracts. In addition, employment opportunities at various phases of the project, for skilled, semi-skilled and unskilled labour would be available. The project will also bring about additional revenue to the government in terms of the various taxes and levies that will be paid into government coffers.

2.5 Justification and Project Benefits

The proposed project will complement considerably the oil palm transformation and economic transformation agendas of the country. Justification is therefore found for the proposed Extension Two oil palm plantation project in its potential to:

- Add value to the existing production of the company
- Provide direct employment
- Create additional jobs
- Contribute to the socio-economic development of neighboring communities
- Increased economic benefits to the nation.

2.6 Envisaged Sustainability

In order to achieve the desirable sustainability of the proposed Extension Two oil palm plantation project, OOPC Plc will develop and operate the project based on industry best practices, applying especially the IFC Performance Standards and the Principles and Criteria of the Roundtable on Sustainable Palm Oil (RSPO). In effect, OOPC Plc will strive continually to implement its Health, Safety and Environment Policy. In so doing, the following aspects of the project sustainability are therefore envisaged:

2.6.1 Financial Sustainability

The planning and management of operations and production activities will aim at long-term financial and economic viability of the project. This will be achieved through sound agronomic and management practices to attain high productivity and premium quality of products.

In addition, the project will be financed from the company's annual turnover and profits, which has been impressive and promising in the last five years. The company recorded a revenue of N6,087,836,000.00 with profit after tax of N5,290,046,000.00 in year 2010. The financial performance of the company has since improved considerably. For the year ended December 2014, the revenue was N8,655,718,000.00, while the profit after tax was N1,570,137,000.00. OOPC Plc is listed on the Nigerian Stock Exchange. The financial performance of the company over the years would enable it to

execute and sustain the proposed Extension Two plantation development project operations.

2.6.2 Technical Sustainability

The company will leverage on its expertise and experience in plantation development and operation in Edo State, other parts of Africa and Asia to ensure that the proposed plantation development enjoys sound technical complements from design to implementation and operation. Such practices will include adequate practices to maintain, and improve long-term soil fertility and minimize and control soil erosion. They will also effectively manage pests, diseases and weeds such as to minimize the use of pesticides. In addition, the planting material will be of the highest quality available. Also the nursery management and plantation upkeep standards will be optimized sustainably.

Essentially, best hands and best management practices will be employed to carry out the project. Importantly, all staff and workers will be competent and adequately trained to ensure the technical sustainability of the proposed project.

2.6.3 Environmental Sustainability

The on and off-site impacts of the plantation activities will continually be assessed and managed. Biodiversity will be conserved through the understanding of the flora and fauna and the habitats that exist inside and around the proposed plantation and through the implementation of the existing policy to conserve biodiversity. In addition, the use of fire in land clearing and land preparation will be largely avoided, whilst strategies to reduce air and water pollution will be implemented. Essentially, the bulk of the solid waste to be generated will be disposed by recycling in the plantation.

2.6.4 Social Sustainability

An assessment of the social impacts of the proposed Extension Two project will be carried out and the results and social action plan will be implemented to ensure that the desirable support and harmony is established between the project and the communities. The necessary mechanisms will be put in place to facilitate communication with the communities, including proper documentation and resolution of conflicts and grievances.

2.7 Project Alternatives

The development of oil palm plantation essentially involves the removal and transformation of existing vegetation into mono crops of oil palm. The plantation development will involve the planting of highly adaptable and high yielding types of oil palm. In this section, alternatives to the proposed project are discussed including the "do nothing" alternative.

2.7.1 The "Do Nothing Alternative"

The "do nothing" alternative would mean that OOPC Plc should continue to operate without the option of increasing its CPO production capacity. This option is unacceptable when one considers the substantial net financial, economic and social benefits that will accrue to OOPC Plc, the neighbouring communities and the national economy.

2.7.2 Alternative Location

The option of alternative location means the undertaking of new plantings of oil palm at a different location. This option is undesirable because the prospect of acquiring new land in the neighbourhood and same agro-ecological zone is low and where possible, it may take relatively long time and expensive. Moreover, establishing the plantation at a different location could mean that it would require travelling longer distances to the company's headquarters at Okomu-Udo in Ovia Southwest LGA of Edo State. The advantage of synergy with the existing management will be lost.

2.7.3 Alternative Plantation Expansion Methods

For large scale oil palm plantation development, the alternative development methods that could be adopted are:

2.7.3.1 Alternative Oil Palm Plantation Expansion Location

The choice of alternative oil palm plantation expansion is another plantation location. This option is not favoured because of land tenure system and problem of land acquisition.

2.7.3.2 Third Party Services

At this time it is not feasible for OOPC Plc to depend on a third party for EFB as there is no oil palm plantation that can produce the quantum of EFB required.

2.7.3.3 Smallholder Development

It is possible to divide the land into small units for small farmers to develop. This option is not favoured because the yields of smallholder operations are much lower than the standard estate operations. The aggregate production of the smallholders will be relatively lower and benefit of rapidly increasing the domestic supply of CPO may not be realized.

2.7.3.4 Preferred Option

Of all the alternatives considered, the full development of the project as proposed is the preferred option.

CHAPTER THREE

3.0 PROJECT DESCRIPTION

The proposed Extension Two oil palm development project is a new acquisition by OOPC Plc. It is made up of a consolidated piece of land totaling 11,400 hectares; spreading across Ovia Northeast and Uhunmwode Local Government Areas of Edo State. The land is covered by statutory Certificate of Occupancy (C of O). The land has been partly developed into oil palm plantation and palm oil mill when it was acquired.

The company intends to fully develop the land into an oil palm estate that will comprise majorly oil palm plantations. The other ancillary components will include earth road network, workshop, powerhouse, housing units and office buildings.

The vegetation of the project site is degraded forest. The proposed plantation development will therefore not involve the clearing of natural forests. The northern half of the land has a few rivers traversing it. The plantation development will ensure that the watersheds are protected and the riparian forest strips will be conserved. All identified natural habitats on the land will also be conserved.

The proposed development will be done in phases, with the first planting intended for 2016 and subsequent plantings phased over three years to terminate in 2018.The planting materials to be used for the oil palm plantings will be sourced from the Nigerian Institute for Oil Palm Research (NIFOR) and other verifiable sources. The types and varieties of the planting materials will be those that are high yielding and very well adaptable to the Nigerian environment and local conditions.

OOPC Plc is a member of the Roundtable on Sustainable Palm Oil (RSPO) and is committed to implementing the principles and criteria of the RSPO in the development and operation of the proposed Extension Two oil palm development project to ensure that it achieves the complementarities of economic, environmental and social factors.

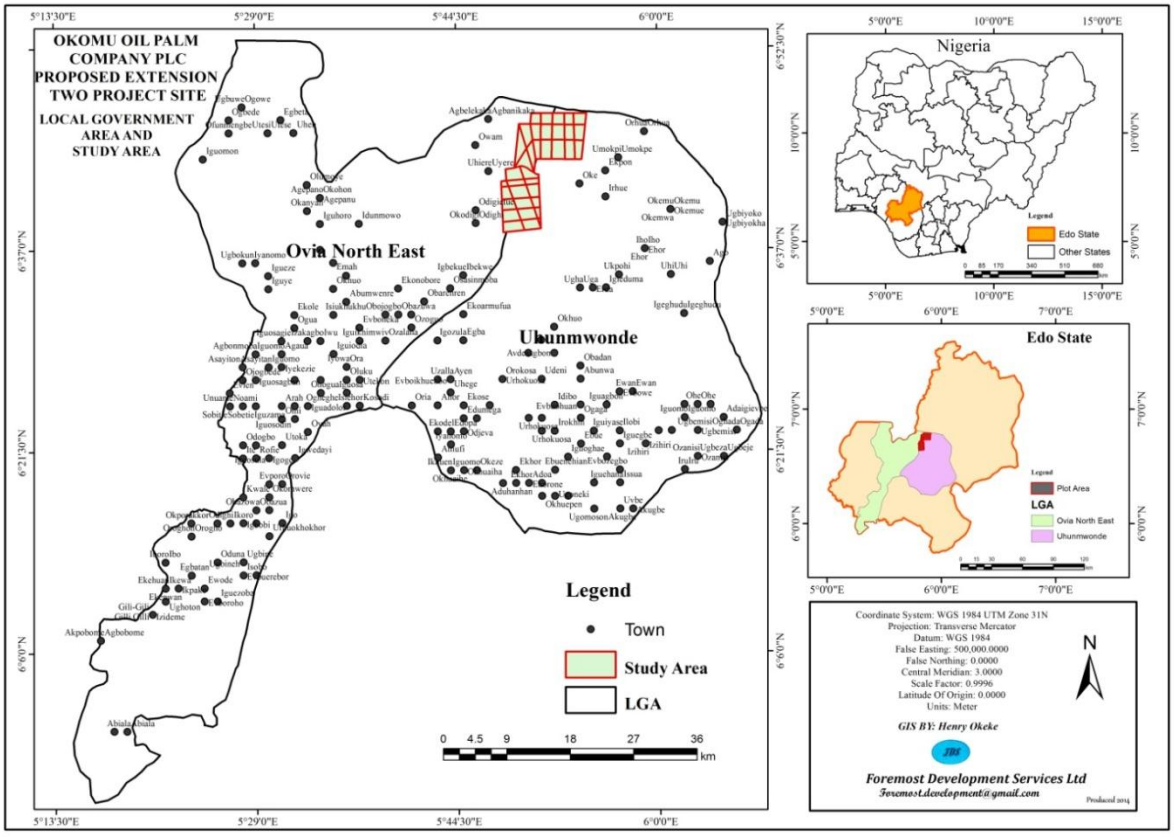
The fresh fruit bunches (FFB) to be harvested from the plantation will initially be processed with the existing mill. However, given that the mill is of low capacity, the company will later upgrade or install a new mill with the appropriate capacity to match the FFB production capacity of the plantation.

The products of the plantation including palm oil and palm kernel oil will be sold to the downstream industrial operators for further processing and manufacturing purposes.

The project will generate substantial organic solid waste. The bulk of the organic waste will be managed by recycling within the plantation. The operation of the project will also generate liquid waste and gaseous emissions. A comprehensive waste management programme will be put in place to sufficiently cater for all the waste streams.

3.1 Project Location

The proposed Extension Two oil palm development project is located within Latitudes $6^0$38' 37"N and 6^0 47' 31"N and Longitudes 5^0 48' 5"E and 5^0 54' 39"E. The total project area is about 11, 416.673 hectares and stretches across two local government areas. The eastern part lies in Uhunmwonde Local Government Area, while the western part lies in Ovia Northeast Local Government Area, Edo State, Nigeria as shown in project location map (Map 3-1).



Source: OOPC EIA Field work 2014

Map 3-1: Project Site Location Map in relation to Nigeria, Edo State and Local Government Areas

3.2 Planting and Development Plan

Out of the available area of 11,416.673 hectares, about 10,000 hectares will be planted over three years as shown in the planting plan below.

Year	Planting Size (Ha)
2016	4,000
2017	4,000
2018	2,000
Total	**10,000**

Source: OOPC Agric Department 2014

The entire land will be developed in phases as the planting of oil palm progresses. Upon full development, the land use will be as presented in Table 3-1.

Table 3-1: Proposed Land use at Extension Two

Land Use	Size (Ha)					
	2015	**2016**	**2017**	**2018**	**2019**	**2020**
Oil palm plantation	664	4664	8664	10000	10000	10000
Nursery	40	40	40	20	0	0
Unplanted	10697.63	5467.63	1467.63	91.63	71.63	0
Infrastructure	0	0	0	40	60	116.63
Housing	15	45	45	65	85	100
Buffers	**0**	**0**	**0**	**0**	**0**	**0**
HCVs	**0**	**1200**	**1200**	**1200**	**1200**	**1200**
Total	**11416.63**	**11416.63**	**11416.63**	**11416.63**	**11416.63**	**11416.63**

Source: OOPC Agric Department 2014

3.3 Activities

3.3.1 Oil Palm Nursery Activities and Management

When seedlings have formed about 5 leaves the seedlings are transplanted to new black polythene bags, 40 cm x 50 cm, partly filled with light topsoil. At transplanting, the old bag is split and seedling with a ball of soil around the roots is put in the new soil carefully. The bags are placed very close together at 90 cm x 90 cm. They are each supplied with a thin line of water pipe. Mulch, using pieces of empty fruit bunches, is placed on the ground between

the bags (Plate 2). One or two large spoonfuls of fertilizer containing NPK and Mg are applied to the soil in each bag once in 6 months.
The seedlings are observed and examined for disease symptoms and pests (i.e. phyto-sanitary observation) and poorly developed and unhealthy ones are removed (culling). For the period of nursery life (11-15 months) maintenance activities include:

- Mulching
- Watering (irrigation)
- Weeding
- Fertilizer application: boiler ash, muriate of potash, urea, PKC and NPK once every 6 months
- Consolidation of loose seedlings
- Phyto-sanitary observations
- Culling

3.3.2 Preparation for Field Planting

Activities include:

- New plantation boundary demarcation
- Study of topography of the new plantation
- Drainage design
- Site forest clearing
- Road design and length to carry bunches by harvesters to the roadside; collection roads will be laid straight and in an N-S direction and connect with sub-main E-W roads.
- Opening of roads and tracks. Trees will be felled, shrubs and weeds completely cleared for vehicular access and to allow lining and holing to be carried out.
- Under brushing: the bush/farmlands/swamp forests will be cleared with cutlasses and axes
- Stacking, stumping and re-stacking

The land will be cleared of trees and bush well in advance of the planting season, that is, in dry season before the beginning of the rainy season.

3.3.3 Planting/Transplanting to the Field

The planting and transplanting activities include:

- Blocking out; plantation will be subdivided into blocks.
- Peg preparation.
- Cover crop will be sown inter-row to prevent establishment of other weeds, to check soil erosion and add nitrogen to soil.
- Holing; holes about 60cm deep and 60cm wide will be dug and spaced out at intervals of 9m in a triangular pattern and parallel rows.
- Transportation of well-watered seedlings and distribution into holes.
- At the planting site, the bottom of the black polybag will be cut out and removed, the seedling placed in the hole, then the side of the bag will be split and the polybag carefully removed. The space around the seedling will be filled with rich topsoil with added fertilizer and firmed down well.
- Weeding to bare ground around planted seedling of 1 metre radius (ring weeding).
- Protecting seedlings against mice and rats with wire netting.
- Regular detection of seedling for diseases to enable quick response (phyto-sanitary supervision).
- Replacement of dead seedlings.

3.3.4 Operational/Maintenance of Oil Palm Plantation

The activities involved in the operational and maintenance of oil palm plantation include:

- Weeding, particularly to remove guinea grass, and weeds such as s*ida acuta, chromolaena odorata* (siam weed), e.t.c.
- Consolidation (due to wind effect) of seedlings
- Rodent control
- Ablation; to increase yield of the first harvesting years by removal by hand of the first female inflorescences appearing on young palms
- Removal of abnormal plants by felling
- Replacement of dead palms

- Fertilizer/mulch application; EFBs, muriate of potash, urea, PKC and NPK
- Removal of dead leaves
- Pruning, to enable viewing of ripening of bunches in the crown
- Maintenance of roads and tracks
- Regular detection of nutrient deficiencies, diseases of adult palms, insect pest such as the West African oil palm leaf miner and the red spider mite
- Fire control; plantation is protected from spreading of bush burning from outside the estate by having wide earth roads; dry fronds are removed. No bush burning is practiced.
- Harvesting: the best tool for harvesting at age 3 to 10 years is a chisel with a blade about 10cm wide. Sharp cutlasses can also be used. The leaf bases, below the mature, ripe bunches, are cut and leaves (fronds) removed to expose the stalk of the fruit bunch, which is then sliced through with the cutlass or chisel. Tall and very tall trees are harvested with a pole/long handle with a curved sharp/hooked knife attached at the tip
- Collection; bunches are normally carried in basins from the field to collecting points on the roadside and then manually loaded into tractors or tractor-drawn receptacles.
- Transportation of Fresh Fruit Bunches to OOPC main estate at Okomu-Udo for processing.

3.4 Waste Management

OOPC Plc has put in place detailed waste management plans covering a comprehensive description of activities and waste handling at preconstruction, construction, operational and abandonment phases of its projects. During site visits, the company's waste management practices were observed and its environmental management system (EMS) was ascertained.

3.4.1 Waste Classification

The wide range of waste that will be generated by the proposed project during development and operation phases are classified into solid waste, liquid waste and gaseous emissions.

3.4.2 Waste Generation and Sources

The largest amount of solid waste will be generated from the field which is mostly organic in nature, but the residential area will generate the liquid waste, while the bulk of the gaseous emission will come from the powerhouse and during land preparation from heavy machinery. The waste profile is presented in Table 3-2.

3.4.3 Solid Waste Handling

Storage: At all the points of waste generation, waste bins will be provided for the immediate storage of solid waste. Provision would also be made for sorting and segregation of all solid waste at the point of generation. There are waste management plans where wealth shall be generated from wastes as much as it is practicable.

Collection and Transfer: Waste collection and transfer would include the provision of a truck to collect and transport the collected waste to a designated dumpsite.

Disposal: The solid waste collected would be transported and disposed of at the dumpsite. A solid waste dumpsite will be established at an appropriate location as may be approved by the relevant regulatory authorities.

3.4.4 Liquid Waste Handling

Wastewater: Wastewater (domestic) will be channeled into soak-away pits of varying dimension attached to every building. The dimension of the soak-away pit will depend on the size of the building.

Storm water: Rainstorm water will be collected in channels and led into natural drainage lines and vegetation.

Table 3-2: Waste Profile of the Proposed Oil Palm Development Project at Extension Two

Project Phase	Waste Characterization		
	Solid	**Liquid**	**Gaseous**
Development: *(Land Preparation)*	• Soil and vegetation • Shrubs • Food Waste • Spoilt farm equipment • Organic materials	• Engine oil • Spent oil	• Fugitive Dust • Suspended Particulate • Carbon dioxide • Carbon monoxide • Greenhouse Gases
Development: *(Planting)*	• Seedling polybags • Dust • Polythene bags • Paper	• Spent Oil	• Fugitive Dust • Suspended Particulate • Carbon dioxide • Carbon monoxide • Greenhouse Gases
Operational: *(Field Maintenance)*	• Dust • Agrochemical containers • Fertilizer bags • Used drums and buckets	• Wastewater	• Fugitive Dust • Suspended Particulate • Carbon dioxide • Carbon monoxide
Operational: *(Harvesting)*	• Papers/plastics/glass • Scrap office equipment • Spout • Used drums and buckets	• Wastewater	• Carbon dioxide • Carbon monoxide • Fumes
(Clinic)	• Syringes • Cotton wool and Bandages • Hand gloves • Empty injection bottles • Sanitary pads • Nylons • Expired drugs	• Expired drugs • Wastewater • Blood	• Carbon dioxide • Carbon monoxide • Fumes
(Residences)	• Cloths • Nylon • Spoilt food • Leaves • Charcoal • Ashes • Plastics & Glass Bottles	• Wastewater	• Carbon dioxide • Aerosols • Carbon monoxide • Vapour

	• Cans and Papers		
Operational: *(Offices)*	• Papers • Hardware and scraps • Plastics • Metals	• Wastewater	• Carbon dioxide
Operational: *(Stores)*	• Papers, • Plastics • Nylon • Wood • Hand gloves & Nose masks	• Wastewater	• Carbon dioxide • Chemical fumes • Fumes/Vapour
Operational: *(Powerhouse)*	• Plastics • Empty cans • Electric cables	• Wastewater • Spilled Oil • Spent Oil	• Suspended Particulate • Carbon dioxide • Carbon monoxide • Greenhouse Gases

Source: OOPC Extension Two EIA Field work 2014

3.4.5 Waste Re-use/Re-cycling

As much as possible, waste will be minimized. A place will be designated for keeping all reusable waste, while essentially organic waste will be recycled in the plantation.

3.4.6 Waste Manifest and Tracking

A manifest system will be established and record will be kept appropriately ensuring that waste is tracked from "cradle to grave".

3.5 Overall Waste Management

No waste shall be discharged into any of the surface rivers or wetland. In the likelihood of any discharge of liquid waste into the environment, such waste will be adequately treated before discharge. Table 3-3 shows the proposed waste management plan to be put in place.

Table 3-3: Proposed waste management plan to be put in place

Type of Waste	Waste Source	Waste Management Option			Disposal	
		Reduce	Re-use	Recycle	Forest/	Land
Gaseous	Heavy duty machines (Land Preparation)	Installation of appropriate filter to the exhaust pipes			-	-
Liquid	Residential Areas (Wastewater)	-	-	-	None	Soak-away attached to buildings.
	Sanitary from Toilets	-	Used in field	-	None	Appropriately designed Septic tanks
	Oil traps				None	Trapping of oil in retention trays
Solid	Domestic waste	Collected and taken to the dumpsite				-
	Plantation Crop leaves, palm fronds, tree back.	Retained in the field as manure				-
	Hazardous wastes such empty agrochemical containers	Taken away by the manufactures and/or suppliers as part of agreement.				-

Source: OOPC Extension Two EIA Field work 2014

Key:

None: Not discharged into/disposed of in the habitat

- Not Applicable

3.6 Decommissioning and Abandonment Phase

3.6.1 Oil Palm Life Cycle

The life cycles of oil palm are presented as follows:

Element	Oil Palm
Nursery	11-15 Months
First Harvest	32-38 Months
Peak Yield	8-10 Years
Economic Life	20-25 Years
Life Span	200 Years

3.6.2 Decommissioning and Abandonment

Oil palm plantation exists for many decades, even centuries. The ownership of a plantation may change but total abandonment is not common. However, a number of factors that may lead to decommissioning and abandonment include:

- Lack of experience and knowledge of operational activities
- Use of out-dated management principles and practices
- Top management sharp financial malpractices and bankruptcy
- Non-payment of workers' salaries
- Neglect of host communities
- Social unrest and physical destruction
- Wild fire or arson

3.7 Project Schedule

Some of the activities to be carried out from first quarter 2016 to 4th quarter 2018 have been provided in Section 3.3. The schedule and timing of the critical project activities are illustrated below:

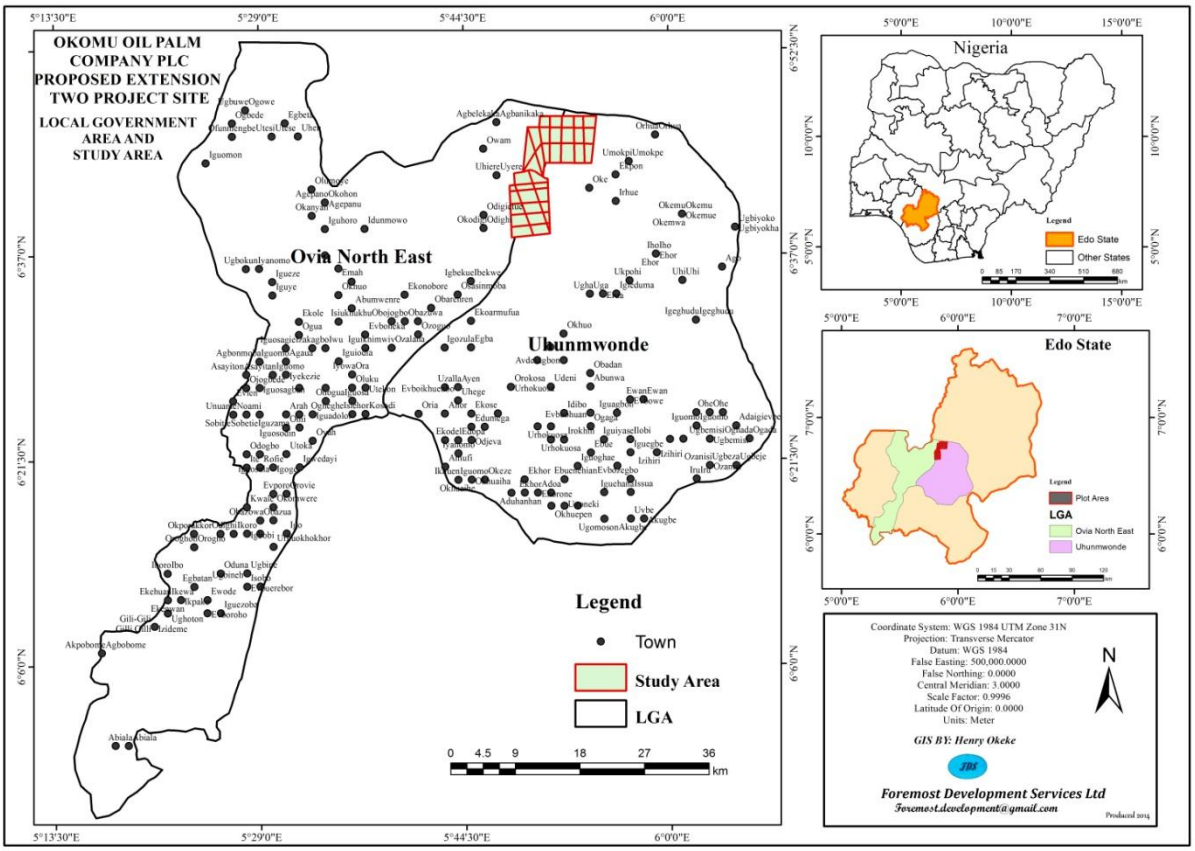
Activities	2014	2015	2016	2017	2018
EIA Process					
Plantation boundary demarcation					
Opening of roads and tracks					
Site clearing					
Stacking, stumping and restacking					
Disposal of vegetation					
Tracing and blocking out					
Peg preparation					
Cover crop sowing					
Holing and transplanting of seedlings					
Consolidation of seedlings					
Protection of planted seedlings					
Plantation upkeep					

CHAPTER FOUR

4.0 DESCRIPTION OF THE EXISTING ENVIRONMENT

4.1 Location

The proposed Extension Two oil palm development project is located within Latitudes $6^0$38’ 37’’N and 6^0 47’ 31’’N and Longitudes 5^0 48’ 5’’E and 5^0 54’ 39’’E. The total project area is about 11, 416.673 hectares and stretches across two local government areas. The eastern part lies in Uhunmwonde Local Government Area, while the western part lies in Ovia Northeast Local Government Area, Edo State, Nigeria as shown in project location map (Map 4-1).



Source: OOPC EIA Field work 2014

Map 4-1: Project Site Location Map in relation to Nigeria, Edo State and Local Government Areas

4.2 Methodology

4.2.1 Data Acquisition from Literature and Previous Studies

The preliminary information on the study area was obtained as follows:

a. Background information on the oil palm industry in Nigeria was obtained from the Nigerian Institute for Oil Palm Research (NIFOR) and other technical notes from the agriculture department of OOPC Plc.
b. The relevant institutional, legal and regulatory framework was obtained from publications by the regulatory agencies and ministries.
c. Recent studies on Extension Two including soil biodiversity and SIA.
d. The most recent relevant meteorological records were obtained from NIFOR and literature.

4.3 Field Data Gathering

After the completion of the scoping, field data gathering were done for the major environmental factors over two seasons (wet and dry). The schedule of field data gathering is presented below:

Factor	Dry Season		Wet Season	
	Start Date	End date	Start Date	End Date
Ecology	4 Mar 2014	20 Mar 2014	6 Sep 2014	20 Sep 2014
Geology	18 Mar 2014	21 Mar 2014	-	-
Soil Survey	17 Mar 2014	16 April 2014	-	-
Microbiology	11 Mar 2015	11 Mar 2015	23 Sept 2014	23 Sept 2014
Surface Water	10 Mar 2015	10 Mar 2015	22 Sept 2014	22 Sept 2014
Groundwater	10 Mar 2015	10 Mar 2015	22 Sept 2014	22 Sept 2014
Air Quality	9 Mar 2015	9 Mar 2015	22 Sept 2014	22 Sept 2014
Noise	10 Mar 2015	10 Mar 2015	23 Sept 2014	23 Sept 2014
Socioeconomic	17 Mar 2014	8 April 2014	-	-
Social Impact	17 Mar 2014	7 May 2014	-	-
Health Impact	16 Mar 2015	20 Mar 2015	22 Sept 2014	26 Sept 2014

4.3.1 Sampling Points and Control Locations

Sampling and observation points were established across the proposed project land. At each sampling location, the GPS location was taken and all the relevant environmental parameters including water quality, air quality, noise level,

temperature, soil, vegetation type, plant form/species and their densities, terrestrial fauna particularly invertebrate species and densities were sampled or observed. Wildlife, especially large mammals were also directly and indirectly observed.

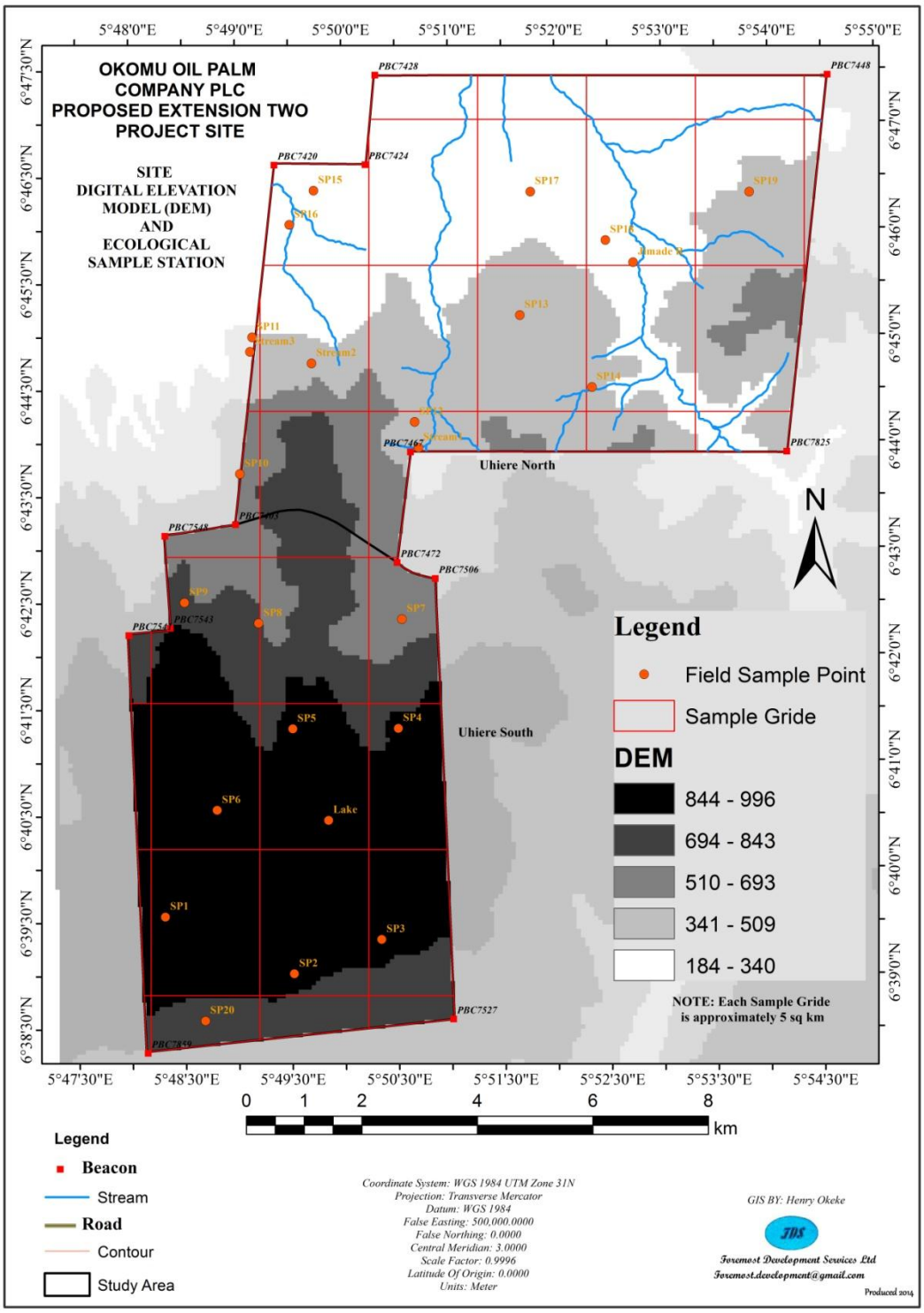
The sampling locations were within the spatial boundaries of the study area, while the control sampling points were appropriately located both within and outside the project boundaries. The sampling points are presented in Table 4-1, while they are illustrated in Map 4-2.

Table 4-1: Sampling Points and Control Location

Sample Points	Coordinates – 31N		Environmental Component
	(UTM Easting)	(UTM Northing)	
Point 1 (Control Point)	**807370.44**	**743794.01**	**Groundwater**
Point 2	811815.43	744000.64	Air, noise
Point 3	811724.04	741577.88	Air, noise
Point 4	814753.24	739975.42	Groundwater
Point 5	811678.31	741640.71	Groundwater
Point 6	772787.40	714847.53	Air, Noise
Point 7	776065.64	710986.30	Air, Noise
Point 8	775776.80	709407.59	Air, Noise
Point 9	775139.36	712863.60	Air, Noise
Point 10	807006.51	750586.58	Air, Noise
Point 11	805680.85	735155.35	Air, Noise
Point 12	806072.06	748190.64	Air, Noise
Point 13	808300.64	744843.21	Air, Noise
Point 14	806304.44	738212.36	Air, Noise
Point 15	807006.51	750586.58	Air, Noise
Point 16	777001.39	712048.14	Stream 1
Point 17	775889.82	713014.21	Stream 2 upstream
Point 18	775505.41	713086.46	Stream 2 downstream
Point 19	776002.00	708395.14	Surface River (Jemide upstream)
Point 20	779221.59	714092.85	Surface River (Jemide downstream)
Point 21 (Control Point)	**811930.28**	**744193.33**	**Air and noise**
SP1	774543.72	707347.97	Biodiversity Study; Flora and Fauna
SP2	775790.72	706995.50	Biodiversity Study;

			Flora and Fauna
SP3	776778.17	707211.64	Biodiversity Study; Flora and Fauna
SP4	776878.13	7709412.95	Biodiversity Study; Flora and Fauna
SP5	775776.80	709407.59	Biodiversity Study; Flora and Fauna
SP6	774864.91	708456.01	Biodiversity Study; Flora and Fauna
SP7	776899.21	710536.16	Biodiversity Study; Flora and Fauna
SP8	775562.25	710508.61	Biodiversity Study; Flora and Fauna
SP9	774657.33	710634.78	Biodiversity Study; Flora and Fauna
SP10	775443.76	711882.30	Biodiversity Study; Flora and Fauna
SP11	775519.35	713177.26	Biodiversity Study; Flora and Fauna
SP12	776975.19	712651.06	Biodiversity Study; Flora and Fauna
SP13	778072.13	713761.85	Biodiversity Study; Flora and Fauna
SP14	778967.52	712872.21	Biodiversity Study; Flora and Fauna
SP15	775626.66	714771.14	Biodiversity Study; Flora and Fauna
SP16	775747.34	714762.88	Biodiversity Study; Flora and Fauna
SP17 (Control Point)	**777848.94**	**714804.19**	**Biodiversity Study; Flora and Fauna**
SP18	779049.34	714231.42	Biodiversity Study; Flora and Fauna
SP19	780186.54	714800.29	Biodiversity Study; Flora and Fauna
SP20	774522.15	706313.31	Biodiversity Study; Flora and Fauna

Source: OOPC – Extension Two EIA Field work, 2014-2015



Source: OOPC EIA Field work 2014

Map 4-2: Extension Two project map showing the sample points

4.3.2 Terrestrial Ecology

4.3.2.1 Climate

The project site falls within the rain forest region of southwestern Nigeria which experiences a hot and humid tropical climate. The climate is characterized by seasonal rainfall, high temperatures and high relative humidity. The environment is noted for two distinct seasons of rainy and dry periods in a year, characterized by the southwest moisture laden monsoon wind and the northeast dry cold harmattan wind respectively. The Southwest trade wind predominates over the area, usually between March and November, while the northeast trade wind has greater influence between December and February/March. The Southwest monsoon wind originates from the Atlantic Ocean; hence it is moisture laden, warm and brings rain to the area. The north east trade wind is characterized by cold, dry and dusty weather, often referred to as harmattan. The occurrence of these trade winds is determined by the North-South migration of the zone of demarcation between them, known as Inter-Tropical Discontinuity (ITD). The movement is usually gradual, steady and consistent, hence, the regular pattern of rainfall and dry periods in the year. It directly and indirectly controls other climatic parameters apart from rain like temperature, relative humidity, cloud cover, wind direction and speed, etc. These in turn moderate and determine crops to be grown, farming systems and operations, etc.

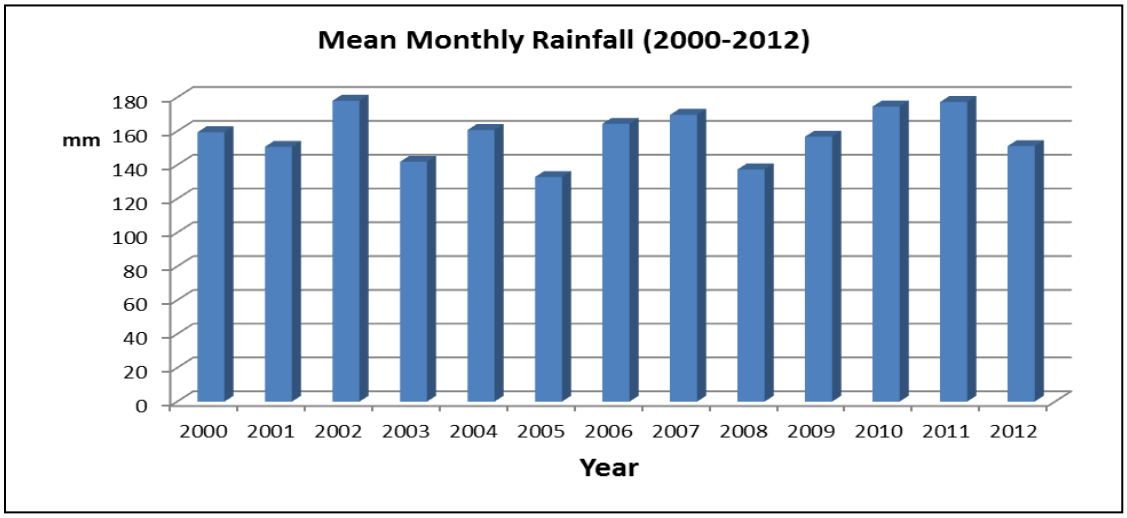
According to Muller-Samanu *et al.* (1994), the area falls between humid and semi humid climate zone of the tropics with about 8-9months of rainfall, and having an average of 8.5 humid months in a year. The rainfall is more than 1,500 mm per annum for most years, and the driest months have less than 60 mm of rain.

Rainfall

The rainfall pattern (amount, intensity and distribution) is greatly influenced by the movement of ITD. The annual total rainfall for the area ranges from 1595 – 2127.2mm (NIFOR meteorological station). The rains are said to have been established when at least 100mm have fallen in a year. Thus, for most years, this is not attained until April. The amount of rainfall increases from April through to June/July when it peaks and then reduces during the month of August before it peaks again in the months of September/October. Thereafter, it tapers-out towards the end of the year.

The total amount of rainfall, its distribution and intensity are very important factors in determining the suitability or otherwise of a land, apart from the quality of soil for any particular agricultural enterprise. The host communities of the project site are essentially agrarian, hence highly influenced by the pattern of rainfall in their activities. The rains,

usually, at the onset of the season are noted for thunderstorms which at times can be destructive, traveling at very high speed exceeding 48km/hr. These are torrential and windy rains, usually referred to as line squall. It should be noted that the amount of rainfall in a month can vary widely from one year to another. This is not unconnected to the global phenomenon of climate change which is becoming more and more apparent in recent years (Figures 4-1 & 4-2).



Source: NIFOR Meteorological station

Figure 4-1: Mean Monthly Rainfall of Study Area and Environs

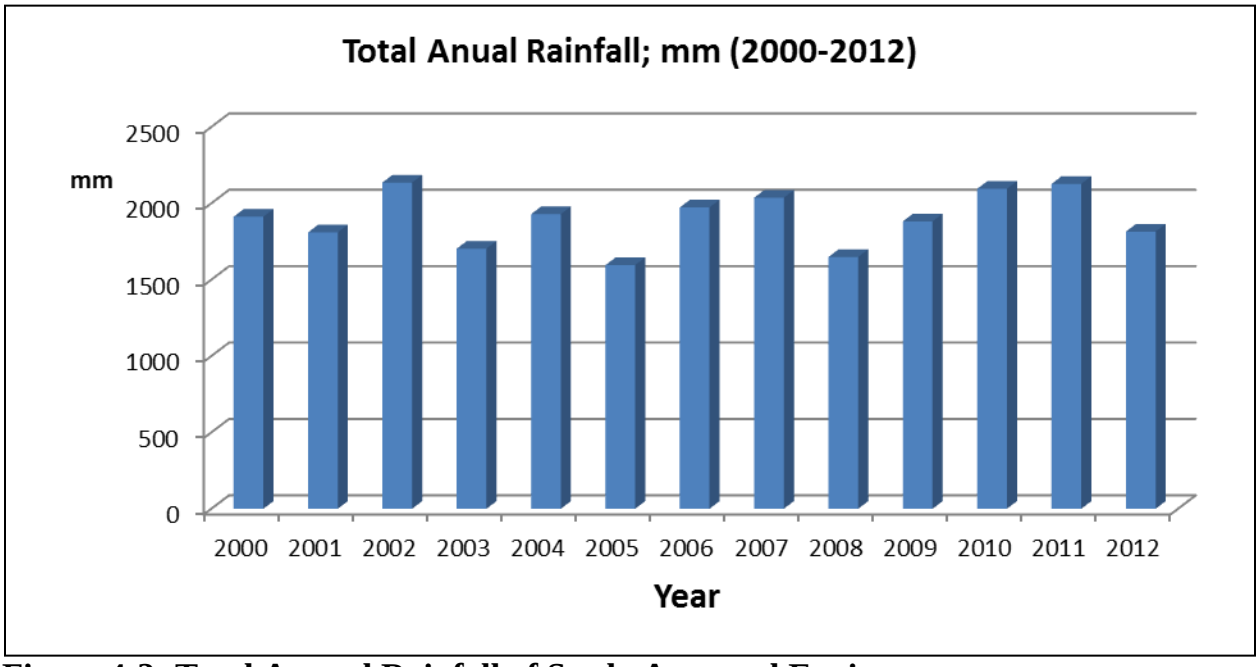


Figure 4-2: Total Annual Rainfall of Study Area and Environs

Source: NIFOR Meteorological station

Temperature

The mean air temperature of the project area, like most of the tropical environment is generally high throughout the year. It is characterized by minimal fluctuations, usually less than 5^{o}C throughout the year. It is referred to as isohyperthermic temperature regime. The highest mean monthly temperatures are recorded in the months of February and March 34.57°C to 33.76°C, while the lowest mean air temperatures are 20.83°C to 20.97°C in the months of January and July respectively. (Table 4-2).

On a general note, the temperature is high throughout the year. Hence, temperature is not a limiting factor to the good performance of crops. It is thus feasible to have an all-year round crop production where moisture is not a limiting factor.

Table 4-2: Indicative Air Temperature (^{0}C) Data of the Surveyed Site

	2004		2005		2006		2007		2008		2009		2010		2011		2012		2013		Mean	
Month	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
Jan	33.3	21.6	33.3	19.6	33.7	22.6	**34.7**	**17.8**	**33.1**	**19.5**	**33.9**	**23.5**	**34.2**	**24.5**	**33.2**	**18.9**	**33.9**	**18.2**	**32.6**	**22.1**	33.59	20.83
Feb	35.6	22.5	35.1	24.1	35.9	22.5	34.9	21.5	36.3	21.5	34.8	23.9	35.1	24.4	33.5	22	33.4	21.7	31.1	20.1	34.57	22.42
March	30.6	24.4	33.7	22	33.7	22.4	33.8	22.6	34.6	21.7	34.8	25.1	34.8	25.4	34.2	22.7	35.1	22.3	32.3	22	33.76	23.06
April	33.5	22.6	34.6	22	34.3	23.2	33.9	21.3	33.7	22.8	35.4	24.2	32	22.8	32.9	22	33.4	21.5	31.3	21.3	33.5	22.37
May	31	23	31.9	20.9	31.2	21.5	32.5	21	32.2	22.4	35.1	23.8	33.4	23.5	32.8	21.6	32.5	20.3	31.2	21.5	32.38	21.95
June	31.5	22.8	31.6	20.8	30.6	20.8	27.6	18.3	31.5	22.4	33.4	23.2	31.4	22.6	31.2	21.5	31.2	20	29.5	20.5	30.95	21.29
July	30.7	21.8	27.4	19.9	29.5	21.1	29.4	21.5	30.1	22	32.2	22.3	29.8	21	29.3	20.3	28.8	20.9	27.8	18.9	29.5	20.97
August	29.8	21.8	27.7	20.9	28.3	20.8	28	23	29.4	22.8	31.5	23.3	28.5	21.5	28.5	20.9	28	20.7	29.2	20.8	28.89	21.65
Sept	30.4	21.5	29.4	21.6	30.9	19.7	28.7	20.2	30.8	23.1	31.6	22.9	30.2	21.5	30.1	20.4	29.8	21.1	29	22.8	30.09	21.48
Oct	31.3	22.1	32.3	19.6	31	20.8	29	20	33.1	23.4	31.5	21.9	31.3	21.9	31.4	21.3	31.5	20.9	31.2	23.6	31.36	21.55
Nov	32.4	22.7	32	20.9	33.3	19.1	24.3	16.5	34.7	24.7	32.8	22.8	32.6	21.9	33.3	21.5	33	21.4	31.3	22.5	31.97	21.4
Dec.	33.7	22.8	32.9	21.1	34	18.6	35.6	19.7	34.3	24.1	34.5	24.4	33.5	20.8	34.2	19	33	18	31.5	21.9	33.72	21.04
Total	**383.5**	**269.6**	**381.9**	**253.4**	**386.4**	**253.1**	**369.4**	**243.4**	**393.8**	**270.4**	**401.5**	**282.3**	**386.8**	**271.8**	**384.6**	**252.1**	**383.6**	**247**	**368**	**258**	**383.95**	**260.11**
Mean	**32**	**22.5**	**31.8**	**21.1**	**32.2**	**21.1**	**30.8**	**20.3**	**32.8**	**22.5**	**33.5**	**23.5**	**32.2**	**22.7**	**32.1**	**21**	**32**	**20.6**	**30.7**	**21.5**	**32.01**	**21.68**

Source: NIFOR Meteorological station

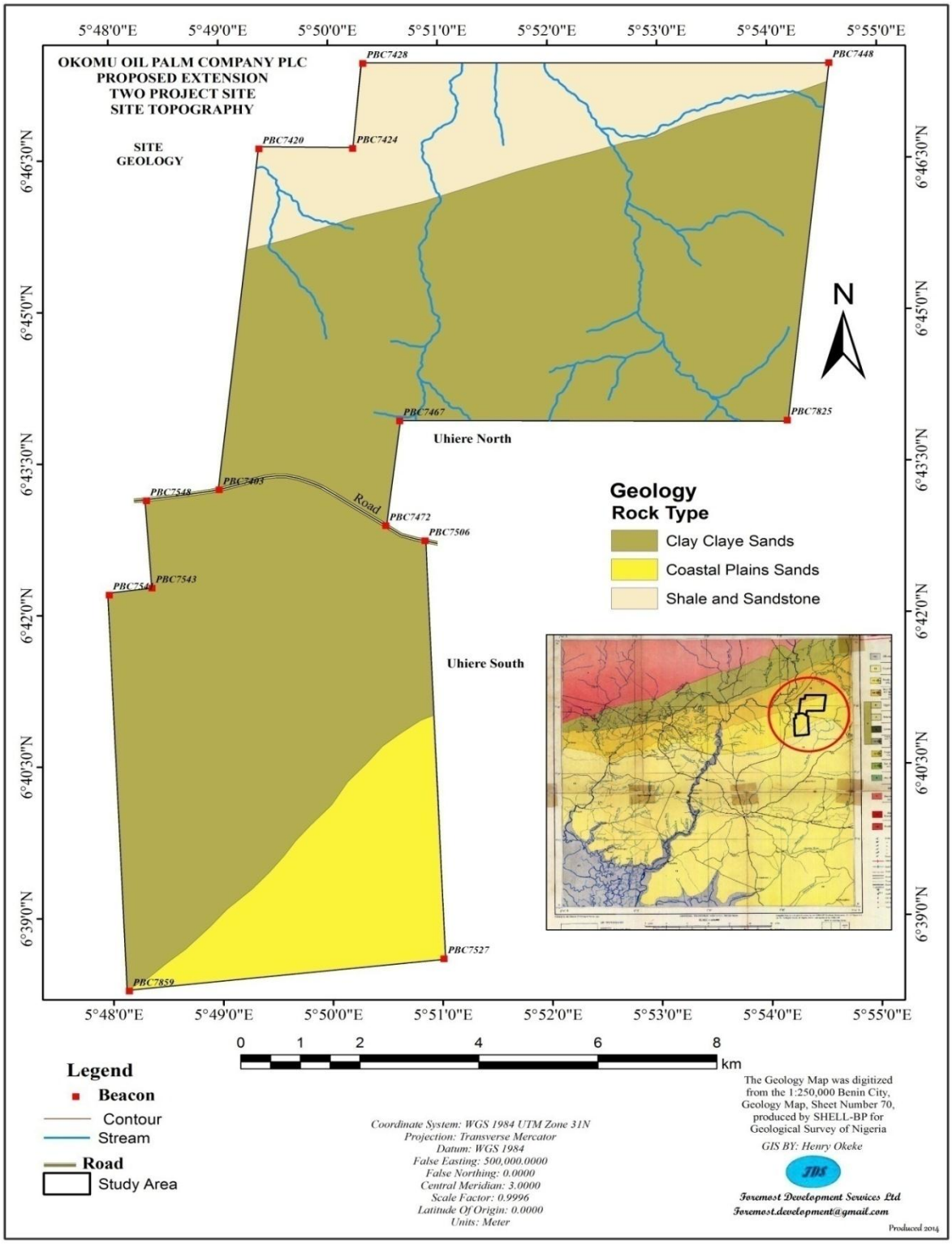
Relative Humidity.

In the tropical environment, there is a good correlation between the temperature/rainfall and relative humidity. The relative humidity of the atmosphere in the environment is generally high throughout the year. The highest values are recorded at the height of rainy season (June and September), while the lowest are expected during the drier months of December and January.

4.3.2.2 Geology and Geomorphology

The project is within the Zone Q (Very Humid Lagos to Benin to Asaba Low land) of the agro-ecological zones of Nigeria. This zone is essentially the western Nigeria lowland, a relatively flat to gently undulating plain developed on sedimentary rocks and littoral deposits. The project site is underlain by Tertiary and Cretaceous sedimentary rocks (mainly sandstones (Ojanuga, 2006).

Most of the soils in the study area were developed from undifferentiated igneous, metamorphic and Pre-Cambrian basement complex rocks with shale underneath (Map 4-3). The rocks are fairly deeply weathered and occurrence of rock-out-crops in the survey area is fairly widespread. The site is generally undulating with a few gentle to steep slopes. A range of relatively steep sided hills running North to South is situated to the west of the site. The area does not rise up to 200m above the sea level. Another range of residual hills approximately parallel to the former occur in the central part. Some scattered residual hills also occur to the southwest, these hills are dissected by the tributary of rivers (Map 4-3).



Source: OOPC EIA Field work 2014

Map 4-3: Geology of the Study Area

4.3.3 Vegetation

The natural vegetation of the area has been greatly modified. Human interference through annual uncontrolled bush burning and intensive small scale farming have reduced the original forest to secondary ones and bush re-growth. The original forest is now mostly confined to river channels and swamps. The mature vegetation consists of very tall trees with height range of 30 to 40 m scattered all over the region without continuous canopy; the middle layer trees with height range of 10 to 30 m and a continuous layer of trees with height range of 10 to16 m.

There were relatively low densities of oil palm trees within the catchment, the palms possessed large kernels and tiny mesocarp suggesting the Dura or other wild varieties. There are naturally occurring plant species. Some of the planted species include citrus, cassava, maize, banana, pawpaw, pineapple, okra, *amarantus spp*, etc. The major human interference is through farming activities in form of land clearing, using chemicals (Plate 4-1), bush burning and fallow/shifting cultivation.

The tracking of the land cover and land use changes of the project site over the last 25-26 years is illustrated in Map 4-4 to show the gradual depletion of the natural vegetation, while photographic evidences of human interferences are captured also in Plate 4-1.

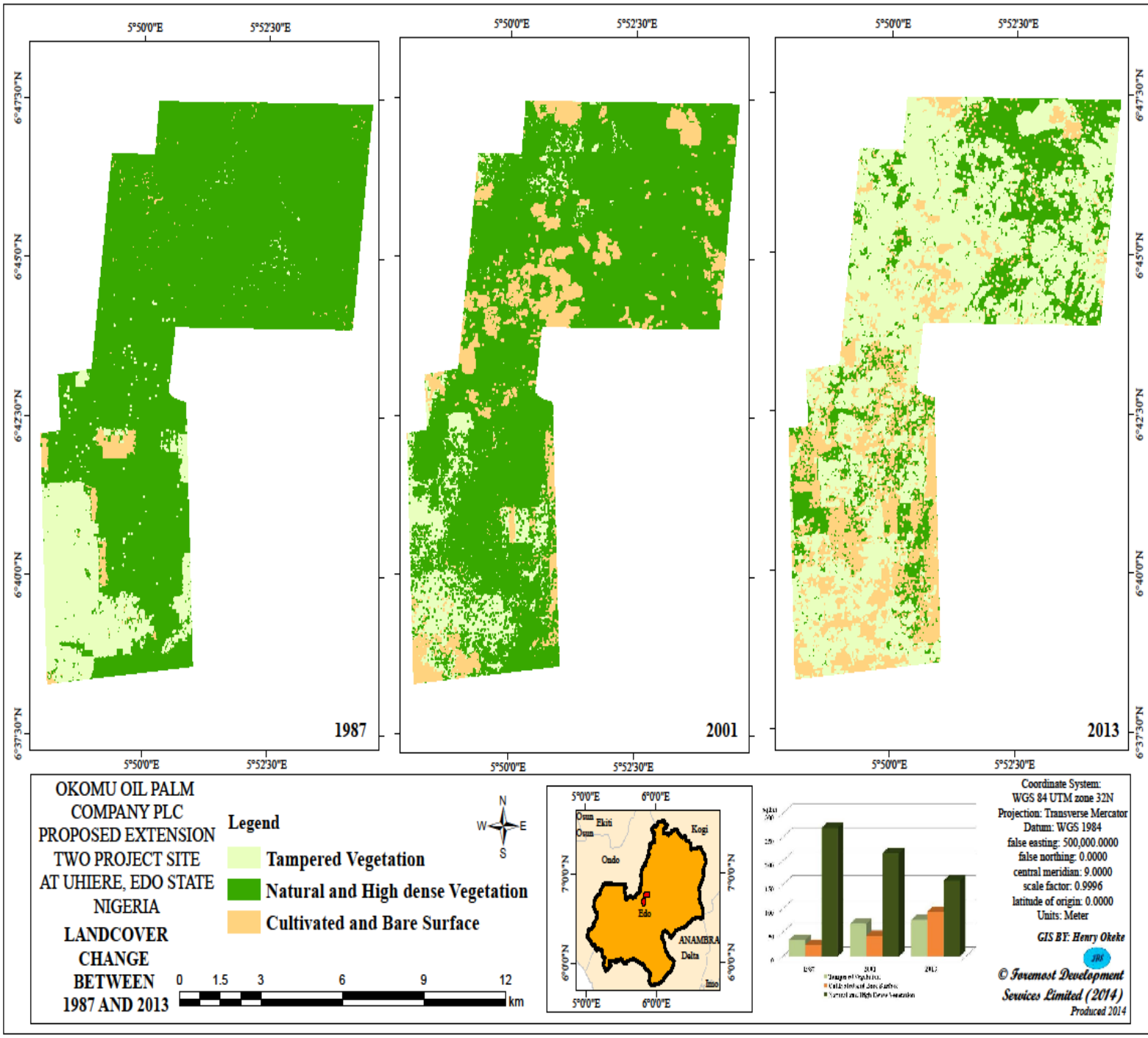
Typical Fallow Vegetation

Uncontrolled bush burning

Remnants of Natural Vegetation

Intensive farming

Plate 4-1: Evidences of human interferences on the natural vegetation



Source:: **OOPC EIA Field work 2014**

Map 4-4: Satellite Imagery of the Land Cover Change of the Project Area (1987- 2013)

4.3.4 Ambient Environment

4.3.4.1 Water Quality Measurement

Sample Identification and Handling

Sample identification data were entered on a label attached to each sample bottle. Information such as sampling point coordinates, time, name of sampler and date were entered on the attached label and subsequently recorded on the field jotter.

Sample Collection and Preservation, Transportation and Storage

Samples were collected in 2 liters polypropylene container and were preserved by cooling in a cooler containing ice.

Samples for heavy metals determination were preserved with conc. Nitric Acid and thereafter stored in a cooler containing ice.

Samples for microbiological analysis were collected in a sterilized bottle. The sample was stored in an ice box and then transported to the laboratory.

4.3.4.2 Results of Water Quality Measurement

The groundwater quality is good and free from pollution. Except for the pH that is generally low, all the water samples from the project's water sources have all physico-chemical and microbiological parameters within the permissible limits recommended by WHO and FMENV for wholesome water.

The results of laboratory analyses of two groundwater water and control samples over two (wet and dry) seasons are presented in Table 4-3.

Table 4-3: Results of Physico-chemical Laboratory Analysis of Groundwater water samples at Extension 2

Parameter/Unit	Reference Standard NIS554:2007	Sample 1 (UTM 31N) E807370.44 ; N743794.01		Sample 2 (UTM 31N) E811678.31 ; N741640.71		Control Sample (UTM 31N) E814753.24 ; N739975.42	
		Dry Season	Wet Season	Dry Season	Wet Season	Dry Season	Wet Season
Appearance	Clear and colourless liquid	Clear and Colourless liquid	Clear and Colourless liquid	Clear and Colourless liquid	Clear and Colourless liquid	Clear and Colourless liquid	Clear and Colourless liquid
Odour	Unobjectionable	Unobjectionable	Unobjectionable	Unobjectionable	Unobjectionable	Unobjectionable	Unobjectionable
Taste	Unobjectionable	Unobjectionable	Unobjectionable	Unobjectionable	Unobjectionable	Unobjectionable	Unobjectionable
pH @27.5 ^{o}C	6.5-8.5	7.07	5.20	6.8	5.8	5.6	6.7
Temperature, ^{o}C	Ambient	29.9	27.5	28.5	27.8	28.9	26.7
Conductivity, µS/cm	1000	29.9	36.3	31.2	22.2	30.0	33.4
Electrode Potential, mV	-	109	114	110	116	116	112
Colour, Pt-Co	15	<1.0	14.0	2.0	11.0	2.0	4.0
Turbidity, NTU	5	<1.0	5.0	1.0	3.0	0.9	2.0
Total Solids, mg/L	-	15.0	21.3	12.0	17.0	13.0	18.0
Total Dissolved solids, mg/L	500	15.0	18.1	9.0	11.0	10.0	16.0
Total Suspended Solids, mg/L	-	<1.0	3.0	2.0	6.0	1.0	4.0
Total Hardness, mg/L $CaCO_3$	150	5.0	11.0	3.0	8.08	4.0	10.0
Total Alkalinity, mg/L	-	9.20	3.12	10.30	4.43	9.6	3.4
Total acidity, mg/L	-	6.96	26.35	2.14	21.75	5.45	24.78
Calcium, mg/L as Ca	-	0.8	1.2	1.1	2.02	0.9	1.3
Magnesium, mg/L as Mg	2.0	0.73	1.94	0.24	0.74	0.21	0.72
Chloride, mg/L	250	4.43	4.42	1.92	1.70	1.9	1.72
Residual chlorine, mg/L	0.2-0.25	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoride, mg/L	1.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Nitrate, mg/L	50	0.12	0.49	0.13	0.49	0.22	0.45
Nitrite, mg/L	0.2	0.02	0.08	0.20	0.21	0.14	0.25
Sulphate, mg/L	100	4	5.0	<1.0	<1.0	<1.0	<1.0
Phosphate, mg/L	-	<0.1	0.3	<0.1	<0.1	<0.1	<0.1
Free carbon dioxide, mg/L	-	6.12	23.19	3.60	19.1	7.4	22.11
Iron (total), mg/L	0.3	<0.01	0.11	<0.1	0.1	0.1	0.1
Lead, mg/L	0.01	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic, mg/L	0.01	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese, mg/L	0.2	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Copper, mg/L	1.0	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium, mg/L	0. 03	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chromium, mg/L	0.05	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Hydrogen Sulphide, mg/L	0.05	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

Source: OOPC – Extension Two EIA Field work, 2014-2015

Table 4-4: Results of Microbiological Laboratory Analysis of Groundwater water samples at Extension Two

PARAMETER (CFU/100mL)	Reference Standard	Sample 1 (UTM 31N) E807370.44 N743794.01		Sample 2 (UTM 31N) E811678.31 N741640.71		Control Sample (UTM 31N) E814753.24 N739975.42	
		Dry Season	Wet Season	Dry Season	Wet Season	Dry Season	Wet Season
Total coliform count*	10	0	0	0	0	0	0
Faecal coliform (E.coli)	Nil	0	0	0	0	0	0
Clostridium perfringens	Nil	0	0	0	0	0	0
Salmonella/Shigella sp.	Nil	0	0	0	0	0	0
Staphylococcus sp.	Nil	0	0	0	0	0	0
Pseudomonas aureus	Nil	0	0	0	0	0	0
Total plate count,	10^2	4	2	2	2	2	2

Source: OOPC – Extension Two EIA Field work, 2014-2015

4.3.5 Ambient Air Quality Measurements

4.3.5.1 In-situ Measurements

In-situ determination of the gases was carried out using portable gas analyzers. The ambient air was monitored using Mattheson IQ-1000 gas analyzer (with mega and electrochemical sensors) to measure the concentrations of carbon monoxide, Oxygen, Non-methane hydrocarbons, hydrogen sulphide, Sulphur dioxide. BWT Gas Alert was used to determine the concentration of NO_2. PPM 1055 Handheld Aerosol Monitor was used to determine Suspended Particulate Matter (SPM). Fisher Scientific Hygrometer was used to determine the temperature and humidity of ambient conditions during the sampling period.

4.3.5.2 Quality Assurance/Control Procedure

The Quality Assurance/Control for laboratory analysis is in accordance with FMEnv recommended methods and it includes blank analysis to establish analytic level, duplicate analysis to establish analytical precision, spiked and blank sample analyses to determine analytical accuracy. It covers all aspects of the study, and includes sample collection, handling, laboratory analysis, data coding and manipulation, statistical analysis, presentation and communication of results. Sample chain custody form was used for the registration and tracking of sample from the field to the laboratory. The names of laboratories used for all the analyses are on Page xi.

4.3.5.3 Results of Ambient Air Quality Measurements

The results of ambient air quality determinations at ten different locations plus the control location are presented in Tables 4-5a and 4-5b. The results show that the ambient air quality is good with all the quality parameters within acceptable regulated limits.

Table 4-5a: Results of Air Quality and Noise Measurements (Wet Season, 22 September 2014)

LOCATION	Powerhouse/ Residential Area	Control	Odighi Community	Owan Community	Uhiere Community	Odiguetue Community	Agbanikaka Community	Orhua Community	Umuokpe Community	Ekpan Community	Irhue Community	Oke Community	**FMEnv. Limit**
Coordinate	N06.701270	N06.72450	N06.64316	N06.76092	N06.73056	N06.67075	N06.78252	N06.64316	N06.76092	N06.73056	N06.67075	N06.78252	-
	E005.818770	E005.821410	E005.764470	E005.768670	E005.788640	E005.770260	E005.777240	E005.764470	E005768670	E005.788640	E005.770260	E005.777240	-
SPM ($\mu g/m^3$)	32	29	27	27	28	28	28	22	22	22	24	24	**250**
Temperature, ^oC	36.9	38.9	38.9	37.8	38.9	42.8	42.8	35.8.4	32.7	31.0	33.3	34.0	**Ambient**
Humidity, %	31.2	31	28	26	24	20	21	60	68	60	56	48	
Carbon monoxide, ppm	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	**10-20**
Carbon dioxide, %	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.01	**Ambient**
Hydrogen sulphide, ppm	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-
VOC, mg/m^3	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
Oxygen, %	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	20.9	21.0	21.0	21.0	**21.0**
Sulphur dioxide, ppm	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	**0.6**
Nitrogen oxides, ppm	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	**0.1**
Noise, dB(A)	59.0	59.9	60.8	68	60.1	62	59.9	55.4	40.1	41.7	52.6	55.2	**90**

Source: OOPC – Extension Two EIA Field work, 2014

Table 4-5b: Results of Air Quality and Noise Measurements (Dry Season, 9 March 2015)

LOCATION	Powerhouse/ Residential Area	Control	Odighi Community	Owan Communit	Uhiere Communit	Odiguetue Community	Agbanikaka Community	Orhua Community	Umokpe Community	Ekpan Community	Irhue Community	Oke Community	**FMEnv. Limit**
Coordinate	N06.701270	N06.72450	N06.64316	N06.76092	N06.73056	N06.67075	N06.78252	N06.64316	N06.76092	N06.73056	N06.67075	N06.78252	-
	E005.818770	E005.821410	E005.764470	E005.768670	E005.788640	E005.770260	E005.777240	E005.764470	E005768670	E005.788640	E005.770260	E005.777240	-
SPM ($\mu g/m^3$)	28	27	26	26	27	26	26	26	25	25	25	25	**250**
Temperature, ^oC	37.2	37.2	35.6	37.3	27.8	26.1	32.4	36.8	34.8	32.2	35.3	34.3	**Ambient**
Humidity, %	28	66	23	26	66	33	28	52	59	50	49	42	
Carbon monoxide, ppm	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	**10-20**
Carbon dioxide, %	0.1	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.03	0.01	0.01	0.01	**Ambient**
Hydrogen sulphide, ppm	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	**-**
VOC, mg/m^3	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
Oxygen, %	20.8	21.0	21.0	21.0	21.0	21.0	21.0	21.0	20.9	21.0	21.0	21.0	**21.0**
Sulphur dioxide, ppm	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	**0.6**
Nitrogen oxides, ppm	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	**0.1**
Noise, dB(A)	67.2	51.2	66.5	64.1	59.1	66.6	61.8	58.6	44.1	43.5	56.2	58.9	**90**

Source: OOPC – Extension Two EIA Field work, 2015

The result of measurements conducted at the sites showed that:

- The concentrations of gases determined were within the Regulatory standards
- The mean of suspended particulate matter was 26±1.0 µg/m^3. The value is quite low compared to the standards for 8-hour exposure.
- The humidity was also low (Mean, 43.5±15.7 %) with values ranging from 23 to 66 %.
- The temperature was relatively high (Mean, 33.9±3.7 ^{o}C). The values varied between 26.1 to 37.3 ^{o}C.
- The ambient air quality around the sites was satisfactory compared to the standard.
- The noise level was within the Regulatory standard across the communities and project area. The mean noise level recorded for all the sampling points was 58.2±8 dB. The values were distributed between 43.5 and 67.2 dB.

4.3.6 Noise Level Measurement

Sound level was measured at same point as that for air quality. A CEL-254
Sound level meter was first calibrated and re-checked before determining the sound level. The reading was allowed to stabilize before recording in decibel units dB(A).

4.3.6.1 Results of Noise Level Measurements

Generally, the proposed oil palm development project area and its environs are serene with no abnormal noise level recorded. A digital sound level meter was used to measure the noise levels at different locations in the proposed project site and villages surrounding it. The measurement taken at different workplaces including the host communities showed that the noise level ranges from 43.5 dB(A) to 67.2 dB(A). The noise levels at different workplaces and its environs are within Federal Ministry of Environment permissible limit of 90 dB(A) for 8 hours exposure as presented in Tables 4-6a and 4-6b below.

Table 4-6a: Noise Levels at Critical Workplaces and the Host Communities at Extension Two – 22 September 2014 and 9 March 2015

LOCATION	Control	Powerhouse/ Residential Area	Odighi Community	Owan Community	Uhiere Community	Odiguetue Community	Agbanikaka Community	**FMEnv. Limit**
Coordinate	N06.72450 E005.82141	N06.701270 E005.81877	N06.6431 E005.7644	N06.76092 E005.76867	N06.73056 E005.78864	N06.67075 E005.77026	N06.78252 E005.77724	- -
Noise, dB(A) Dry Season, 22 September 2014	59.9	59.0	60.8	68	60.1	62	59.9	
Noise, dB(A) Wet Season, 9 March 2015	51.2	67.2	66.5	64.1	59.1	66.6	61.8	**90**

Source: OOPC – Extension Two EIA Field work, 2014-2015

Table 4-6b: Noise Levels at Critical Workplaces and the Host Communities at Extension Two – 22 September 2014 and 9 March 2015

LOCATION	Control	Orhua Community	Umuokpe Community	Ekpan Communit	Irhue Community	Oke Community	**FMEnv. Limit**
Coordinate	N06.72450 E005.82141	N06.64316 E005.76447	N06.76092 E005768670	N06.73056 E005.78864	N06.67075 E005.770260	N06.78252 E005.777240	- -
Noise, dB(A) Dry Season, 22 September 2014	59.9	55.4	40.1	41.7	52.6	55.2	
Noise, dB(A) Wet Season, 9 March 2015	51.2	58.6	44.1	43.5	56.2	58.9	**90**

Source: OOPC – Extension Two EIA Field work, 2014-2015

4.3.7 Ecological Environment

4.3.7.1 Flora and Fauna Composition

4.3.7.1.1 Flora

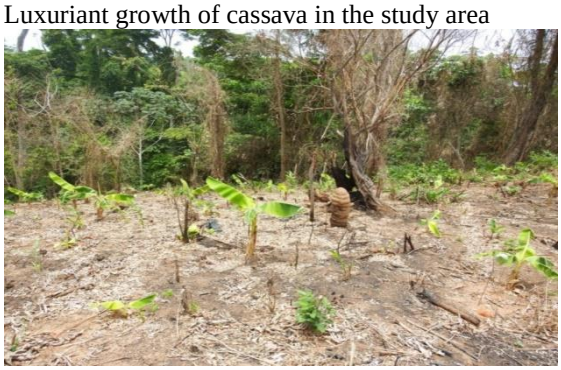
The vegetation in the northern part of the proposed site consists of a mosaic of fallow lands, farms, and riparian wetlands along the streams located within the site. The commonest crops under cultivation in the farms include *Manihot esculenta* (cassava), *Musa sapientum* (Plantain), *Zea mays* (corn), and *Dioscorea alata* (yams). The fallow lands are covered by a variety of weeds including *Commelina nodiflora, Panicum repens, Indigofera suffruticosa, Chromoleana odorata, Tridax procumbens, Panicum maximum, Axonopus compressus, Ageratum conyzoides, Ipomoea involucrata, Sida acuta, Abuliton* sp., *Costus afer, Smilax anceps, Manniophyton fulvum, Solanumtorvum Ipomoea hirta* and *Cyperus* spp.

Trees within the fallow area of the northern region of the proposed project area include *Baphia nitida, Trema orientalis, Pycnanthus angolensis, Musanga cecropioides, Alchornea cordifolia, Alstoni aboonei, Milicia excelsia,Nauclea spp., Voacanga spp, Terminalia ivorensis,Ricinodendron africanum ,Irvingia gabonensis* and *Bombax* spp. The riparian wetland areas along the streams and *Jemide* River are dominated by swamp loving plants such as *Hallea ciliata, Ancistrophyllum seccundiflorum, Uapaca spp., Musanga cropioides, Anthostema aubryanum, Danielia ogea, Pandanus togoensis,* and *Alchornea cordifolia.* Riparian wetlands area areas of high conservation value as they contain sensitive biota. Aquatic macrophytes encountered include *Cyrtosperma senegalense, Ipomoea aquatica, Leersia hexandra, Crinum sp.* and *Jussiea repens.* The vegetation is generally healthy. The cassava mosaic disease is however prevalent in the study area.

The vegetation in the Southern part of the study area is also similar to that of the northern part but a portion of it is presently covered by oil palm plantation, farmlands, forest regrowth and with weed species typical of the lowland rain forest zone in Nigeria. The dominant plants include Guinea grass (*Panicum maximum), Trema orietalis, Alchornea cordifolia,* Siam weed (*Chromoleana odorata*) and *Sida* spp. However, there is a lake (06° 40' 27.4" N and 005° 49' 50.5" E) within the southern part of the proposed project area, with some aquatic plant species such as *Nymphaea lotus* and *Pistia stratiotes, Cyrtosperma.*


Luxuriant growth of cassava in the study area


Part of a plantain farm


A new plantain farm at the edge of one of the streams


Part of a yam farm


Part of the fallow land colonised by various weeds, shrubs and trees


A riparian forest is well developed along one of the streams.


River Jemide with emergent aquatic species


The southern part with mainly weed species

Source: OOPC – Extension Two EIA Field work, 2014-2015

Plate 4-2: Different types of vegetation recorded on Extension Two

Forest Stratification

Forest stratification was observed in large patches. There were three tree strata, consisting of emergents, canopy and under-storey layers. Other life forms associated with trees were epiphytes and climbers.

Emergent

These are the tallest trees (>35m) scattered within the forest. Their crowns do not touch as they are far apart and tower above the canopy trees. Emergent species encountered during the survey included *Triplochiton scleroxylon*, *Ceiba pentandra*, *Khaya ivorensis*, *Terminalia superba*, *Piptadeniastrum africanum* and *Milicia excelsa*. A *Terminalia sp* tree was above 50m in height and 5m in girth. As these are timber species of value, these forest fragments are susceptible to assault by timber merchants and their collaborators.

Source: OOPC – Extension Two EIA Field work, 2014-2015

Plate 4-3: Emergent vegetation

Canopy Layer

The trees in this layer have their crown touching one another so they form a complete cover (canopy) over the forest, thus casting shade upon the species below. Species found in this layer included *Trema guineensis*, *Antiaris toxicaria*, *Trilepisium madagascariense*, *Malacantha alnifolia*, *Hallea ciliata*, *Alstonia boonei* and *Dacryodes edulis*.

Source: OOPC – Extension Two EIA Field work, 2014-2015

Plate 4-4: Canopy trees

Under-Storey Layer

The trees in this layer are adapted to the little amount of light that filters through the canopy layer. They are smaller in size and some notable characteristics include buttresses at the bases of the stems, relatively thin barks, and drip tips of leaves. Species found included *Olax subscorpioidea*, *Celtis phillipensis*, *Cola millenii*, *Campylospermum flavum*, and *Pycnanthus angolensis*.

The canopies of trees in this layer were infested with epiphytes such as lichens, mosses and ferns, and some vascular plants including *Culcasia scandens* and a variety of orchids. The shrub layer had species like *Abrus precatorius*, *Cnestis ferruginea*, and *Connarus staudtii*. *Paullinia pinnata* occurred at the edge of the forests where there is illumination.

Source: OOPC – Extension Two EIA Field work, 2014-2015

Plate 4-5: Understorey trees with epiphytes

Active Farmlands

The presence of farmland within the proposed project area was observed. Arable crops include maize, cassava, yam, pawpaw, plantain, banana and various species of vegetables such as *Telfaria occidentalis* and *Vernonia amygdalina*, which were being harvested on a large scale for sale in markets.

4.3.8 Wildlife Fauna

4.3.8.1 Composition of the fauna

The terrestrial wildlife fauna of the region consist of mammals, birds, reptiles, amphibians and invertebrates.

4.3.8.1.1 Mammals

Table 4-7 gives a summary of the mammalian fauna recorded from the study area. A total of 27 species of mammals (excluding bats) were recorded in the area during the period of study. These species belong to 6 mammalian Orders, 16 Families, and 24 Genera. They include the rodents (Rodentia), primates (Primates), pangolins (Pholidota), carnivores (Carnivora), insectivores (Insectivora), and ungulates (Artiodactyla). The rodents were the most dominant mammalian group, excluding bats, constituting about 40% of the total number of mammalian species recorded. Except for the Giant rats, the rodents are small mammals and are very varied in pelage coloration and patterning (Happold, 1987). They are mostly terrestrial and live in burrows, being mostly nocturnal. Because of their large numbers they are neither threatened nor endangered by the proposed project but rather considered a pest to field crops and stored products. They are listed as Least Concert (LC) by the 2014 IUCN Redlist.

The primates include the monkeys, galagos and pottos. Monkeys were sighted along the watershed forest in Grid 11, 17 and 18. Mona monkeys (*Cercopithecus mona*) and the White-throated monkeys were seen recently but their population is declining as a result of habitat loss through deforestation for timber and conversion of forest to agricultural land. These monkeys are now restricted to the watershed forest of the Jemide River. The White Throated Monkey is listed in the IUCN Red list (2014) as Vulnerable and will need special attention for protection when clearing and farm operations commence. Pottos and galagos have been reported by trappers and hunters. Although their population is declining, they were considered as Least Concern by the IUCN Redlist.

The carnivores are represented by small to medium-sized species of civet, genet and mongoose. They are all rare and may be threatened by habitat loss and over-

exploitation by humans for food. They were considered as Least Concern by the IUCN Redlist.

Amongst the Artiodactyla (even-toed ungulates) only the antelopes (family Bovidae) and bush pigs (family Suidae) were reported to occur in the area. They are commonly found in the area and may not be threatened immediately by the project. However, as the forest becomes more accessible to hunters/trappers due to the project, these wildlife species will be seriously threatened. The buffalo was reported to be present in the past but this species has not been recorded in the area in the last 5 years and may be locally extinct. All the Artiodactyla are considered as Least Concern by the IUCN Redlist.

The pangolins (Order Pholidota) were represented by a single species of tree pangolin, or White-bellied Pangolin *Manis tricuspis = Phataginus tricuspis*. This species is considered as Vulnerable by the IUCN Redlist. Table 4-7 gives a checklist of all the mammalian fauna found in the area of study.

Estimates of population densities based on counts of trapping animals or interviews by hunters were low. The population density of most species of primates, carnivores, artiodactyls may vary between 2-10/km^2 while rodents may vary between 10-20/km^2 depending on the species. Plate 13 shows some of the mammals species recorded within the project area.

Table 4-7: Number of species, genera and families of mammals (excluding bats)

Order	Family	Genera	Species
Rodentia	6	6	11
Primates	3	4	4
Artiodactyla	2	3	4
Carnivora	2	5	5
Insectivora	2	2	2
Pholidota	1	1	1
Total	**16**	**21**	**27**

Source: OOPC – Extension Two EIA Field work, 2014-2015

4.3.8.1.2 Birds (Avifauna)

The avifauna of the region represents the diverse habitat types in the region. The habitats include secondary forest at various successional stages, farmlands (including cassava, yam) and freshwater swamp forest in the northern part of the concession and oil palm plantation in the south. A total of 49 species were recorded. Birds' characteristic of primary forest or old growth secondary forest

such as hornbills, turacos, various bulbuls, flycatchers, and eagles were found in the primary forest fragment near the *Jemide River*.

Seed and insect eating birds dominated the farmlands and oil palm plantation in the southern part of the concession within the proposed project area. They include bulbuls, barn swallows, swift, wagtails, waxbills, pin-tailed whydahs, common thrush, kingfishers and sunbirds. These species gives a clear indication of habitat change.

Common raptors in the proposed project area include hawks, hawk-sparrow, kites, buzzards, palmnut vultures and martial eagles.

Moreover, only a few species restricted to the Guinea-Congo Forest Biome, were identified during the assessment. These include the White-Thighed Hornbill (*Bycanistes albotibialis*), African Emerald Cuckoo (*Chrysococcyx cupreus*), Yellow-Crested Woodpecker (*Thripias xantholophus*) and White-Breasted Negro finch (*Nigrita fusconotus*). Plate 4-6 shows some of the bird species recorded from the proposed project area.

The proposed project area is not located within any Important Bird Area (IBA) as defined by Birdlife International. The nearest being the Okomu National Park, approximately 60 km, in Ovia Southwest Local Government Area, Edo State, Nigeria.

Table 4-8: A checklist of avifauna of the proposed project area

Family	**Scientific Name**	**Common Name**	**IUCN Status**
Accipitridae	*Gypohierax angolensis*	Palm-Nut Vulture	Least concern
Accipitridae	*Polyboroides radiatus*	Harrier Hawk	LC
Accipitridae	*Polemaetus bellicosus*	Martial Eagle	LC
Accipitridae	*Milvus migrans*	Black Kite	LC
Accipitridae	*Kaupifalco monogrammicus*	Lizard Buzzard	LC
Alcedinidae	*Halcyon malimbica*	Blue-Breasted kingfisher	LC
Alcedinidae	*Halcyon senegalensis*	Woodland Kingfisher	LC
Alcedinidae	*Alcedo cristata*	Malachite kingfisher	LC
Apodidae	*Cypsiurus parvus*	African Palm-swift	LC
Ardeidae	*Bubulcus ibis*	Cattle Egret	LC
Bucerotidae	*Bycanistes subcylindricus*	Black-and-White Casqued Hornbill	LC
Bucerotidae	*Tockus fasciatus*	African Pied hornbill	LC

Capitonidae	*Pogoniulus bilineatus*	Yellow-Rumped Tinkerbird	LC
Capitonidae	*Pogoniulus subsulphureus*	Yellow-Throated Tinkerbird	LC
Cisticolidae	*Cisticola erythrops*	Chattering Cisticola	LC
Columbidae	*Turtur tympanistria*	Tambourine Dove	LC
Columbidae	*Streptopelia senegalensis*	Laughing Dove	LC
Columbidae	*Streptopelia semitorquata*	Red eyed Dove	LC
Coraciidae	*Eurystomus glaucurus*	Broad-Billed Roller	LC
Columbidae	*Turtur afer*	Blue-spotted Wood dove	LC
Corviidae	*Corvus albus*	Pied Crow	LC
Cuculidae	*Centropus senegalensis*	Senegal Coucal	LC
Cuculidae	*Centropus grilli*	Black Coucal	LC
Cuculidae	*Chrysococcyx caprius*	Didric cuckoo	LC
Estrildidae	*Nigrita fusconotus*	White Breasted Negrofinch	LC
Estrildidae	*Lonchura cucullata*	Bronze Mannikin	LC
Estrildidae	*Nigrita canicapillus*	Grey-Headed Negrofinch	LC
Estrildidae	*Lonchura bicolor*	Black and White Mannikin	LC
Hirundinidae	*Hirundo nigrita*	White-Throated Blue Swallow	LC
Hirundinidae	*Hirundo aethiopica*	Ethiopian Swallow	LC
Meropidae	*Merops pusilus*	Little Bee-Eater	LC
Meropidae	*Merops albicollis*	White-throated bee-eater	LC
Motacillidae	*Motacilla flava*	Yellow Wagtail	LC
Motacillidae	*Macronyx croceus*	Yellow-Throated Longclaw	LC
Nectariniidae	*Hedydipna collaris*	Collared Sun-bird	LC
Nectariniidae	*Cinnyris cupreus*	Copper Sun-bird	LC
Nectariniidae	*Cinnyris superbus*	Superb Sunbird	LC
Numididae	*Numida meleagris*	Helmented Guinea Fowl	LC
Passeridae	*Passer griseus*	Northern Grey-Headed Sparrow	LC
Picidae	*Dendropicos goertae*	Grey Woodpecker	LC
Picidae	*Dendropicos gabonensis*	Gabon Woodpecker	LC
Ploceidae	*Ploceus cucullatus*	Village Weaver	LC
Pycnonotidae	*Pycnonotus barbatus*	Common Bulbul	LC
Pycnonotidae	*Andropadus virens*	Little Greenbul	LC
Pycnonotidae	*Thescelocichla leucopleura*	Swamp Palm Bulbul	LC
Sylviidae	*Hylia prasina*	Green Hylia	LC
Turdidae	*Turdus pelios*	African Thrush	LC
Viduidae	*Vidua macroura*	Pin-Tailed whydah	LC


White-throated Bee-eater, *Merops albicollis* Little Bee-eater, *Merops pusillus*


Red-eyed Dove, *Streptopelia vinacea* Pied Crow

Plate 4-6: Bird species recorded at project site


Bird nest

Weaver Bird nest

Plate 4-7: Bird nests

Source: OOPC – Extension Two EIA Field work, 2014-2015

4.3.8.1.3 Invertebrates: Arthropods and Molluscs

Arthropods collected were represented mainly by the Lepidoptera (butterflies), Coleoptera (beetles), Isoptera (termites), Orthoptera (grasshoppers), Hemiptera (bugs) and Diptera (flies). Land molluscs were represented by over thirty species of snails belonging to the families Achatinidae, Streptaxidae, Subulinidae, urocyclidae, and Veronicellidae.

Butterfly, Prey mantis, Dragonfly

Butterflies

Plate 4-8: Arthropods from the proposed project area

4.3.8.1.4 Amphibians and Reptiles

The reptiles were represented by chameleons, geckos, monitor lizards, agama lizards, snakes, skinks, and tortoises. There are reports of the presence of the long snouted crocodiles in the lake within the southern part of the project area. However, none was sighted during the study. A total of 14 species of reptiles and ten (10) amphibian species were recorded in the proposed project area. Apart from the crocodiles and the royal python most reptilian and amphibian species are neither endangered nor threatened. The amphibians were represented mainly by different types of frogs and toads including the African Tree frogs and the Tongueless frogs. A checklist of the amphibian and reptilian species found or reported is listed in Table 4-9.

Table 4-9: Checklist of reptiles and amphibians reported from the proposed project area

Order	Family	Common name	Scientific name	Abundance	IUCN status
Chelonia	Testudinidae	Tortoise			
		Serrate Hinge-back tortoise	*Kinixys erosa*	rare	LC
Crocodilia	Crocodylidae				
		Dwarf Crocodile	*Osteolaemus tetraspis*	rare/extinct locally	V
Squamata	Agamidae	Agama lizard	*Agama agama*	Abundant	LC
	Gekkonidae	Wall Gecko	*Hemidactylus brooki*	Abundant	LC
	Scincidae	Skinks	*Mabuya sp*	Abundant	LC
			Lygosoma sp	Abundant	LC
			Melanoceps sp.	Abundant	LC
	Varanidae	Nile Monitor	*Varanus niloticus*	Rare	LC
	Boidae	Royal Python	*Python regius*	Rare	LC
	Colubridae	Common Snakes			
		Common Nigerian File Snake	*Mehelya crossi*	Abundant	LC
		The Lined House Snake	*Boaedon lineatus*	Abundant	LC
		the Common Hedge Snake	*Philothamnus irregularis*	Abundant	LC
	Elapidae	Black Cobra	*Naja melanoleuca*	Abundant	LC
	Viperidae	common vipers	*Vipera sp.*	Abundant	LC
Amphibia	Bufonidae	Toads	*Amietophrynus maculates*	Abundant	LC
	Dicroglossidae	True frogs	*Hoplobrachus occipitalis*	Abundant	LC
	Arthroleptidae		*Leptopelis hyloides*	Rare	LC
	Phrynobatrachidae		*Phrynobatracus sp*	Abundant	LC
	Hyperoliidae	Treefrogs	*Afrixalus dorsalis*	Rare	LC
			Hyperiolius fusciventris	Rare	LC
	Ptychadenidae		*Ptychadena longirostris*	Abundant	LC
			Ptychadena oxyrynchus	Abundant	LC
			Ptychadena pumlio	Abundant	LC
			Chiromantis rufescens	Rare	LC

Source: OOPC – Extension Two EIA Field work, 2014-2015

4.3.9 Aquatic Biology

This section focuses on the water and bottom sediment characteristics within the area. This component of the study is aimed at monitoring surface water and bottom sediment parameters which, when altered, can easily affect the ability of the concerned attributes to perform their natural functions.

The river system is a major resource for the proposed plantation especially for the processing of the palm oil. The location of major river systems which bordered the proposed site on the North West and South West will aid the underground water recharge.

The area is drained by two perennial water bodies, Jemide and Owan Rivers, which are tributaries of the *Osse* River that originates from the Idanre hills and drains into the Benin River into the Atlantic Ocean. Other water bodies sampled within the area were as follow: Stream 1 (06° 44' 30.4" N, 005° 49' 05.7" E), stream 2 (06° 44' 44.9" N, 005° 49' 07.6" E). The major water body was the Jemide River (N 6° 45' 42.1" N, 005° 52' 43.9" E) that flows into the Owan River. The only water body in the southern part is the "Odigi" pool (06° 40' 27.4" N, 005° 49' 50.5" E).

4.3.9.1 Methodology

Field and laboratory studies were carried out, in addition to literature studies. During the fieldwork, present situation of salient environmental parameters with regards to water resources quality was carried out. Sampling and laboratory analyses of water were aimed at determining the magnitude and pattern of variation of appropriate physico-chemical and microbiological parameters within the study area.

One (1No.) representative sample each of surface water was collected from Jemide and Owan Rivers and then taken to the laboratory for analysis.

4.3.9.2 Field Work

At each sampling station, water samples were collected and stored in 2 liter polyethylene bottles, and pre-treated as suggested by Battley and Gardner (1977). Samples for heavy metal determinations were fixed with concentrated H_2SO_4 and refrigerated. Samples for microbiological analyses were stored in sterile Macarthy bottles and also refrigerated. In-situ measurements for pH, DO, Conductivity, Salinity, TDS and Temperature were determined using various digital meters.

4.3.9.3 Laboratory Analysis

a) **Biochemistry of Water Sample:**
   The parameters determined, were Biochemical Oxygen Demand (BOD) and Chemical Oxygen Demand (COD). Tests for these parameters were conducted

using the incubation method recommended by the American Public Health Association (APHA).

b) **Chemistry:**
The parameters determined include:

- Nitrate and ammonium (NO^3 and HN_4-N) which were determined using ion chromatography.
- Exchangeable cations, which were determined using atomic absorption spectrophotometry. The exchangeable metals tested for are, Na^+, K^+, Ca^{2+}, Mn^{2+}, phenols, cyanides, chloride and sulfides were determined using appropriate methodology. Chloride by the Mohr method, cyanide using reagent supplied by E. Merck, Darmstadt, Germany.
- Heavy metals (Fe, Zn, Cr, Pb, Cu, V, Ni, Hg, Ba, etc) were to be determined using Atomic Absorption Spectrophotometry.

4.3.10 Sediment Studies

4.3.10.1 Methodology

Two (2Nos.) sediment samples were taken during fieldwork exercise, Sediment samples were taken at location where water sample was collected. The sediment samples were taken using a Van-Veen type grab sampler and sediment samples for Total Hydrocarbon estimations, Poly Aromatic Hydrocarbons and phenols were stored in aluminum foils and refrigerated prior to laboratory analyses, while samples for microbiological analyses were stored in sterile Teflon bags and equally refrigerated. Samples for others were stored in labeled polyethylene bags prior to laboratory analysis.

4.3.10.2 Laboratory Analysis

The collected sediment samples were used for the laboratory analyses at Jawura Environmental Services, No.77, Ikorodu Road, Fadeyi (1st Floor), Shomolu, Lagos-state. The analyses undertaken were as follows:

a. Physico-chemical Characteristics:

- Particle size, soil texture, moisture content and organic content. Particle size was determined using the standard Bouycous hydrometer, while organic content were determined using sodium hexametaphosphate solution method.

- Major and trace metals Mg^{2+}, Ca^{2+}, Na^+, Zn^{2+}, K^+) were determined using the X-Ray Fluorescence (XRF) method.

- Heavy metal (Cu, Fe, Pb, Cd, V, Ni, Hg, etc) were determined using atomic absorption spectrophotometery method.

- pH, oil and grease, Total Hydrocarbon Content (THC) using standard methods.

b. Geotechnical Studies:

Geotechnical studies were conducted for engineering characteristics of the sediments. In order to achieve this, the following classification tests were conducted using standard engineering methods.

- Moisture content determination
- Grain size analysis
- Specific gravity
- Permeability
- Bulk density
- Strength test

c. Microbiology:

Soil and bottom sediment samples were subjected to microbiological tests as follows:

- Total heterotrophs, were isolated using the standard plate count (SPC) technique.
- Total pathogens were isolated using three (3) selective media (MacConkey agar, blood agar and decoxycholocate agar.
- Fungi were isolated using minimal salts agar.
- Hydrocarbon utilizing micro-organisms were determined using minimal salt agar, and a single source of carbon (crude petroleum) according to the method described by Raymond et al (1976).

a. Identification of Micro Organisms

Hydrocarbon utilizing bacteria was first purified to obtain a pure culture, stained by grain staining technique to differentiate gram positive from gram negative organisms. The organisms were then passed through series of biochemical tests which include glucose/gas production, lusive/omitare, hydrogen sulfide and indole, oxidize, adonitol, arabinose, sorbitol, ducitol, motility, phenyl alanine, urea, citate utilization. All these reagents were packaged in three sets.

1. BBL minitech for identification of gram positive organisms.
2. BBL. Enterotubes I and H for identification of gram negative bacteria (oxidize negative).
3. BBL oxiferm tubes I and H for identification of gram negative, oxidize positive bacteria.

The BBL identification kit is latest technology in numerical identification of microorganisms. It is packaged by Becton Dickinson Microbiology Systems, USA. The bicode manual used for identification is the 1993 version. Fungal and yeast identification was at specie level by microscopic examination and sugar fermentation.

b. Total Hydrocarbon Contents

Sampling and subsequent laboratory analyses of sediment samples were aimed at checking if the proposed site area has been impacted. At each sampling point, sediment was collected in aluminum foil and kept in a refrigerator prior to the time of analysis. The hydrocarbon content of the samples was extracted using the Soxhlet apparatus with methylene chloride under reflux for a minimum of 6 hours as suggested by Brown et al (1983). The extract, which was concentrated with a rotary evaporator was analyzed by Gas Chromatography with flame ionization Detector (GC-FID) and quantified by comparison with the appropriate THC standard.

4.3.10.3 Results and Discussions

The planktonic community was represented by 29 species of phyto-planktons and 2 species of zooplankton. The phytoplankton consist of Bacillariohyta (7 species), Chlorophyta (10 species) Euglenophyta (4 species) Cyanophyta (1 species), and Dinophyta (7 species) while the zooplankton was up of 2 species of Cladocera and Copepoda. There was no evidence of eutrophication (alga bloom). The family composition of the plankton species is illustrated in Figure 4-3.

The benthic fauna of the Jemide and Owan rivers is made up of eleven (11) species; decapods, crustacean and larval forms of Coleoptera, Diptera, Tricoptera and Odonata. These species are indicative of the absence of organic pollution.

Ichthyofauna

Ichthyofauna (fishes) information revealed that the fish comprised mainly members of the family Cichlidae (*Oreochromis niloticus*, *Sarotherodon galilaeus*), Clariidae (*Clarias gariepinus* and *Heterobranchus longifilis*), Hepstidae (*Hepsetus odoe*) and Gymnarchidae (*Gymnarchus niloticus*).

Table 4-10; A checklist of plankton species recorded from the water bodies within the project area during the rainy and dry seasons

	TAXA	Stream 1	Jamide Downstream	Jamide Upstream
	BACILLARIOPHYTA		19	
1	*Baccillaria paradoxa*		15	16
2	*Flagillaria sp*	32		15
3	*Bidulphia sinensis*			1
4	*Bidulphia regia*	1	5	1
5	*Melosira granulata*		1	
6	*Synedra acus*	17	11	10
7	*Synedra ulna*	16	4	14
	CHLOROPHYTA			
8	*Melosira granulata*	1		1
9	*Volvox africana*	1		
10	*Spirogyra sp*	18	8	22
11	*Spirogyra majuscula*	10	4	
12	*Pandorina morum*	21		11
13	*Pandorina sp*	60	17	
14	*Closterium gracile*		1	
15	*Closterium pseudonulula*			1
16	*Sirogonium melanosporum*	8	7	3
17	*Scenedesmus sp.*			1
	EUGLENOPHYTA			
18	*Euglena spirogyra*		1	
19	*Phacus Curvicauda*	1		
20	*Phacus acuminatus*		1	
21	*Euglena sp*	7	15	32

	CYANOPHYTA			
22	*Coelosphaerium pallidum*		2	
	DINOPHYTA			
23	*Gymnodinium fusum*	11	2	4
24	*Merisbmospeida elegans*			3
25	*Microcystis aeruginosa*		14	4
26	*Oscillatoria priceps*		1	
27	*Protoperidinium depressum*		1	
28	*Peridinium cincium*		2	
29	unidentified		2	
	ZOOPLANKTON			
	ARTHROPODA			
	CRUSTACEA			
	CLADOCERA			
	SIDIDAE			
30	*Diaphanosoma excisum*		1	
	COPEPODA			
	ORDER CYCLOPOIDA			
31	Mesocyclops bodanicola	6	2	3

Source: OOPC – Extension Two EIA Field work, 2014-2015

Table 4-11; List of benthic fauna recorded from the aquatic habitats in the project area during the rainy and dry seasons

	TAXA	STREAM 1	JAMIDE UPSTREAM	JAMIDE DOWNSTREAM
	DECAPODA			
1	*Desmocaris trispinosa*	5		2
2	*Caridina gabonesis*	2	2	6
	DIPTERA			
	Chironomidae			
3	*Chironomus sp*	5		1
4	*Chironomus fractilobus*	2		
5	*Tarnypus sp*		5	3
6	*Culex sp*		1	
	COLEOPTERA			
7	*Hydrophilus sp*		1	1
	EPHEMEROPTERA			
8	*Elassoneura candida*		2	
9	*Cloeon sp*		12	4
10	*Baetis sp*		3	
	TRICHOPTERA			
11	*Trichoptera* larvae		2	
	ODONATA			
12	Anisoptera			
13	*Aphyla sp*	2		
14	*Libellula sp*		3	

Source: OOPC – Extension Two EIA Field work, 2014-2015

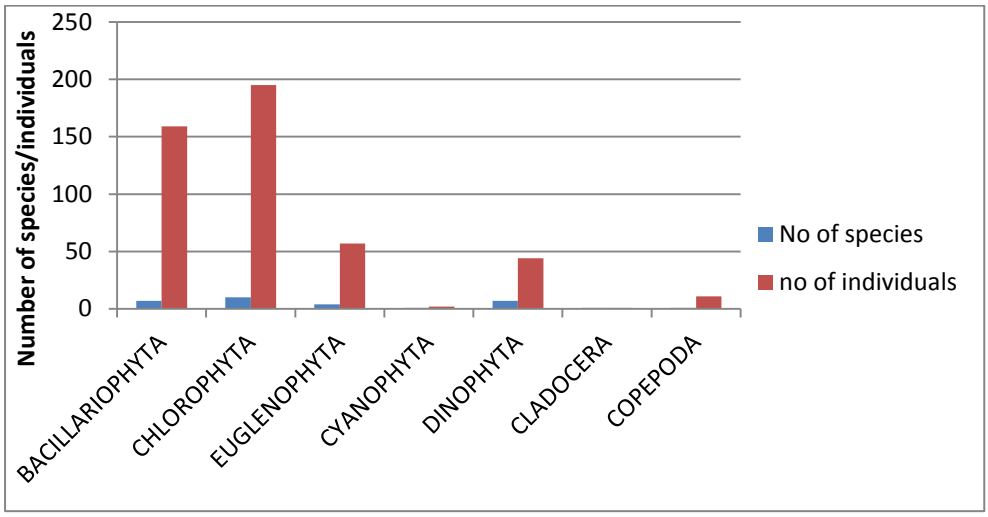


Figure 4-3: Family composition of plankton recorded in water bodies

Surface Water Quality

In-situ physio-chemical parameters measured were pH, Electrical conductivity, Dissolved Oxygen, salinity and temperature as presented in Table 4-12.

Table 4-12: Physico-chemical Analysis Result of Jemide and Owan Upstream and Downstream Water Samples at Extension Two oil palm plantation development project.

BENIN-OWENA RIVER BASIN/UNIVERSITY OF BENIN
JOINT ANALYTICAL RESEARCH LABORATORY

Office: Ugbowo Campus,
Uniben.
08033914394

Our Ref.:.....

SAMPLE MATRIX: WATER
DATE ANALYZED: 24/04/15

Prof. C. OKE

Parameter	Stream1(10)	Jamide Downstream	Jamide Upstream	Stream 2 Upstream	Stream 2 Downstream
PH	6.7	6.6	6.7	5.9	5.6
Conductivity(μscm$^{-2)}$	20	20	20	50	50
Turbidity(NTU)	10	7	6	303	240
Suspended solid	5	3	5	208	170
Dissolved oxygen	3.2	2.6	2.4	1.2	1,9
B.O.D	1.5	0.5	1.2	2.6	2.1
Alkalinity	6	4	6	4	2
Hardness	6	4	6	14	14
Chloride	10.6	10.60	10.6	14.12	14.12
Phosphate	0.15	0.12	0.17	2.17	1.74
Nitrate	4.9	5.1	9.2	4.9	9.5
Sulphate	7	6	7	40	43
Calcium	1.60	0.80	1.60	3.21	2.40
Magnesium	0.49	0.49	0.49	1.46	1.95
Nickel	0.183	0.284	0.193	0.223	0.170
manganese	ND	ND	ND	0.023	0.005
Iron	0.200	0.611	0.241	5.518	4.583
Copper	0.021	0.02	0.011	0.007	0.017
Zinc	ND	ND	ND	0.008	ND
Lead	0.048	0.052	0.086	0.050	0.039
Cadmium	ND	ND	ND	ND	ND

All unit are in mg/l except otherwise mentioned. ND: Not detected.

UWAIFO OSARETIN P.
ANALYST

Legend: Streams 1&2 are tributaries to River Jemide

Water quality varied from one location to another within the proposed project area. The pH varied from 5.6 – 6.7, Conductivity 20 – 50(uscm-2), Turbidity 6-303, Suspended solids 3-208 mg/l, Dissolved oxygen 1.2-3.2, Biological oxygen demand 0.5-2.6 mg/l, Alkalinity 2-6, Hardness 4-14, Chloride 10.6-14.12, Phosphate 0.15-2.17, nitrate 4.5-9.5 mg/l, Sulphate 6-43 mg/l, calcium 1.6-3.21mg/l, Magnesium 0.49-1.95mg/l. All the values determined for heavy metals in the water bodies occurred in low concentration much below the recommended limits by FMENV and WHO. Water temperature was 27ºC± 0.4. Water movement could only be determined for Jemide River because other streams were seasonal. The speed of the water ranged from 0.5 to 0.7m/sec; with a mean of 0.603±0.054 m/sec. Secchi disc turbidity for Jemide River was 80cm.

Bottom Sediments

The results of the laboratory analyses of the bottom sediment samples collected during the field exercise are presented in Table 4-13. The pH value of the sediment samples was within the range of 6.50 and 6.74 with an average of 6.62. Results of grain size analyses showed that the sediment samples were predominantly made up of sand with an average content value of 85.0% followed by silt having an average content value of 2.15% and lastly clay with 2.0% average content value.

Table 4-13: Bottom Sediment Analysis Result

Sample Code	pH	E.C (µS/cm)	O.C (%)	THC (mg/kg)	SAND (%)	CLAY (%)	SILT (%)
September 2015							
SP1	6.50	678.50	0.03	0.001	85.00	2.00	2.15
SP2	6.74	760.80	0.05	0.002	85.00	2.00	2.15

Source: OOPC; EIA Fieldwork 2014-2015

4.3.11 Soil Characteristics

Field morphological characterizations were conducted by systematically placing transect on already existing foot paths and other minor roads that interconnect the entire site thus, forming a good network of access routes to the land. These foot paths transverse across the land in a north south direction, with Oke community road serving as the base line. Using Dutch Soil Auger and Mussel Soil Colour Chart, the morphological characteristics of the soils were examined from the soil surface to a depth of 120cm except where hindrances like concretions and plinthite in the soils prevented reaching this depth.

As movements were made along the roads, footpaths and transects, using pre-programmed GPS points as navigation guide, auger examinations were made into the land to examine the soil for identification of soil types, characterization, classification and soil type boundary placement. Changes in vegetation cover, land use, physiography, soil surface form, stoniness and micro-relief, etc were noted and used as clues to arrive at changes in soil types and establishment of soil boundaries. The information was recorded on the Base Map (sketched, perimeter map), field notebook and proforma data sheet while the GPS coordinates were Clark on the waypoint database. About 118 soil auger examination holes were made and used for the identification, characterization and classification of the soil types. Placements of boundaries were achieved by grouping similar auger examination points. Modal soil profile pits were dug at the most representative auger examination points for each of the identified soil types. On the whole, three major soil types (series) were identified. Each of the profile pits measures 1.5m by 2m by 2m. The depth varied depending on the peculiarity of the soil type, but not less than 140cm for classification and characterization purposes.

All the necessary environmental information relating to the site characteristics and the soil morphology were recorded on the proforma. These include Environment, Soil profile, Coordinate value (including X, Y, and Z) of each auger, profile and observation station. It is important to state that the manifest presence of rivers and streams did not affect the sampling intensity since effective geo-morphological observations were made before the delineation of the different mapping units.

4.3.11.1 Soil Profile:

The soil profiles were described according to the FAO guideline (2010). The soil characteristics and morphological properties were described for each of the identified horizons (layers) in the profiles. The soil colour was evaluated with the aid of Munsell Soil Colour Charts; texture was determined on the field by hand feel method, at moist state. Structure, concretions, roots and boundary forms were described using visual assessment. The soil consistence was determined at dry, moist and wet states on the field.

After the description of the sites and soil profiles, samples were taken from each of the soil profiles, starting from lowest horizon upward. In the section A of the surveyed site, a total of 62 soil samples were collected from the delineated layers

from 15 soil profile pits while 52 surface samples were collected from the different sampling points (Map 9) at 0-20 cm soil depth. In the section B of the site a total of 46 soil samples were collected from the delineated layers from 11 soil profile pits while 63 surface samples were collected from the different sampling points (Map 9) at 0-20cm soil depth. The samples were put into polythene bags and labeled for laboratory analyses.

4.3.11.2 Laboratory Analytical Methods

The soil samples collected were air dried at room temperature and sieved through a 2mm sieve. The resulting soil samples were analysed for their physical and chemical properties as follows: Particle size was determined by hydrometer method (Gee and Boulder, 1986). Available Phosphorous (P) was determined by Bray P-I method (Anderson and Ingram, 1993). Total Nitrogen (TN) was determined by macro-kjedhal method (Brookes *et al.,* 1985). Soil pH was determined in a 1:2 soil to water suspension using a pH meter (Maclean, 1982). Exchangeable bases were extracted using $NH_4$0AC buffered at pH 7.0 (Thomas, 1982). While Potassium (K) and Sodium (Na) were read from a flame photometer, Exchangeable Calcium (Ca) and Magnesium (Mg) was determined using atomic absorption spectrophotometer. Total Exchangeable acidity ($H^+ + Al^{3+}$) was by titration method (Anderson and Ingram, 1993) while effective cations exchange capacity was determined by summation of exchangeable cations and exchangeable acidity (Tan, 1996).

The gravel portion (> 2mm diameter), of the soil samples were weighed and the ratio of gravel to fine earth calculated. Thus, the gravel content was calculated as a percentage of total air-dried soil. The proportion or gravel content goes a long way to influence, soil physical properties like bulk density, porosity, compatibility, shearing index, infiltration and hydraulic conductivity rates, etc.

4.3.12 General Soil Properties and Interpretation

4.3.12.1 Particle Size Distribution

Characteristically, the soils had low silt and clay content and high sand contents (Table 2). These soils had sand content that ranged in values between 70.60% and 93.20% .The surface horizons in most cases had higher sand content than the subsurface horizon but there was no consistent pattern of profile distribution of the sand particle size fraction. The values of silt content of the soils were comparatively lower than the values of the sand fractions and ranged in values from 1.40% and 13.40% in the surface soils, while the subsurface horizons had silt contents that ranged from 1.40% to 17.40%. The profile distribution of the silt particle size fraction did not follow any regular pattern of distribution within the profile. The

clay contents of these soils increased with increasing soil depth in most profiles except in profile P.2Bwhere there was decrease in the clay content of the soil with increasing soil depth. However there was no strong evidence of clay illuviation in many of the profiles. Pedons P.2B, P.6B, P.157, P.177 and P.191 have no accumulation of clay in any part of the profile, while the remaining profiles show some weak evidence of argilluviation. The surface horizons had clay that ranged in value from 5.40% to 15.00% while the subsurface horizons had clay content that ranged from 5.40% to 28.00%.

The textures of these soils were predominantly sand to loamy sand in the epipedon while the subsurface horizons were predominately sand to sandy clay loam in texture. Three profiles (P.6B, P.177 and P.191) had no textural change with increasing soil depth. These profiles had sand textural class throughout the profile.

The soil structural classes of the soils ranged from weakly formed fine-crumbs in the surface horizons to moderately developed medium and coarse sub-angular blocky structures in the subsurface horizons. The consistencies were loose – friable in the surface and firm in the sub surface horizons.

4.3.12.2 Bulk Density, Porosity and Soil Gravimetric Water Content

The soil bulk density (ρ_b) varied from one part of the surveyed site to the other and from one mapping unit to the other but was lower generally in the soil surface compared with the deeper soil layers and thus majorly increased with increasing soil depth while the soil total porosity (P_t)was higher at the uppermost layers (0-25 cm) of the soil than the underlying layers. The gravimetric water content (θ_g) also, increased with increasing soil depth in most parts of the surveyed soil. The high bulk density values recorded as the profiles depth increases, according to Mbagwu *et al*. (1984) could be caused by translocation of clay from eluvial horizon, with simultaneous loss of structure and closer packing of sand grains in the eluvial horizon. Other authors such as Rasool *et al*., (2007); Singh *et al*., (2007); Busari *et al*. (2012a); Busari *et al*., (2012b) have reported increase in bulk density with increasing soil depth because of influence of soil organic matter which was higher in the upper horizon than the lower horizons (Salako *et al*., 2006).

With exception of some parts of mapping unit 6 (P.2b and P.6B), the range of bulk density, total porosity and θ_g from all the mapping units portend no hindrance to oil palm cultivation. These ranges of bulk density and θ_g are a reflection of the various land uses, vegetation and topography of the different parts of the surveyed site. For instance, in the SMU 2 of the surveyed land around profile pit P.001 the low range

of ρ_b and high range of θ_g is attributable to densely vegetated *Chromoleana odorata* (Siam weeds) with less human impacts and a nearly flat land terrain.

Table 4-14: Soil Particle Size Analysis of Representative Soil Profiles

S/Code	H-Depth	Sand %	Silt %	Clay %	Soil texture
P.001	0-20	93.20	1.40	5.40	Sand
	20-66	77.20	17.40	5.40	loamy sand
	66-142	79.20	15.40	5.40	loamy sand
	142-200	75.20	2.80	22.00	Sandy clay loam
P.011	0-15	89.20	4.80	6.00	Sand
	15-35	89.20	4.80	6.00	Sand
	35-83	91.20	2.80	6.00	Sand
	83-146	75.20	1.40	23.40	sandy clay loam
	146-200	75.20	1.40	23.40	sandy clay loam
P.040	0-5	75.20	13.40	11.40	sandy loam
	5--49	83.20	4.30	12.50	loamy sand
	49-97	76.20	4.40	19.40	sandy loam
	97-160	76.60	3.40	20.00	sandy clay loam
P.091	0-21	92.60	1.40	6.00	Sand
	21-71	82.60	5.40	12.00	loamy sand
	71-115	76.60	3.40	20.00	sandy clay loam
	115-163	70.60	1.40	28.00	sandy clay loam
P.095	0-49	90.60	3.40	6.00	Sand
	49-73	82.60	3.40	14.00	sandy loam
	73-121	85.60	8.80	5.40	loamy sand
	121-160	91.80	2.80	5.40	Sand
P.111	0-9	91.80	2.80	5.40	Sand
	9--49	85.80	8.50	5.70	loamy sand
	49-91	83.80	10.50	5.70	loamy sand
	91-180	75.80	3.80	20.40	sandy clay loam
P.117	0-8	91.80	0.80	7.40	Sand
	8--54	91.20	3.40	5.40	Sand
	54-139	75.20	4.40	20.40	sandy clay loam
	137-170	75.20	2.40	22.40	sandy clay loam
P.137	0-11	93.20	1.40	5.40	Sand
	11--41	90.40	4.20	3.86	Sand
	41-119	79.20	5.40	15.40	sandy loam
	119-200	75.20	5.40	19.40	sandy loam
P.157	0-13	93.20	1.40	5.40	Sand
	13-36	93.30	1.40	5.40	Sand
	36-90	91.20	1.40	7.40	Sand
	90-170	89.20	1.40	9.40	loamy sand
	170-200	89.20	1.40	9.40	loamy sand

P.159	0-10	93.20	1.40	5.40	Sand
	10--37	91.80	1.80	6.40	Sand
	37-80	91.80	2.80	5.40	Sand
	80-170	83.20	3.40	13.40	sandy loam
P.177	0-12	89.20	5.40	5.40	Sand
	12--45	92.60	2.00	5.40	Sand
	45-103	90.60	4.00	5.40	Sand
	103-182	88.00	6.60	5.40	Sand
P.191	0-13	88.00	6.60	5.40	Sand
	13-48	88.00	6.60	5.40	Sand
	48-112	90.60	4.00	5.40	Sand
	112-170	90.00	4.60	5.40	Sand
P.196	0-20	92.60	1.40	6.00	Sand
	20-48	92.60	1.40	6.00	Sand
	48-120	78.60	5.40	16.00	sandy loam
	120-180	84.60	1.40	14.00	loamy sand
P.2B	0-16	85.60	2.40	12.00	loamy sand
	16-61	85.60	2.40	12.00	loamy sand
	61-150	91.20	2.80	6.00	Sand
	150-200	93.20	0.80	6.00	Sand
P.6B	0-20	91.20	2.80	6.00	Sand
	20-49	89.20	4.80	6.00	Sand
	49-145	89.20	4.80	6.00	Sand
	145-190	91.20	2.80	6.00	Sand

Source: OOPC – Extension Two EIA Field work, 2014-2015

Table 4-15: Some Soil Physical Properties of the Representative Soil Profiles

Profile No	Depth (cm)	Bulk density (g cm^{-3})	Total Porosity (%)	Gravimetric water content (%)
PT.001	0-25	0.89	65.40	16.09
	25-50	1.32	48.29	14.62
	50-75	1.68	34.37	12.12
	75-100	1.25	51.08	17.07
PT.011	0-25	1.76	31.19	11.56
	25-50	2.07	19.26	15.27
	50-75	1.98	22.84	20.62
	75-100	1.97	23.24	21.76
PT.040	0-25	1.47	42.72	11.11
	25-50	1.69	33.97	10.24
	50-75	1.93	24.43	14.21
	75-100	1.91	25.22	16.49
PT.091	0-25	1.71	33.18	11.90
	25-50	1.94	24.03	8.38
	50-75	1.89	26.02	13.98
	75-100	1.77	30.79	16.67
PT.095	0-25	0.91	64.45	10.38
	25-50	1.19	53.46	17.35
	50-75	1.62	36.76	27.61
	75-100	1.45	43.52	20.42
PT.111	0-25	1.00	61.02	10.20
	25-50	1.07	58.24	15.24
	50-75	1.02	60.23	16.00
	75-100	1.31	48.69	13.95
PT.117	0-25	1.85	27.61	6.04
	25-50	2.15	16.08	8.53
	50-75	1.94	24.03	11.52
	75-100	1.98	22.84	15.46
PT.137	0-25	1.21	52.67	5.88
	25-50	1.15	55.05	9.73
	50-75	1.20	53.07	11.02
	75-100	1.43	44.32	12.14
PT.157	0-25	1.26	50.68	2.42
	25-50	1.30	49.09	4.69
	50-75	1.20	53.07	5.08
	75-100	1.35	47.10	6.02
PT.159	0-25	1.42	44.53	2.32
	25-50	1.57	38.67	3.76
	50-75	1.66	35.16	3.89
	75-100	1.92	25.00	5.01

PT.177	0-25	1.23	51.87	3.31
	25-50	1.39	45.51	5.11
	50-75	1.33	47.90	5.34
	75-100	1.36	46.70	6.72
PT.191	0-25	1.24	51.48	2.46
	25-50	1.33	47.90	3.05
	50-75	1.28	49.88	7.94
	75-100	1.27	50.28	5.60
PT.196	0-25	0.95	63.01	6.45
	25-50	1.11	56.65	6.42
	50-75	1.37	46.30	1.48
	75-100	1.47	42.72	1.39
PT.2B	0-25	1.85	27.61	3.85
	25-50	2.03	20.85	4.52
	50-75	2.23	12.89	5.94
	75-100	2.10	18.06	6.80
PT.6B	0-25	1.69	33.97	4.22
	25-50	1.86	27.21	3.83
	50-75	1.81	29.20	8.43
	75-100	1.48	42.33	8.97

Source: OOPC – Extension Two EIA Field work, 2014-2015

Generally, the range of soil bulk density across the site, with exception of some parts of the site already identified above, does not present any setback for the intended crop (oil palm). The soil gravimetric water content which was generally higher around 50-75 cm soil depth is a sign of potential source of available water for oil palm as this soil depth forms the root feeding zone of the intended crop. The higher bulk density and lower θ_g in some parts of the surveyed site suggest that soil conservation measures and soil water management approaches must be adopted to make the best out of the soil of this area.

4.3.13 Soil Chemical Characteristics

The soils had reaction ranging from strongly acid to slightly alkaline (5.54 - 7.40). The exchangeable acidity (H + Al) values of the soils were low and ranged from 0.03 to 0.09cmol kg^{-1}(Table 4-16).

The exchange sites of these soils were dominated by exchangeable calcium and magnesium. The exchangeable calcium (Ca^{2+}) ranged in values from 3.17cmol kg^{-1} to 16.85cmol kg^{-1}. In most profiles, the highest Ca value was observed in the first surface horizon. The Magnesium (Mg^{2+}) contents of the soils varied from 0.48cmol

kg^{-1} to 2.30cmol kg^{-1}. Exchangeable K^+ content of the soils was low and ranged from 0.02cmol $kg^{-1}$to 0.48cmol kg^{-1}.

The subsoil had values of K^+ that was lower than 0.10cmol kg^{-1}in most cases. Apart from Ca and Mg which were moderate in all the pedons, the values of exchangeable K and Na within the rooting zones (0- 100 cm) were well below the suggested critical requirements for most arable crops grown in the agro-ecological zone of the project site. This means that apart from $Ca^{2+}$and Mg^{2+}which are adequate in supply, the quantity of the other exchangeable bases will limit crop production in these soils.

The suggested soil critical levels of exchangeable Mg (0.28cmol kg^{-1}) showed that the Mg^{2+} status of the soil will not limit the yield of oil palm grown on these soils. Soils with exchangeable K less than 0.13cmol kg^{-1} have been classified as being poor in K, and those that contained between 0.13cmol kg^{-1} to 0.31cmol kg^{-1} as being moderately endowed with K, while those having exchangeable K that is greater than 0.31cmol kg^{-1} were regarded as being adequate in K.

In Nigeria, the recommended critical K level for oil palm ranged between 0.18cmol kg^{-1} and 0.35cmol kg^{-1}. Based on the above recommendation, the supply of K is expected to limit the production of oil palm on these soils. Also, the low K^+: Ca^{2+} or K^+: Ca^{2+} + Mg^{2+}ratio is likely to aggravate the problem of K^+ uptake. Kirkman *et al.* (1994) noted that the displacement of K^+ by Ca^{2+}+(Mg^{2+}) was particularly important in the soils because of selective adsorption of Ca^{2+} which resulted in leaching of K^+. Parfitt (1992) also reported that a high solution concentration of Ca^{2+} led to complementary ion effect occurring between Ca^{2+} and K^+ and that this led to reduced K^+ uptake by plants. Application of K fertilizer will be a critical requirement for sustainable use of these soils for oil palm production.

The effective cation exchange capacity (ECEC) of the soils was low in pedon P.001 but moderate in all other pedons. The ECEC in pedon P.001 ranged from 4.71cmol $kg^{-1}$to 7.66cmol kg^{-1} while those of the remaining pedons ranged from 10.05cmol kg^{-1} to
18.64cmolkg^{-1}. Percentage base saturation (BSat) values ranged between 98.96% and 99.75%. In most of the profiles, the sum of Ca^{2+} and Mg^{2+} accounted for more than 80% of the TEB and ECEC.

Table 4-16: Soil Chemical Properties of the Representative Soil Profiles

Profile No.	H-Depth	pH	N (%)	Org C (%)	Al+H	Ca	Mg	K	Na	ECEC	CEC clay	B-Sat	ESP	Av. P	Mn	Fe	Cu	Zn	EC
								cmol kg^{-1}								mg kg^{-1}			
P.001	0-20	5.60	0.09	1.02	0.08	5.99	1.12	0.18	0.29	7.66	7.00	98.96	3.79	2.15	22.15	12.75	0.65	2.05	70.50
	20-66	5.51	0.04	0.61	0.06	4.23	1.19	0.15	0.21	5.84	5.44	98.97	3.60	2.99	25.06	13.83	0.75	1.65	56.40
	66-142	5.61	0.02	0.33	0.06	3.42	1.16	0.02	0.05	4.71	4.50	98.73	1.06	3.06	23.90	12.80	0.60	1.55	28.20
	142-200	5.61	0.02	0.11	0.05	3.66	1.36	0.04	0.07	5.18	5.16	99.03	1.35	1.81	13.47	14.38	0.55	1.75	28.20
P.2B	0-16	5.46	0.09	0.08	0.07	3.17	1.26	0.04	0.14	4.68	4.66	98.50	2.99	2.92	9.10	15.05	0.50	1.65	28.20
	16-61	5.36	0.01	0.14	0.07	9.41	1.48	0.03	0.11	11.10	11.06	99.37	0.99	4.81	12.35	21.46	0.45	1.55	14.41
	61-150	5.41	0.17	2.02	0.06	12.23	1.42	0.26	0.49	14.46	13.28	99.59	3.39	6.04	19.05	19.30	0.35	2.85	84.60
	150-200	5.36	0.02	0.16	0.07	10.10	1.12	0.12	0.24	11.65	11.56	99.40	2.06	5.04	3.00	17.10	0.50	1.80	56.40
P.6B	0-20	5.77	0.08	0.75	0.08	10.18	1.22	0.18	0.35	12.01	11.57	99.33	2.91	6.37	10.25	14.35	0.45	1.95	42.30
	20-49	5.72	0.02	0.27	0.08	11.33	1.51	0.03	0.07	13.02	12.86	99.39	0.54	5.37	7.65	12.98	0.55	1.60	14.10
	49-145	5.56	0.01	0.12	0.05	12.53	1.62	0.03	0.11	14.34	14.27	99.65	0.77	4.26	2.60	13.80	0.60	1.80	14.10
	145-190	5.41	0.01	0.13	0.06	13.28	1.73	0.07	0.13	15.27	15.19	99.61	0.85	4.78	5.85	18.72	0.25	3.65	28.20
P.011	0-15	5.70	0.17	2.27	0.08	15.58	2.42	0.19	0.37	18.64	17.32	99.57	1.98	2.26	93.10	12.70	0.35	6.90	112.80
	15-35	5.41	0.05	0.34	0.06	11.63	1.47	0.07	0.13	13.36	13.16	99.55	0.97	2.17	16.05	24.85	0.80	3.40	42.30
	35-83	5.31	0.02	0.16	0.07	10.55	1.39	0.05	0.11	12.17	12.08	99.42	0.90	1.96	9.40	20.18	0.65	5.05	14.10
	83-146	5.80	0.01	0.14	0.07	12.02	1.20	0.04	0.09	13.42	13.40	99.48	0.67	3.61	12.65	19.85	0.75	3.75	14.10
	146-200	5.76	0.01	0.12	0.06	11.48	1.10	0.04	0.11	12.79	12.77	99.53	0.86	3.33	15.50	24.30	0.70	2.75	28.20
P.040	0-5	5.60	0.09	0.71	0.07	13.28	1.16	0.41	0.71	15.63	15.41	99.55	4.54	4.87	14.35	23.20	0.75	2.40	56.40
	5-49	5.20	0.03	0.19	0.04	8.99	0.98	0.07	0.13	10.21	10.16	99.61	1.27	6.03	13.85	15.65	0.90	2.50	14.10
	49-97	4.90	0.03	0.28	0.03	10.15	1.02	0.04	0.09	11.33	11.28	99.74	0.79	2.70	14.60	13.86	0.80	2.35	28.20
	97-160	4.80	0.01	0.10	0.05	9.33	0.56	0.04	0.07	10.05	10.03	99.50	0.70	2.08	16.66	16.05	0.65	1.75	28.20
P.091	0-21	6.40	0.10	1.24	0.07	12.55	1.14	0.08	0.16	14.00	13.28	99.50	1.14	5.56	16.70	4.00	0.85	4.25	56.40
	21-71	5.60	0.04	0.35	0.06	10.63	0.89	0.03	0.05	11.66	11.56	99.49	0.43	4.37	22.30	8.95	0.95	5.50	28.20
	71-115	5.66	0.02	0.15	0.06	12.38	1.17	0.04	0.07	13.72	13.69	99.56	0.51	2.89	16.50	10.63	1.25	4.00	28.20

	115-163	5.60	0.01	0.04	0.07	10.78	0.75	0.03	0.05	11.68	11.68	99.40	0.43	3.98	18.45	17.54	1.50	2.55	14.10
P.095	0-49	5.20	0.22	3.00	0.08	14.88	1.06	0.36	0.62	17.00	15.25	99.53	3.65	5.19	50.75	18.75	1.65	2.35	112.80
	49-73	4.80	0.12	1.00	0.05	11.83	0.68	0.08	0.15	12.79	12.54	99.61	1.17	12.87	3.05	13.90	2.30	1.75	14.10
	73-121	4.70	0.21	3.29	0.08	11.40	0.62	0.26	0.47	12.83	10.70	99.38	3.66	15.31	3.25	16.10	2.15	2.65	112.80
	121-160	4.90	0.02	0.10	0.06	9.44	0.69	0.02	0.02	10.23	10.17	99.41	0.20	7.41	6.00	12.87	1.05	1.85	28.20
P.111	0-9	5.56	0.11	0.92	0.05	9.36	0.62	0.08	0.13	10.24	9.64	99.51	1.27	4.36	17.75	20.15	0.55	2.85	56.40
	9-49	4.91	0.03	0.32	0.09	13.19	1.82	0.02	0.05	15.17	14.97	99.41	0.33	7.00	10.80	14.63	0.65	2.25	28.20
	49-91	6.00	0.01	0.05	0.07	`13.06	1.91	0.02	0.07	2.07	2.04	96.62	3.38	3.33	8.50	13.19	0.50	3.00	28.20
	91-180	6.40	0.01	0.09	0.07	14.23	1.94	0.04	0.11	16.39	16.37	99.57	0.67	3.30	7.75	8.44	0.35	4.05	14.10
P.117	0-8	6.10	0.15	2.20	0.08	16.46	1.63	0.27	0.49	18.93	17.89	99.58	2.59	5.54	6.60	6.10	0.30	4.56	141.00
	8-54	6.10	0.09	0.80	0.06	12.23	1.14	0.12	0.20	13.75	13.23	99.56	1.45	2.84	14.00	9.30	0.95	1.95	28.20
	54-139	4.90	0.02	0.09	0.06	11.35	1.08	0.05	0.16	12.70	12.68	99.53	1.26	2.80	9.55	5.36	0.70	2.15	28.20
	137-170	6.90	0.01	0.08	0.07	9.43	1.08	0.03	0.07	10.68	10.67	99.34	0.66	1.27	5.50	4.85	1.00	2.00	14.10
P.137	0-11	5.46	0.22	2.90	0.08	14.95	2.30	0.23	0.38	17.94	16.06	99.55	2.12	2.64	49.55	11.55	0.90	5.95	141.00
	11-41	5.66	0.04	0.26	0.06	14.11	2.11	0.05	0.13	16.46	16.22	99.64	0.79	0.82	41.87	9.75	0.60	3.55	28.20
	41-119	5.76	0.01	0.07	0.04	12.88	1.81	0.03	0.07	14.83	14.81	99.73	0.47	0.55	50.10	7.66	0.80	4.55	28.20
	119-200	5.76	0.01	0.06	0.05	13.52	2.00	0.03	0.07	15.67	15.66	99.68	0.45	0.94	35.75	10.12	0.90	2.50	28.20
P.157	0-13	5.10	0.07	0.53	0.04	10.55	0.86	0.05	0.13	11.63	11.29	99.66	1.12	1.27	10.55	12.15	0.30	2.30	56.40
	13-36	4.90	0.02	0.15	0.04	13.11	1.05	0.02	0.07	14.29	14.19	99.72	0.49	0.94	4.20	10.86	0.50	3.05	28.20
	36-90	4.70	0.01	0.07	0.05	10.93	0.77	0.02	0.05	11.82	11.79	99.58	0.42	1.52	3.85	15.65	0.40	2.00	14.10
	90-170	4.60	0.04	0.34	0.04	11.42	0.63	0.01	0.05	12.15	12.02	99.67	0.41	2.58	5.62	14.82	0.60	4.20	28.20
	170-200	5.10	0.01	0.06	0.06	10.96	0.84	0.01	0.05	11.92	11.90	99.50	0.42	1.96	3.95	18.71	0.45	2.75	14.10
P.159	0-10	5.20	0.07	0.63	0.09	11.03	0.78	0.11	0.20	12.21	11.80	99.26	1.64	3.19	4.70	17.35	0.55	1.45	70.50
	10-37	4.90	0.01	0.13	0.08	9.87	0.67	0.04	0.07	10.73	10.66	99.25	0.65	1.42	2.75	19.42	0.65	1.65	28.20
	37-80	4.60	0.01	0.13	0.09	11.83	0.48	0.04	0.11	12.55	12.47	99.28	0.88	1.37	5.50	29.20	0.50	1.50	28.20
	80-170	4.70	0.01	0.11	0.07	10.51	0.61	0.02	0.05	11.26	11.23	99.38	0.44	2.82	12.30	24.55	0.65	5.10	14.10
P.177	0-12	7.40	0.10	0.83	0.08	13.76	1.16	0.31	0.55	15.86	15.32	99.50	3.47	5.71	15.00	25.65	0.50	6.05	70.50
	12-45	5.20	0.01	0.12	0.05	10.55	0.59	0.23	0.42	11.84	11.76	99.58	3.55	1.91	21.50	22.15	0.85	5.85	14.10
	45-103	5.50	0.01	0.06	0.06	11.40	1.23	0.47	0.84	14.00	13.96	99.57	6.00	1.83	18.45	11.29	0.80	5.60	28.20

	103-182	5.56	0.01	0.05	0.05	11.29	1.46	0.03	0.09	12.92	12.89	99.61	0.70	1.24	16.90	13.33	0.95	7.85	28.20
P.191	0-13	5.61	0.09	0.74	0.06	12.17	1.18	0.12	0.22	13.75	13.27	99.56	1.60	2.40	25.35	9.86	0.70	6.70	14.10
	13-48	5.81	0.01	0.04	0.04	14.30	1.78	0.02	0.07	16.21	16.18	99.75	0.43	2.25	15.60	10.25	0.60	9.15	28.20
	48-112	5.91	0.01	0.06	0.03	14.18	1.47	0.02	0.07	15.77	15.73	99.81	0.44	1.82	19.28	7.85	0.55	11.25	28.20
	112-170	5.61	0.01	0.05	0.06	13.78	1.84	0.05	0.13	15.86	15.83	99.62	0.82	1.49	27.42	6.21	0.65	7.50	28.20
P.196	0-20	5.81	0.16	2.14	0.05	16.85	2.20	0.26	0.47	19.83	18.58	99.75	2.37	2.85	83.90	6.15	0.50	8.50	84.60
	20-48	5.76	0.03	0.22	0.04	12.77	1.96	0.05	0.15	14.97	14.84	99.73	1.00	3.13	42.55	6.83	1.25	8.00	28.20
	48-120	5.71	0.02	0.21	0.05	13.46	2.08	0.14	0.29	16.02	15.97	99.69	1.81	5.43	38.75	8.29	1.10	5.75	28.20
	120-180	5.56	0.01	0.10	0.06	13.27	2.12	0.10	0.20	15.75	15.73	99.62	1.27	8.14	45.56	10.11	0.95	6.75	14.10

Source: OOPC – Extension Two EIA Field work, 2014-2015

The organic carbon content of the soils was moderate to high in the surface of all the pedons except pedon P.2B (where OC value was 0.08%). However, the OC content of the subsurface horizons were very low except in pedons P.2B and P.095 (where OC values were 2.02% and 3.29% in the third horizon respectively). Organic carbon content of the surface soils ranged from 0.53% and 3.00% while the subsurface horizons had organic carbon contents that ranged from 0.05% to 0.35%. In all the profiles the organic carbon content of the horizons deeper than 30 cm were below the critical requirement of 0.8% recommended for sustainable production of oil palm.

The total Nitrogen (TN) status of the soils varied linearly with the soil organic carbon content. Thus the TN content of the soil was moderate in the surface horizons with moderate OC contents and very low in the subsurface horizons where the OC content was low. The surface horizons had TN that ranged from 0.08% to 0.22% while the subsurface horizons have TN that ranged from 0.01 – 0.21. In most cases, the surface horizons had the highest TN content.

Available P was low in the surface and subsurface horizons of the soils. Available P in these soils ranged from 2.15 mg kg^{-1} and 6.37 mg kg^{-1} in the surface horizons while the subsurface horizons had values of available P between 1.27 mg kg^{-1} and 15.31 mg kg^{-1}. In most cases, the surface horizons had higher content of available P than the subsurface horizons. All the pedons were deficient in available P and thus application of P fertilizer will be required for sustainable production of oil palm.

4.3.13.1 Micro-Nutrient Status of the Soils

The values of available Fe in the soils were very high and ranged from 4.00 to 29.20 mg kg^{-1} (Table 4). These values are higher than values reported for most soils in Nigeria (Adesanwo, 2002). Available Fe is generally high in tropical soils, although localized deficiencies of Fe are known to occur (Enwezor *et al*., 1990; Adesanwo, 2002). At low nutrient level, even 30 mg kg^{-1}, Fe has been reported to be toxic (Moorman and Van Breemen, 1978).

Apart from its direct effect on crops, high level of Fe in the soil can also have serious negative effect on availability of P for plant uptake. However, at high soil pH (pH > 6.0) both the uptake of Fe and its influence on availability of P may not be significant. Therefore, any step taken to bring down the soil pH

from neutrality will improve the activity of soil Fe with its likely negative effects on P availability.

The contents of available copper ranged from 0.25 to 2.30 mg kg^{-1}, with a mean of 0.67 mg kg^{-1}. The mean value of Cu obtained in this study is lower than the critical value of 0.75 mg kg^{-1} suggested for EDTA-extractable Cu (Haque *et al*., 2010). However, pedons P.040, P.091, P.095 and P.196 had mean Cu content higher than this suggested critical value. This result suggests that external input of Cu inform of fertilizer will be for sustainable use of the land for oil palm production.

The values of available Mn ranged from 2.60 to 93.10 mg kg^{-1} with a mean of 20.65 mg kg^{-1}. The values of Mn obtained in this study were higher than the critical values suggested by several authors (Borggaard, 1976; Kociał kowski *et al*., 1999) and higher than values reported for most parts of Nigeria.

The available Zn ranged from 1.50 to 11.25 mg kg^{-1} with a mean of 4.62 mg kg^{-1}. Chude and Obigbesan (1982) reported mean Zn values that ranged from 2.50 to 42.50 mg kg^{-1} for soils on sedimentary deposits and a range of 5.80–22.50 mg kg^{-1} for soils developed on igneous and metamorphic deposits in southwestern Nigeria. Haque *et al*., (2010) suggested a critical range of 1.40 – 3.00 mg kg^{-1} for EDTA-extracted Zn. A critical range of 1.0–5.0 mg kg^{-1} has been reported elsewhere (Sims and Johnson, 1991; Deb and Sakal, 2002). The values obtained from this study are lower than those reported by Chude and Obigbesan (1982). From the result obtained in this study, Zn may not be limiting to sustain good oil palm yield.

4.4 Socioeconomic and Social Impact Assessment

A comprehensive Social Impact Assessment (SIA) of the proposed project was carried out. The full SIA report is presented in the Appendix, while the extracts from the report are presented as follows:

4.4.1 Communities

There are ten communities surrounding Extension Two. The respective locations of the communities in relation to Extension Two are as follows:

4.4.1.1 Agbanikaka Community

Agbanikaka, which translates to "The Land of Peace", is an Uhobe community in Ovia North East Local Government Area in Edo State, Nigeria. The community is in the North-West of the Extension and shares boundaries with Sabogida, Ijagba, Owan, and Sobe in the North, South, East and West respectively.

4.4.1.2 Owan Community

Owan, which translates to "The land that protects its children", is an Uhebe community in Ovia North East Local Government Area in Edo State, Nigeria. The community is in the North-West of Extension Two, and shares boundaries with Sabongida, Ofutabe, Uhiere, and Agbanikaka in the North, South, East and West respectively.

4.4.1.3 Uhiere Community

Uhiere, which translates to "The Land of Peace", is an Ishan community in Ovia North East Local Government Area in Edo State, Nigeria. The community is in the West of the project site and shares boundaries with Oke, Ofutabe, Odiguetue and Owan, in the North, South, East and West respectively.

4.4.1.4 Odiguetue Community

Odiguetue, which translates to "The Land of dignity", is an Edo community in Ovia North East Local Government Area in Edo State, Nigeria. The community is in the South-West of the project site and shares boundaries with Okokhuo, Oke, Uhiere and Odighi in the North, South, East and West respectively.

4.4.1.5 Odighi Community

Odighi, which translates to "The Land of honey", is an Ozoguo community in Ovia North East Local Government Area in Edo State, Nigeria. The community is in the South-West of the project site and shares boundaries with Idunmowo, Oke, Osasimoba, and Uhiere in the North, South, East and West respectively.

4.4.1.6 Ihrue Community

Ihrue, which translates to "The Land of evil blood", is a Benin community in Uhunmwonde Local Government Area in Edo State, Nigeria. The community is in the East of the project site and shares boundaries with Oke, Iruekpe, Ekpan and Ikhuo in the North, South, East and West respectively.

4.4.1.7 Oke-Irhue Community

Oke, translates to "The Land surrounded by hills", is a Benin community in Uhunmwonde Local Government Area in Edo State, Nigeria. The community is in the East of the project site and is one of the oldest communities based on oral history.

4.4.1.8 Ekpan Community

Ekpan, which translates to "The Land of Peace", is a Benin community in Uhunmwonde Local Government Area in Edo State, Nigeria. The community is in the East of the project site. The community which is about 2 square kilometers in size (in-dwelling) is made up of four quarters namely Dumeso, Idueke, Ukpoka and Egohie. It shares boundaries with Isa West, Owan, Irhue and Umukpe-Irhua in the North, South, East and West respectively.

4.4.1.9 Umuokpe Community

Umuokpe, which translates to "The Land of Prosperity", is a Benin community in Uhunmwonde Local Government Area in Edo State, Nigeria. The community is in the North-East of Extension Two. It is about 2 square kilometers in size (in-dwelling) and is made up of three quarters and seven compounds. The community shares boundaries with Orhua, Ekpan, Isan West and Owan in the North, South, East and West respectively.

4.4.1.10 Orhua Community

Orhua, which translates to "The Land of humility", is a combination of Ishan and Benin community in Uhunmwonde Local Government Area in Edo State, Nigeria. The community is in the North-East of the project site and shares boundaries with Iruekpen, Umuokpe, Isan West and Owan in the North, South, East and West respectively.

4.4.2 Study Approach and Methodology

Methodology adopted for the study in the selected communities involved triangulation of various sources of data with the use of tools relevant to Participatory Rural Appraisal (PRA) and Socio-Economic Assessment.

The following steps were undertaken at ensuring the successful outcome of the study:

- Formal stakeholders' meetings with the ten local communities of the proposed Extension Two (FGD)
- Scoping: This is the process of identifying, defining and prioritizing the social components to be addressed in the social assessment. The impact of the proposed Extension Two was assessed in terms of the following impact criteria:

  - ✓ *Scale*: Physical scale/areas which the impact would be felt (local or regional).
  - ✓ *Duration*: Length of time the impact would likely be felt (short term, medium term and long term).
  - ✓ *Severity*: The intensity of the impact.
  - ✓ *Direction*: Whether the impact would be positive (beneficial) or negative (adverse).

4.4.2.1 Data collection

To facilitate accurate information dissemination from each community,

- structured check-lists were used to enlist information and data in the ten communities as well as other internal and external stakeholders of the respective communities such as community executives, Local Government representatives, CBOs and NGOs, and so on.
- Interview of key informants in each community to obtain divergent views on the issues at stake and how to address them.

4.4.2.2 Review of relevant document

Secondary data were gathered from journals, archives, publications and internet. The gathering and review of published and unpublished baseline/project data were not left out.

4.4.2.3 Delineation of study area for assessment

Delineation can be viewed as description, explanation and marking out of the study area for assessment. Initially five communities in the west of the project site were scheduled for assessment because of their location along Benin-Akure road while the other five communities which are in the east of the project site and somehow interior were scheduled to be assessed later but field reality did not permit it. This field reality included local politics, availability of stakeholders, market day and people's livelihood and misconception of the Extension Two

project and the SIA study team. At last the study team adopted flexibility to achieve the study objectives as enumerated under the field work section.

4.4.2.4 Field Work

Socio-economic survey and SIA of the proposed project communities were concurrently conducted as outlined in Table 4-17.

Table 4-17: **Schedule of Socioeconomic and SIA exercise**

Communities	Attendance	Checklist authentication
Agbanikaka	27	Ikpefuran Sunday - 08038157678
Owan	28	Elder Clement Ugboiyobo
Uhiere	35	Francise Obanor - 08182731748
Odiguetue	36	John Ehigia - 08182401090
Odighi	27	Flamingo Dajide - 08077220988
Oke- Irhue	53	Ohiengbe Sylvester - 08134266005
Ihrue	15	Samuel Alohan (08031259221)
Umuokpe	15	(Community Secretary - 08086792306)
Epkan	13	Matthew Omoniyi (07031259895)
Orhua	10	O.C. District Forest Chairman - 08066318167

4.4.2.5 Duration of Study

The socioeconomic and social impact assessment study including data collection and fieldwork in the ten communities was conducted between March and May 2014.

4.4.3 General Baseline Socioeconomic Conditions

4.4.3.1 Household Demographics

From communities sources the demographic data are summarized in Table 4-18. The cumulative population of all the affected communities is **25,500**. A dominant feature of the structure of the population of the Extension Two communities is its significant level of young people with over 80% of the population below the age of 45 years. Adults in the age group 45 years and above constitute about 16 % of the population. The male to female ratio is more or less even.

Table 4-18: Demographic Data

S/N	Community	Children	Youth	Adult	Total	LGA	Male	Female
1	Agbanikaka	1,200	800	300	2,300	Ovia North East	1,300	1,000
2	Owan	1,500	1,000	500	3,000	Ovia North East	1,400	1,600
3	Uhiere	600	1,200	200	2,000	Ovia North East	1,000	1,000
4	Odiguetue	1,500	2000	1000	4,500	Ovia North East	2,200	2,300
5	Odighi	1,000	1500	500	3,000	Ovia North East	1,400	1,600
	Sub-Total	**5,800**	**6500**	**2500**	**14,800**		**7,300**	**7,500**
6	Ihrue	400	800	300	1,500	Uhunwonde	800	700
7	Oke-Ihrue	2,000	1600	400	4,000	Uhunwonde	2,100	1,900
8	Ekpan	500	700	300	1,500	Uhunwonde	700	800
9	Umuokpe	400	600	200	1,200	Uhunwonde	500	700
10	Orhua	600	1,600	300	2,500	Uhunwonde	1,300	1,200
	Sub-Total	**3,900**	**5,300**	**1500**	**10,700**		**5,400**	**5300**
	Grand Total	**9,700**	**11,800**	**4,000**	**25,500**		**12,700**	**12,800**

The population distribution is skewed towards youth and the implication is that unless they are productively engaged in proposed Extension Two project, they may constitute a social/security risk as soon as their farmland is taken over by the project.

4.4.3.2 Housing

Housing is one of the three essential things of life and the housing pattern of the people in the ten affected communities of proposed Okomu Extension Two project is below MDG goals with only 29% living in cement block houses. Table 4-19 shows the housing summary on community basis.

Table 4-19: Housing Patterns of affected Communities

S/N		Thatched roof (%)	Shed for relaxation (%)	Zinc roof (%)	Mud house (%)	Block & Cement (%)
1	Agbanikaka	3	10	12	50	25
2	Owan	3	7	20	60	10
3	Uhiere	1	2	2	80	15
4	Odiguetue	1	2	2	10	85
5	Odighi	1	5	14	60	25
6	Ihrue	4	3	8	50	35
7	Oke- Ihrue	1	4	5	70	20
8	Umuokpe	1	3	6	70	20
9	Orhua	4	3	3	65	25
10	Ekpan	5	5	10	45	35
	AVERAGE	**2**	**5**	**8**	**56**	**29**

Source; OOPC EIA Field Work 2014-15

4.4.3.3 Infrastructure

It was obvious that all the ten communities of the proposed Extension Two project lack virtually all the desirable basic infrastructural facilities. There are four (4) abandoned reticulated water & three (3) neighbourhood water schemes which are malfunctioning therefore, no portable water for most population in the affected communities.

Plate 4-9;Umuokpe malfunction water scheme

Plate 4-10; Odiguetue abandoned water scheme

Oke-Irhue community is one of the oldest communities based on oral history, and till date the little infrastructure there, such as road, health centre care all dilapidated. Odighi community has some infrastructural facilities, which are mostly non-functional.

Plate 4-11; Irhue community road

Plate 4-12; Odighi malfunction reticulated water scheme

4.4.3.4 Agriculture and Household Nutrition

Farming and agricultural activities are rain fed and on subsistence level. Men are more into farming (usually with the assistance of children/youth) than women. A wide range of crops is cultivated especially cocoa, plantain/banana, maize, cassava, vegetables and root/stem crops. Apart from being one of the main traditional occupations of the people, it is also practiced mostly by the natives due to the community's land ownership structures.

The assets used in agricultural activities are as follows:

Human Assets: The people employ traditional farming skills such as:

- Land management skills, like rotational bush fallowing, in cultivation of crops
- Maintenance of local farm tools
- Fairly good marketing skills but growth and opportunity in the commodity value chains have not been used to their advantage.

Natural Assets: These include farmland, soil and topography and favorable climate.

Physical Assets: Farmers own hoes, cutlass, spades, wheelbarrow, basins, basket and other equipment.

Social Assets: There is low level of social cooperation due to subsistence level of farming practice as well as poverty.

The rainy season (March/April to September/October is associated with peak cropping seasons especially arable crop cultivation whilst the dry season is used for harvesting, marketing and land preparation for the next farming season.

The level of poverty in all the communities is pretty high as the standard of living is really low. Though the communities are rich in agricultural produce, due to the lack of processing facilities, most of their crops get spoilt early because of lack of storage facilities for these produce.

Plate 4-13; Farm produce prone to spoliage

Water resources and forest natural resources (such as honey, snail etc) are continuously utilized over the years, while over dependence on forest resources for domestic energy requirement (fire wood) has considerably led to deforestation and vegetation depletion.

4.4.3.5 Education

There is no marked discrimination in access to education gender-wise, although the only few primary schools and two secondary schools in the Extension Two communities have positive correlation with the school enrolment rate. The informal education facilities and the adult learning programmes are non-existent in all the communities. It is worth mentioning that the educational attainment /

literacy level amongst the community people is below average. There is however skewed literacy rate in favor of men compared to women.

Plate 4-14; Orhua Secondary School

Plate 4-15; Odiguetue Primary School

4.4.3.6 Health

All the four (4) health centers in the communities need staffing, equipment and drugs.

Plate 4-16; Odiguetue health Centre

Plate 4-17; Umokpe Nursing Home

4.4.3.7 Livelihood Strategies

Economic activities of Extension Two communities are relatively diverse although on small and medium scales. Traditional occupations of the people of the affected communities include subsistence farming, lumbering and agro-based trading. These livelihoods are practiced alongside other gainful non-traditional economic activities such as commercial transportation, civil service, contracting and artisans. There are fertile soils for farming; rivers for fishing & water transport, timber for lumbering as well as forest products as natural resource use in the most of the affected communities.

4.4.3.8 Income and Expenditure

The measurement of income level is generally a major problem in Nigeria because of the reluctance of respondents to give accurate information on their real income. Moreover, there are problems in quantifying the real income of the rural working population because a good proportion of their produce is consumed directly and does not enter the market.

There are various forms of social capital available to households in the community notably family support, exchange of labour, group activities, association and cooperative groups. The main sources of income of households and individuals are from occupations / activities like farming, trading and rendering of various services. Generally, there is poor income security in virtually all the communities.

4.4.3.9 Belief Systems and Sacred Sites

Sacred sites are places within the landscape that have a special significance under Aboriginal tradition. Hills, rocks, waterholes, trees, plains and other natural features may be sacred sites. In coastal and sea areas, sacred sites may include features which lie both above and below water. There are sacred sites in some of the communities such as Agbanikaka and Odighi. In Agbanikaka, there are two shrines that is, Osun Shrine and a sacred shrine called Ose River Shrine. It was said that Odiguetue community has a lake called Odighi Lake and they have a shrine beside the lake. The locations of these sacred sites in Extension Two land are in the South West and North West.

Some belief systems are localized while some cut across the ten communities. Uhiere has two main rivers (Ikpesira and Abumeri). The Ikpesira River has great law guiding it like; no one is allowed to visit it at night, no woman in her period is allowed to visit it, it forbids fishing and the pouring of oil on it; while the Abumeri River forbids the killing of its fishes only.

The community frowns greatly at having sex with married women (another man's wife), the use of "juju" is a taboo and also no use of gun or cutlass when fighting, and stealing is also a taboo. The Oke River is one of their main sources of water but the River forbids the washing of oil and killing of the fish.

4.5 Social Impact Assessment

4.5.1 Baseline Social Situation

A baseline assessment provides information on the situation the study aims to change. It provides a critical reference point for assessing changes and impact, as it establishes a basis for comparing the situation before and after an intervention, and for making inferences as to the effectiveness of the program. Baseline assessments should be conducted before the actual programme intervention starts so as to serve as a benchmark for examining what change is triggered by the intervention. The baseline situation information was obtained through direct observation and local talent and knowledge of communities. The direct observation is nothing less than "Visual inspection" which is the quickest and best way to check issues of location, scale and proximity that determine many impacts. Stakeholders and local communities have local knowledge that you need. And, impacts depend on what those that are affected value and need!

The results of baseline situation as related to the people of the communities to be affected by the proposed Extension Two project are presented as follows:

> ***People's way of life***: Based on the empirical data gathered from the FGD and key informants from the various communities it is obvious that the people are majorly farmers with a few into some forms of trade. They tend to be more bounded by the common interests they share as farmers. Apart from Odiguetue and Oke that have internal crisis among themselves and the SIA team identified them as social hot spots, other communities are peaceful and are receptive to strangers. During the study of the various communities we were informed that some criminals from Oke went to the bush and killed a young man from Uhiere who attempted to run when he was about to be robbed. Few days later we also heard that another person was shot dead at Oke due to conflict among groups of youths. Even during pre-entry visit to the community some members of Oke community presented such a high level of antagonism that neither the study team nor the company is welcomed. Other communities such as Owan, Odighi, Agbanikaka, Uhiere are very harmonious in their day to day live, and tend to work for the overall interest of the community members.
>
> ***Their culture***: The ten communities have similar culture in the way of greetings, marriage, tradition and other norms and values. Some of their

traditions or community dos and don'ts include – no fighting in the bush and with dangerous weapon; no love making in the bush; no sexual advances from any man to a married woman. But a community like Owan places emphasis on no usage of charms against any other person the community. It is their belief that River Owan is not friendly to strangers – hence, it is advised that strangers beware. The Owan, Agbanikaka and Uhiere are a multi ethnic communities but the predominant language among them is Owan language; for Oke, Umopke, Epkan and Orhua the dialect is basically Ishan. But Odiguetue, Odighi and Irhue are Benin speaking people. Odighi and Uhiere both have sacred rivers that are not accessible.

***Their environment*:** On the general perspective their environment is clean and habitable. No exposures to hazardous and dangerous chemicals; no epidemic outbreak whatsoever. The air is generally clean. However, the pathetic condition of their source of portable water can lead to water borne diseases. Owan River demands an urgent attention due to some community members who deposit waste substances therein or use chemical to kill fish from the river.

One of the major problems in some of the communities is erosion and flooding. During the peak of rainy season the western part of Owan land is cut off from the community for about three months. To the extent that the two major rivers around Ose and Owan meet at some point and making the major road to Benin partially impassable for about two to three days. Likewise at Irhue – the only security outfit Nigerian police Force was forced out of the location because of flooding.

The physical safety of most of the communities is threatened at a particular period of the year because of the activities of Fulani herdsmen armed with sophisticated rifles and who without regard enter into farmlands with their cattle, when challenged for this provoking action they either attack the males or rape the females in the communities.

Their Health and Wellbeing: The health status is average as in a normal Nigerian community setting. But the people are majorly affected by malaria and typhoid fever. The lack of healthcare facilities in most of the

communities also place the community members at risk most especially pregnant and nursing mothers.

Their Level of Education: Although no educational status related questions were asked but from our observation most men can express themselves either in pidgin or simple English but the case is different with women. However, there are some graduates from various institutions and some other persons with vocational skills. There is opportunity to develop capacity and competencies even further most especially in the agricultural sector.

Their Personal and Property Rights: The land use and ownership of the proposed Extension Two project communities is mainly for farming and gathering of forest products and there is no case of share-croppers in the community at present. The community is claiming that the proposed project land belongs to them and none of their representatives have been engaged in the acquisition process. Farmers whose farms will be directly affected by the proposed project will be affected economically. However, Odiguetue and Oke complained that their farmlands have been encroached upon due to the tracing round the proposed project boundaries by Okomu Oil Palm Company and expected that compensation should be paid to them. The purported encroachment into personal and property rights has been identified as topmost of factors that can generate crisis between community members and Okomu Oil Palm Company Plc. Therefore, proper resettlement plans are required to alleviate the economic effects on the affected families.

4.5.2 Mitigating Adverse Social Impacts

Impacts are matched to mitigation actions. Mitigation is the implementation of measures designed to reduce the undesirable effects of a proposed action on the people and/or environment. The types of mitigation measures are contained in the Table 4-20 below.

Table 4-20: Types of Mitigation Measure

Type of mitigation measure	**How it works**
Prevention and control measures	Fully or partially prevent an impact/reduce a risk by: -Changing means or technique -Changing or adding design elements -Changing the site -Specifying operating practices
Compensatory measures	Offset adverse impacts in one area with improvements elsewhere.
Remediation measures	Repair or restore the environment after damage is done.

4.5.3 Response from Okomu Oil Palm Company Plc to Community Issues and Concerns

Overall the Okomu OPC Plc agreed that the SIA study has revealed the former owners (A & Hatman Limited) as grossly lacking in international best practices in its operations. The company has therefore decided to start on a clean slate by initiating the desirable corrective social actions including:

i) Continuing and concluding the process of obtaining Free Prior Informed Consent (FPIC) from the communities.
ii) Draw and present the Extension Two management plan to the communities and other stakeholders.
iii) Produce and present a community engagement plan to the communities.
iv) Address interactively all the carry-over issues of wrong perception, misunderstanding and transfer aggression by the communities urgently.
v) Present and validate all evidences of engagement and compensations by A & Hatman with the communities.
vi) Present and discuss the social impact management plan with the communities.

4.5.4 Summary of SIA

Based upon the findings, the proposed Extension Two project showed generally positive social consequences in the affected communities. However, there are considerable adverse social impacts enumerated by community stakeholders and perceived by the study team, which require urgent attention and mitigation measures in order for Okomu Oil Palm Company Plc to achieve social security in the project area.

The following management and mitigation measures are proposed for adoption and implementation to address the significant potential social and environmental impacts in order to make the proposed Extension Two project socially acceptable and beneficial:

- Implement FPIC
- Develop and implement community engagement plan
- Avoidance of displacement of communities and people.
- Identification, demarcation and appropriate management of traditional conservation areas and other high conservation values in the landscape.
- Prevention of pollution of water resources.
- Ensuring proper participatory disengagement and payment of compensation to farmers using the land.
- Fire prevention programmes and zero or controlled burning.
- Corporate social services to communities.
- Provision of healthcare services and HIV prevention.
- Diligent implementation of social impact management plan

4.6 Consultation with and Participation By Stakeholders

4.6.1 Introduction

In the EIA process, consultation with and participation by stakeholders is a very important activity. EIA is not EIA without consultation and participation by stakeholders. It is a continuous activity in the EIA process, taking place in early stages prior to the decision on the action to be taken on the project. The decision may be made by the proponent (e.g. choices between various alternatives), jointly by the proponent and the decision-making and environmental regulators (screening and scooping decisions) and the public on whether or not to allow the project or proposal proceed (Wood, 1996).

The stakeholders include the adjoining communities, to the proposed project location, environmental regulatory agencies, governmental ministries and parastatals, local governments, non-governmental organizations (NGOs) and persons having interest and concerns on the conservation of the areas where development will take place (Fig. 4-4).

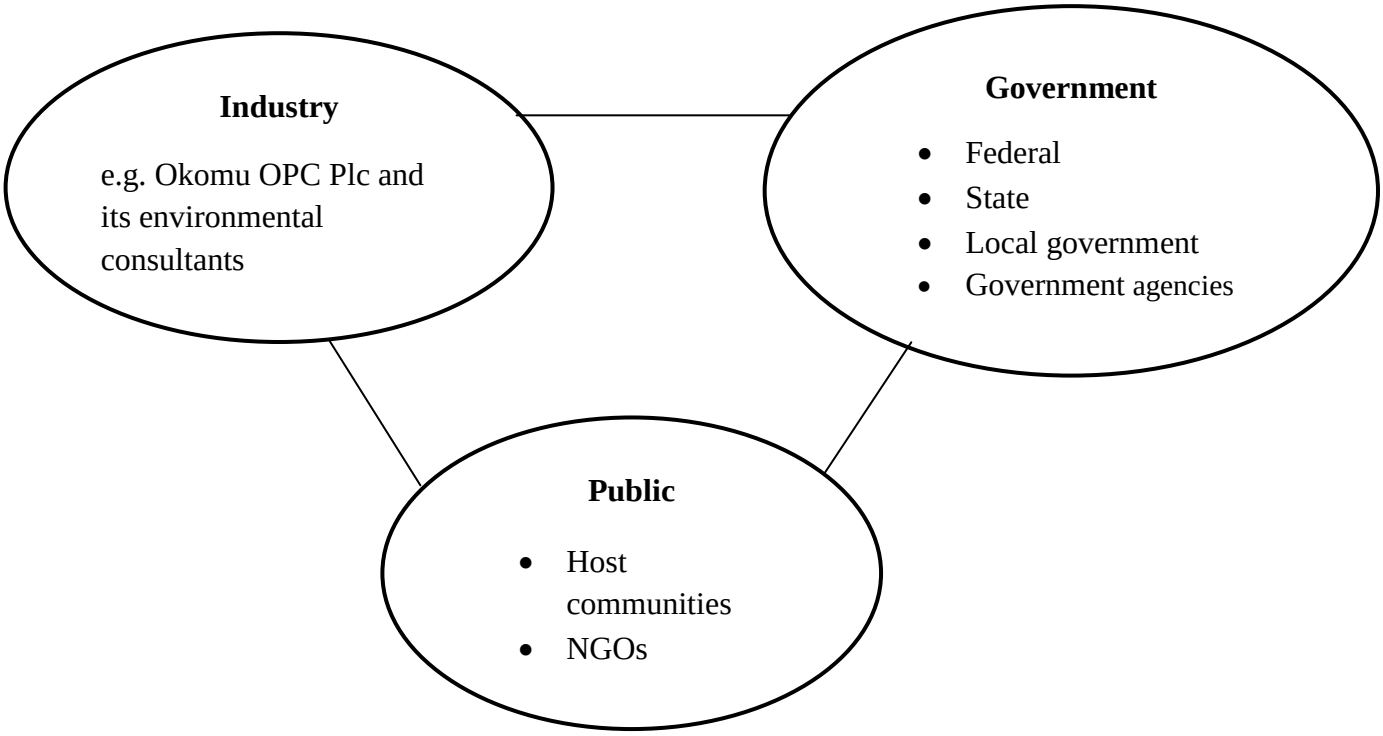


Fig. 4-4: Stakeholders' interrelationship in the activities for an EIA study

4.6.2 Objectives

The specific objectives of the consultation and participation process are to:

- Inform and educate stakeholders about the project
- Obtain stakeholders view on the project as it may affect the existing conditions of the environment of the area
- Assist in scoping of activities to be included in the study
- Resolve conflicts relating to the project
- Identify problems, concerns and needs of adjoining communities
- Establish a coordinal link between the proponent (Okomu Oil Palm Co Plc) and the communities

4.6.3 Consultations with Stakeholders

4.6.3.1 Institutional

Federal Ministry of Environment, FMEnv

The Federal Ministry of Environment, FMEnv, at Abuja was consulted in screening process or initial environmental examination (IEE) in order to categorize the project. Also an application for an EIA study by the Company, the Terms of Reference and Scope of the study to be carried out, were submitted 23 July 2013 to the FMEnv for vetting and approval. The FMEnv carried out a site verification visit on August 2013 and subsequently approved the TOR for the EIA study. Regular contacts were made with the FMEnv at Abuja and sometimes with the Edo state Zonal office in Benin City.

In similar vein contacts and consultations were made with the following government agencies:

a. Ministries of Environment and Public Utilities, Benin City.
b. Ministry of Agriculture and Natural Resources, Benin City
c. Uhunmwonde and Ovia Northeast Local Government Areas of Edo State, Nigeria

4.6.3.2 Communities

OOPC Plc uses its community engagement platform and mechanism to hold regular meetings with the ten related communities. The community engagement meetings presented the opportunity for the EIA consultants to present and explain the oil palm expansion project to the understanding of the communities. The concerns of the communities were noted and the company received some immediate requests from the communities for consideration.

The engagement and EIA consultation meetings with the communities were held under cordial atmosphere.

4.6.4 Levels of Community Representatives and Organizations Consulted

4.6.4.1 Adjoining Communities

In all the communities, meetings and consultations were held with representatives including individuals, community heads and leaders. Others included community development associations and community based organizations. The meetings and consultations usually held at either their town hall or at the quarters of the community heads and the communities had representations including the youth association members. The schedule of the meetings is shown below, while photo illustrations are provided in Plate 4-18.

Communities	Attendance	Reference Contact
Agbanikaka	27	Ikpefuran Sunday - 08038157678
Owan	28	Elder Clement Ugboiyobo
Uhiere	35	FranciseObanor - 08182731748
Odiguetue	36	John Ehigia - 08182401090
Odighi	27	Flamingo Dajide - 08077220988
Oke- Irhue	53	Ohiengbe Sylvester - 08134266005
Ihrue	15	Samuel Alohan (08031259221)
Umuokpe	15	(Community Secretary - 08086792306)
Epkan	13	Matthew Omoniyi (07031259895)
Orhua	10	O.C. District Forest Chairman - 08066318167

Agbanikaka Community with study team

Uhiere Community with study team

Irhue Community with study team

Odighi Community Leaders with OOPC Management Team

Odiguetue Community with OOPC Management Team

A & Hatman Workers with OOPC Management Team

Plate 4-18: Photos of community meetings

4.6.5 Issues and Concerns of Communities and Consultations

At the meetings, the communities highlighted and discussed freely what they perceived as environmental and social issues and concerns that are related to the proposed oil palm development project at Extension Two. The issues and concerns are presented in Section 4.5.3.

4.6.6 Communities' Assessment of the Environmental Impact of the Proposed Extension Two Project

The communities expressed their own opinion of how the proposed project would impact their environment. The aggregated opinions are presented in Table 4-21.

Table 4-21: Summary of communities' assessment of environmental impact of the Proposed Extension Two oil palm development project

	Adverse/Positive/Beneficial/Increase/Decrease/No effect
Population of community	Slight increase, temporary effect
Age/sex distribution	No effect
Culture; traditional administration	No effect
Sacred shrines	No effect
Religious worship	No effect
Sacred forest	No effect
Festivals	No effect
Ethnic composition	No effect
Fisheries	No effect
Forests	Adverse: deforestation
Wildlife	Adverse: disappearance
Medicinal plants	Adverse
Soil	Possible soil erosion
Water bodies	No effect
Employment opportunities	Positive
Income	Positive (Communities) Adverse (Migrant communities)
Occupation wages	Positive
Other companies in community	No effect
Education	No effect
Housing	No effect (adjoining communities
Settlement pattern	No effect
Flooding	No effect
Air quality and noise level	No effect
Water quality	No effect
Health	No effect

CHAPTER FIVE

5.0 ASSOCIATED AND POTENTIAL ENVIROMENTAL IMPACTS OF THE PROPOSED PROJECT

5.1 Impact Assessment Overview

Fig. 5-1 illustrates the approach and methodology of the impact assessment process. The potential for an environmental impact exists where an environmental aspect has been identified i.e. where a project activity has been determined to have the potential to interact with the biophysical and socio-cultural environment. The significance of each aspect is then determined. Impacts can either be positive or negative.

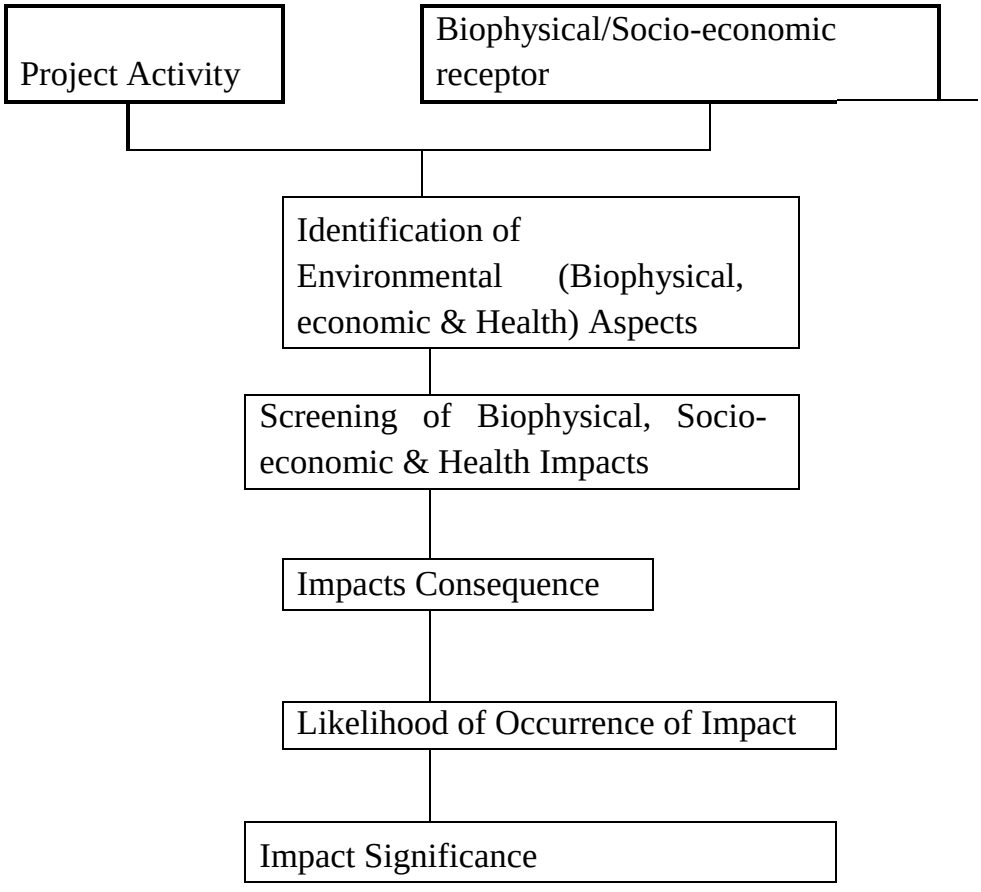


Fig. 5-1: Overview of the Impact Assessment Process

The primary objectives of the impact assessment process are to:

- Establish the significance of identified potential impacts that may occur as a result of a project activity being undertaken.
- Differentiate between those impacts that are insignificant (i.e. can be sustained by natural systems) and those that are significant (i.e. cannot be sustained by natural systems).

Unacceptable negative impacts will require additional mitigation measures to complement those incorporated in the project design. Potential cumulative impacts are also considered. The significance of an impact is determined by:

- Determining the environmental consequence of the activity;
- Determining the likelihood of occurrence of the activity and
- Subsequently calculating the product of these two parameters.

Expert panels were constituted and employed extensive use of matrices and predefined criteria in screening aspects, determining their consequence and impact significance. The following sections provide detailed information on the impact assessment process adopted for this study.

5.2 Impact Prediction Methodology

Various impact assessment guidelines and methodologies have been developed to date, and new ones are emerging. Internationally acceptable methods of impact prediction and evaluation include, among others, the following:

- Leopold Interaction matrix (modified after Leopold *et al*., 1971)
- Overlays Method (McHarg, 1968); and
- Battelle Environmental Evaluation system (Dee *et al.,* 1972).

The Leopold Interaction Matrix, when compared to the other two approaches is simple, provides the same level of details, requires comparable knowledge of the environment and relies on limited data unlike the other methods that rely on availability of large historical data bank. The Leopold Interaction matrix was therefore selected for the purpose of impact screening for this EIA.

5.3 Identifications of Environmental and Socio-economic aspects and impacts

5.3.1 *Definition of Environmental Aspects*

The international Organization for standardization's Environmental Management Systems (EMS), ISO 14001, defines an environmental aspect as:

"*An element of an organization's activities, products or services that can interact with the environment"*

5.3.2 Identification of Environmental and Socio-economic Aspects

To identify project environmental aspects, all proposed project activities were considered in terms of their potential to interact with the natural (physical and biological elements) and socio-economic environments. Activities assessed covered routine, non-routine and accidental operations.

5.3.3 *Definition of Impacts*

ISO 14001 also defines an environmental impact as;

"*Any change in the environment, whether adverse or beneficial, wholly or partially resulting from an organization's activities, products or services."*

An environmental or socio-economic impact may result from any of the identified project development aspects; that is, activity-receptor interaction. These definitions were used in the identification of the proposed Extension Two oil palm development project's environmental and socio-economic aspects and impacts.

The following characteristics were also used to define impact:

- *Negative:* An impact that is considered to represent an adverse change from the baseline or to introduce a new undesirable factor.
- *Positive:* An impact that is considered to represent an improvement to the baseline or to introduce a new desirable factor.
- *Direct (primary):* Impacts that result from the direct interaction between a planned project activity and the receiving environment.
- *Secondary: Impacts that result from the primary interaction between the project and its environment as a result of subsequent interactions within the environment.*

- *Indirect:* Impacts that result from other activities that are encouraged to happen as a consequence of the project.
- *Temporary:* Temporary impacts are predicted to be of short duration, reversible and intermittent/occasional in nature.
- *Short-term:* Short-term impacts are predicted to last only for a limited period but will cease on completion of the activity, or as a result of mitigation measures and natural recovery.
- *Long-term:* Impacts that will continue for the life of the project, but cease when the project stops operating.
- *Permanent:* Impacts that occur during the development of the project and cause a permanent change in the affected receptor or resource that endures substantially beyond the project lifetime.
- *On-site:* These are limited to the project site.
- *Local:* Impacts that affect locally important environmental resources or are restricted to a single (local) administrative area or a single community. For this EIA, local impacts are restricted to the project site and adjacent areas.
- *Regional:* Impacts that affect regionally important environmental resources or are experienced at a regional scale as determined by administrative boundaries.
- *National:* Impacts that affect nationally important environmental resources; affect an area that is nationally protected; or have macro-economic consequences.

5.3.4 Screening and Scoping for Potential Impacts

A modified version of the Leopold matrix technique was employed to screen and scope for the potential impacts of the proposed project on the environment. The basis for the screening was derived from the following:

- Knowledge of the project activities (as summarized in Table 5-1), equipment types and layout of the project facilities.
- Detailed information on the existing environmental conditions of the project area.
- Review of other EIA reports on similar projects/environments.
- Series of experts group discussions, meetings and experience on similar projects.

Table 5-1: Summary of proposed project phases and associated activities

S/NO	PROJECT PHASE	ASSOCIATED ACTIVITY
1	Pre-construction	Plantation boundary demarcation
		Opening of roads and tracks
		Site forest clearing
		Stacking, stumping and restacking
		Disposal of vegetation
2	Construction	Tracing and blocking out
		Peg preparation
		Cover crop sowing
		Holing and transplanting of seedlings
		Consolidation of seedlings
		Protection of planted seedlings
		Housing and Office buildings
3	Operation	Weeding
		Fertilizer application
		Mulching
		Pruning of fronds
		Maintenance of tracks and roads
		Harvesting and collection of fruit bunches
		Transportation of FFB for processing
4	Decommissioning/Abandonment	Laying off workers/Severance Payment
		Land restoration
		Removal of equipment and ancillary Facilities
		Return of land area to State Government

5.3.5 Determination of Impact Significance

Once all environmental aspects were identified, the levels of impacts that may result from the proposed project activities were assessed. In assessing the level of impact that an activity may cause, two key elements were considered namely:

- **Consequence:** The resultant effect (positive or negative) of an activity's interaction with the natural and/or socio-economic environments.
- **Likelihood:** The likelihood that an activity has occurred.

5.3.5.1 Consequence

To assign a level of consequence to each environmental and socio-economic impact, criteria were defined for environmental and socio-economic consequence. The environmental and socio-economic consequence criteria, categories and definitions are presented in Tables 5-2 and 5-3 respectively. "Catastrophic" represents the most severe consequence.

Table 5-2: Categories, Ranking and Definition of consequence levels for natural environmental impacts

Category	Ranking	Definition
Catastrophic	**5**	• Transboundary and/or national scale impact resulting in: o Long term and profound change and/or damage to the natural environment and its ecological processes. o Increase in threat category for rare and endangered species of fauna and flora identified in national and global listings. • Natural habitat restoration time greater than 10 years and requiring large-scale and long term intervention. • Breach of environmental regulations and/or company policy and/or greater than 200% exceedance of international, national, industry and/or operator standard for an emission parameter. • Negative widespread national and international media coverage. • Significant long-term financial loss.
Major	**4**	• Regional to national scale impact resulting in: o Medium term change and/or damage to the natural environment and its ecological processes. o Reduction in regional habitat and species diversity o Direct loss of habitat for endemic, rare and endangered species of fauna and/or flora and for species' continued persistence and viability nationally and regionally (for species unable to disperse). • Natural habitat restoration time 5-10 years and requiring substantial intervention. • Breach of environmental regulations and company policy and/or 100%-200% exceedance of international, national and industry and/or operator standard for an emission parameter. • Sustained adverse national media attention. • Significant medium term financial loss.
Moderate	**3**	• Local to regional scale impact resulting in:

		○ Short term change and/or damage to the natural environment and its ecological processes. ○ Direct loss of habitat crucial for species' (including listed species) continued persistence and viability in the project area (for species unable to disperse). ○ Introduction of exotic species of fauna in invasive floral species replacing resident 'natural communities' within the project area. ○ Environmental stress lowering reproductive rates of species within the project area. • Natural restoration time 2-5years and requiring intervention. • Potential breach of environmental regulations and company policy and/or 50%-100% exceedance of international, national, industry and/or operator standard for an emission parameter. • Complaints from the public, authorities and possible local media attention. • Medium term financial loss.
Minor	**2**	• Local scale impact resulting in: ○ Short-term change and/or damage to the local natural environment and its ecological processes. ○ Short-term decrease in species diversity in selected biotopes/areas within the project area. ○ Increased mortality of fauna species due to direct impact from project activities. • Natural restoration within 2years requiring minimal or no intervention. • 10%-50% exceedance of international, national, industry and/or operator standard for an emission parameter. • Public perception/concern. • Short-term financial loss.
Negligible	**1**	• Impact largely not discernible on a local scale being absorbed by the natural environment; areas adjacent to disturbed areas absorb exodus of species able to disperse. • Restoration within 6months without intervention. • Up to 10% exceedance of international, national, industry and/or operator standard for an emission parameter. • Public perception/concern. • Minimal financial loss.
None	**0**	• Impact absorbed by local natural environment with no discernible effects. • No restoration or intervention required. • No exceedance of international, national, industry and/or

		operator standard for an emission parameter. • No financial loss.
Positive	+	• Activity has net positive and beneficial effect resulting in environmental improvement for example: o Ecosystem health o Increase in magnitude or quality of habitat for rare and endangered species of fauna and flora as well as for those species known to naturally occur in the area. o Growth of 'naturally occurring' populations of flora and fauna. • Positive feedback from stakeholders. • Potential financial gains

Table 5-3: Categories, Ranking and Definition of consequence levels for socio-economic environmental impacts

Category	Ranking	Definition
Catastrophic	**5**	• Emergency situation with harmful consequences to human health (e.g. fatalities) • Disastrous consequences on the livelihoods of individuals (e.g. curtailment of access to primary income source). • Calamitous consequences on those seeking to access community facilities and utilities (e.g. resettlement of large numbers (1000s) of households). • Disastrous consequences on the national economy. • Breach of company social policy and/or legislation
Major	**4**	• Major impacts on human health (e.g. serious injury). • Significant impact on the livelihoods of individuals (i.e. access to income source restricted over lengthy period of time). • Serious impact on access to community facilities and utilities (e.g. resettlement of large numbers (10s-100s) of households). • Notable consequence on the economy, at a local, regional and/or national level (e.g. virtually no local sourcing of supplies or personnel). • Breach of economic social policy and/or regulation.
Moderate	**3**	• Modest impact on human health and wellbeing (e.g. noise, light, odour, dust, injuries to individuals). • Moderate impact on individual livelihoods (e.g. restricted access to income source). • Medium impact on access to community facilities and utilities (e.g. access to utilities restricted for long periods

		(weeks) of time). • Moderate impact on the wider economy, at a local, regional and/or national scale (e.g. only moderate levels of employment and supply sources within Nigeria). • Potential breach of company social policy and/or legislation
Minor	**2**	• Limited impact on human health and wellbeing (e.g. occasional dust, odours, traffic noise). • Some impact on the livelihoods of individuals (e.g. isolated incidents related to ethnic tensions and some restrictions on access to income source). Natural restoration within 2 years requiring minimal or no intervention. • Some impact on access to community facilities and utilities (e.g. access to cultural centres restricted to a limited extent, i.e. (days). • Sparse impact on the wider economy, at a local, regional, and national level (e.g. limited procurement).
Negligible	**1**	• Possible nuisance to human health and wellbeing (e.g. occasional unpleasant odour). • Very limited disruption caused to those earning their livings (e.g. no noticeable impact on heralding operations). • Inconvenience experienced in accessing community facilities and utilities (e.g. electricity supply disruption for short (hours) period of time). • Very limited impact on the wider economy at a local, regional and/or national scale (e.g. no discernible indirect and induced development).
None	**0**	• No impact on human health. • No impact on livelihoods. • No impact on community facilities/utilities. • No impact on the wider economy
Limited positive	**+**	• Some beneficial improvement to human health. • Some benefits to individual livelihoods (e.g. additional employment opportunities). • Limited improvements to community facilities/utilities (e.g. no discernible improvement). • Some impact on the wider economy (e.g. limited local procurement).
Modest positive	**++**	• Moderate beneficial improvement to human health • Medium benefits to individual livelihoods (e.g. employment impacts). • Modest improvements to community infrastructure/utilities. • Moderate impact on the wider economy (e.g. some local sourcing of supplies).

Significant positive	+++	• Major beneficial improvement to human health. • Large scale benefits to individual livelihoods (e.g. large scale employment). • Major improvements to community facilities/utilities. • Notable impact on the wider economy (e.g. extensive use of local procurement).

5.3.5.2 Likelihood

Likelihood in this assessment implies the likelihood of an activity occurring. To assign likelihood to each activity, five criteria were defined and ranked. The criteria for likelihood are shown in Table 5-4. Level five, "certain", represents the highest certainty that the activity will occur.

Table 5-4: Likelihood categories and rankings of natural and socio-economic impacts

Category	Ranking	Definition
Certain	5	The activity will occur under normal operating conditions.
Very likely	4	The activity is likely to occur under normal operational conditions.
Likely	3	The activity is likely to occur at some time under normal operating conditions.
Unlikely	2	The activity is unlikely to occur at some time under normal operating conditions.
Very unlikely	1	The activity is very unlikely to occur under normal operating conditions but may occur in exceptional circumstances.

5.3.5.3 Significance

The significance of the impact is determined by calculating the product of an environmental aspect's consequence and likelihood of occurrence. Fig 5-2 below illustrates all possible product results for the five consequence and likelihood categories.

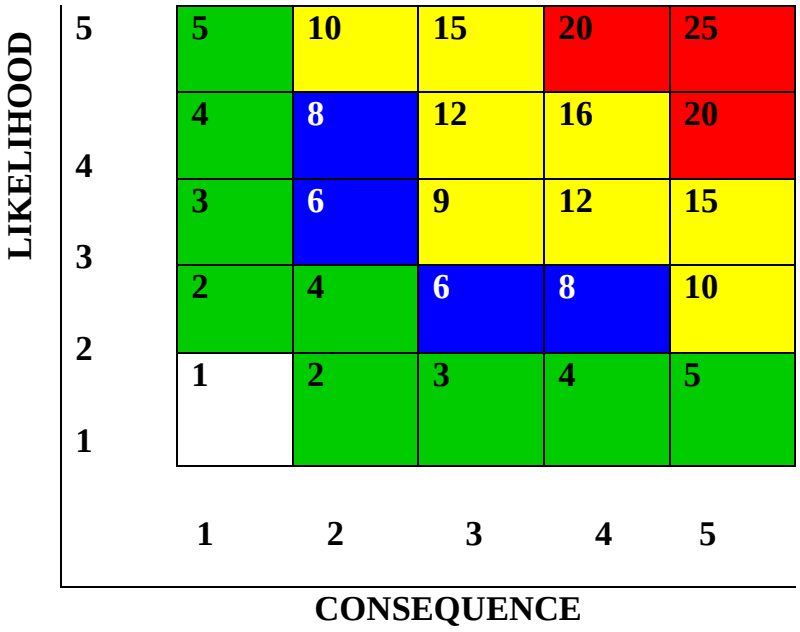


Fig. 5-2: Consequence-Likelihood product results

Based on its consequence-likelihood score, each environmental impact was again ranked into five categories or orders of significance as illustrated in Table 5-5.

Table 5-5: Environmental impact significance rankings

Ranking (consequence x likelihood)	Significance
>16	Critical
9 – 16	High
6 – 8	Medium
2 – 5	Low
<2	Negligible

To assist in determining and calculating the significance of the impact, impact assessment matrices were developed. Activities were listed on the y-axis and receptors on the x-axis.

A second matrix was compiled to calculate the overall significance of each of the identified potential impacts. In the 'significance' impact matrix, the significance of each impact on the receptor (i.e. consequence x likelihood) was

calculated. From this matrix, those impacts that fell into "medium" and above (i.e. >5) were identified. These impacts were subjected to further examination and analysis in terms of identifying activities for which additional restoration measures may be required.

A panel of experts independently carried out all quantitative rankings on a scale of 1-5. Independent scores were thereafter statistically analyzed and the results of the scores judged as follows:

- If variance, s^2<5% of the mean, subjectively is minimal and the score is good.
- If s^2>5% but <10% of the mean, the score is fair and scorers were given the opportunity to review their scores.

5.4 Impact Evaluation

5.4.1 Identifying Environmental and Socio-economic Receptors

Following the provision of detailed project activities in Chapter Three and the characterization of environmental and socio-economic baseline of the project area in Chapter Four of this report, the environmental and socio-economic receptors were identified. In all, a total of 18 receptors were identified and grouped as follows:

Physical	:	7 receptors
Biological	:	2 receptors
Socio-economic	:	6 receptors
Others (Health and Safety)	:	3 receptors

Table 5-6 presents a list of receptors identified for this assessment. A brief explanatory comment is also provided.

Table 5-6: Identified project environmental and socio-economic receptors

Environmental Receptor	Comment	Impact Indicators
Physical		
Air quality	Air quality in and around the proposed project site	Increased concentration of gaseous and particulate pollutants (such as NO_x, SO_x, CO, VOC, PM_{10}, $PM_{2.5}$, CO_2)
Noise and Vibration	Ambient noise level in and around the proposed project site.	Increased ambient noise and vibration level, night and day-time disturbance, hearing loss, communication impairment etc
Soil	The soil of the area in which project activities are proposed to occur.	Changes in physical, chemical and biological properties, loss of soil ecology and fertility, compaction, erosion etc.
Groundwater/Aquifers	The groundwater resources and aquifers of area in which project activities are proposed to occur	Ground water level, changes in physical, chemical and biological properties, contamination and availability of portable water.
Surface water	The surface water such as stream in area in which project activities are proposed to occur.	Changes in surface water quality indices such as hydrocarbons, total suspended solid, turbidity, metals and hydrobiology. Destruction of aquatic habitats.
Hydrological systems	The terrestrial physical system of streams in area in which project activities are proposed to occur.	Alteration in hydrology, sedimentation, erosion
Landscape/Topography	The geomorphologic land forms and terrain of area in which project activities are proposed to occur.	Alteration in drainage pattern, changes in landscape.
Biological		
Terrestrial Flora	Plant species that occur in the area in which project activities are proposed to occur.	Loss of terrestrial flora (economic plants, rare or endangered species), introduction of new species.
Terrestrial Fauna	Terrestrial fauna such as reptiles, birds etc. that rely on the project area as a habitat and/or food source.	Loss of terrestrial fauna; involuntary migration.
Socio-economic		
Land Use	Existing use of the land area in which project activities are proposed to occur.	Loss of land value
Population	The people living in area in which project activities are proposed to occur.	Changes in total population, gender ratio, sex ratio, age distribution etc
Utilities	The utilities (e.g. power supply, water, sewage services etc) of area in which project activities are proposed to occur.	Changes in existing utilities, damage to public utilities e.g. pipes, cables.
Infrastructure	The buildings and general infrastructure (e.g. schools, hospitals, road, waste handling	Access to education facilities, access to health facilities, access to communication facilities, access to road, access to waste management facilities,

	facilities etc) of area in which project activities are proposed to occur.	access to emergency services
Employment	The employment situation in the project area and area beyond.	Opportunities for local and national employment; changes in income level.
Community Relations	The cordial relationship between the project proponent and the communities around the project area	Hostility toward the proponent facilities and its workforce resulting to down-time and subsequent loss in productivity.
Other (Health and safety)		
Construction workers	The health and safety of workers involved in the construction phase of the proposed project activities.	Accidents, injury, fatality from height, exposure to nuisance (dust, noise), fire, explosion, exposure to dangerous chemicals.
Workplace Health and Safety	The health and safety of employees involved with the operational phase of the proposed project activities.	Accidents, injury, exposure to nuisance (dust, noise), fire, explosion, exposure to radiation, ergonomics.
General Public	The health and safety of general public including people residing or working within the proximity of the proposed project site.	Level of disease vectors, exposure to disease, exposure to radiation, accident, fire, explosion, injuries from falling of tower/mast.
Corporate Company Image	The company's reputation in relations to workers' safety and welfare and relationship with the host communities in the area of its operation.	Accidents, injury, fire, explosion, conflicts with the host communities, bad and/or low quality products.

Identified project activities and environmental and socio-economic receptors were integrated into a matrix with the activities on the y-axis and environmental receptors on the x axis, and the matrix was completed for each of the project elements. The matrix was subsequently assessed to identify every possible case of activity-receptor interaction. Where it was considered that an activity-receptor interaction was possible, the cell was marked denoting an identified environmental aspect.

The completed environmental and socio-economic aspect matrix is presented in Table 5-7.

Table 5-7: Environmental and Socio-economic Aspects

Project activities at various phases	Environmental Receptors																	
	Physical							Biological		Socio-economic						Others (Health and Safety)		
	Air quality	Noise and Vibration	Soil	Ground water And Aquifer	Surface water	Hydrological System	Landscape	Terrestrial Flora	Terrestrial Fauna	Land Use	Population	Utilities	Infrastructure	Employment/ Income	Community Relations	Construction workers	workplace health and safety	General public	Corporate Company Image
Pre-construction																			
Plantation boundary demarcation	•	•	•	•	•	•	•	•	•	•					•	•	•		
Opening of roads and tracks	•	•	•	•	•	•	•	•	•	•					•	•	•		
Site forest clearing	•	•	•	•	•	•	•	•	•	•					•	•	•		
Stacking, stumping and restacking			•														•		
Disposal of vegetation			•														•		
Construction																			
Tracing and blocking out			•														•		
Peg preparation								•	•								•		
Cover crop sowing			•			•											•		

Holing and transplanting of seedlings			•		•	•		•	•								•		
Consolidation of seedlings																	•		
Protection of planted seedlings																	•		
Operation																			
Weeding	•							•	•					•			•		
Fertilizer application	•		•	•	•			•	•					•			•		
Mulching			•											•					
Pruning of fronds														•			•		
Maintenance of tracks and roads	•	•	•	•	•	•							•	•			•		
Use of diesel machinery and powered generators for electricity generation	•	•	•	•										•			•		
Harvesting and collection of fruit bunches														•			•		
Transportation of FFB for processing		•										•		•			•		•
Decommissioning /Abandonment																			
Laying off workers/Severance Payment											•			•	•				•
Land Restoration	•	•	•	•	•	•	•	•	•					•			•		•
Removal of equipment and ancillary Facilities							•								•		•		•
Return of land area to State Government			•				•			•									•

Following the completion of the environmental aspect identification process, a process of impact assessment was completed. This involves the computation of the potential impact of the project activities on the recipient environment using a modification of the Leopold interaction matrix based on consequence and likelihood as defined in Tables 5-2, 5-3 and 5-4. Every identified aspect was assessed and ranked in terms of its consequence and likelihood thus enabling the determination of the overall significance of the aspects. In evaluating the environmental and socio-economic aspects, emphasis is placed on specific cause and effect relationships.

The value assigned to each cell in the matrix is in the form "x (y)": where "x" denotes the consequence and "y" the likelihood of the impact. A final impact significance matrix was completed containing products of the consequence and likelihood values. The results of the impact assessment process are presented in Tables 5-8 and 5-9. It is important to note that in compiling the tables, no additional mitigation measures have been considered other than those incorporated in the original project design.

Table 5-8: Unmitigated potential environmental and Socio-economic impacts consequence and likelihood

Project activities at various phases	Environmental Receptors																	
	Physical							Biological		Socio-economic						Others (Health and Safety)		
	Air quality	Noise and Vibration	Soil	Ground water And Aquifer	Surface water	Hydrological System	Landscape	Terrestrial Flora	Terrestrial Fauna	Land Use	Population	Utilities	Infrastructure	Employment/ Income	Community Relations	Construction workers	workplace health and safety	Corporate Company Image
Pre-construction																		
Plantation boundary demarcation	3(2)	2(2)	2(2)	2(2)	3(2)	1(4)	1(2)	2(4)	2(4)	2(2)				+	2(2)	3(3)	3(3)	
Opening of roads and tracks	3(2)	2(2)	2(2)	2(2)	3(2)	1(4)	1(2)	2(4)	2(4)	2(2)				+	2(2)	3(3)	3(3)	
Site forest clearing	3(2)	2(2)	3(2)	2(3)	3(2)	2(4)	1(2)	3(4)	3(4)	2(2)				+	2(2)	3(3)	3(3)	
Stacking, stumping and restacking			1(1)											+			3(2)	
Disposal of vegetation			1(1)														2(2)	
Construction																		
Tracing and blocking out			2(2)														3(1)	
Peg preparation								3(2)	3(2)					+			3(2)	
Cover crop sowing			+			1(1)											3(1)	
Holing and transplanting of seedlings			1(1)		3(2)	1(1)		2(2)	2(2)								3(2)	
Consolidation of seedlings																	3(1)	
Protection of planted seedlings																	3(1)	

Operation																			
Weeding	3(1)							2(2)	2(2)					+			3(3)		
Fertilizer application	2(2)		3(3)	4(2)	4(3)			4(3)	4(3)					+			3(3)		
Mulching			0(1)											++					
Pruning of fronds														++			3(2)		
Maintenance of tracks and roads	3(2)	3(2)	2(2)	1(1)	3(2)	2(2)							+	+			3(3)		
Use of diesel machinery and powered generators for electricity generation	3(3)	3(3)	3(2)	3(1)										+			3(3)		
Harvesting and collection of fruit bunches														++			3(3)		
Transportation of FFB for processing	3(2)											2(2)		++			3(3)	3(3)	
Decommissioning /Abandonment																			
Laying off workers/Severance Payment											4(3)			4(4)	4(4)			3(2)	
Land restoration	3(2)	2(2)	2(2)	2(2)	2(2)	2(2)	2(1)	2(2)	2(2)					4(4)				3(3)	
Removal of equipment and ancillary Facilities		2(1)					3(3)								3(2)			2(2)	
Return of land area to State Government			2(2)				2(2)			2(2)					2(1)			3(3)	

Table 5-9: Unmitigated potential environmental and socio-economic impacts significance

Project activities at various phases	Environmental Receptors																	
	Physical							Biological		Socio-economic						Others (Health and Safety)		
	Air quality	Noise and Vibration	Soil	Ground water And Aquifer	Surface water	Hydrological System	Landscape	Terrestrial Flora	Terrestrial Fauna	Land Use	Population	Utilities	Infrastructure	Employment/ Income	Community Relations	Construction Workers	workplace health and safety	Company Corporate Image
Pre-construction																		
Plantation boundary demarcation	6	4	4	4	6	4	2	8	8	4				+	4	9	9	
Opening of roads and tracks	6	4	4	4	6	4	2	8	8	4				+	4	9	9	
Site forest clearing	6	4	6	6	6	8	2	12	12	4				+	4	9	9	
Stacking, stumping and restacking			1											+			6	
Disposal of vegetation			1														4	
Construction																		
Tracing and blocking out			4														3	
Peg preparation								6	6					+			6	
Cover crop sowing						1											3	
Holing and transplanting of seedlings			1		6	1		4	4								6	
Consolidation of seedlings																	3	

Protection of planted seedlings																	3	
Operation																		
Weeding	3							4	4					+			9	
Fertilizer application	4		9	8	12			12	12					+			9	
Mulching			0											++				
Pruning of fronds														++			6	
Maintenance of tracks and roads	6	6	4	1	6	4								+			9	
Use of diesel machinery and powered generators for electricity generation	9	9	6	3										+			9	
Harvesting and collection of fruit bunches														++			9	
Transportation of FFB for processing	6											4		++			9	9
Decommissioning /Abandonment																		
Laying off workers/Severance Payment											12			16	16			6
Land restoration	6	4	4	4	4	4	2	4	4					16			9	9
Removal of equipment and ancillary facilities		2					9								6		6	4
Return of land area to State Government			4				4			4					2			9

Colour Legend: **High** **Medium** **Low**

5.5 Description of Impacts

5.5.1 Significant Impacts

The proposed Extension Two oil palm development project by OOPC Plc offers a number of potential beneficial impacts to the host communities of the project site and area beyond. These effects shall be enhanced throughout the duration of the project. Improved and more secured plantation development would benefit a broad range of individuals, communities and businesses throughout Nigeria. The project will substantially improve agricultural development by improving palm oil production n that will continuously provide job opportunities for teeming youths in Nigeria.

In addition, the project will contribute to achieving some of the objectives of the Federal Ministries of Agriculture & Rural Development and Trade & Investment which include securing the social and economic benefits of an efficient Agricultural and Investment sector; considerably increasing the domestic supply of Palm oil to at least satisfy its demand in the country.

Moreover, the project will provide employment opportunities for qualified Nigerians (skilled, semi –skilled and unskilled) from the immediate project area and beyond. The employment opportunity will lead to acquisition of new skills and introduction of all manners of income generating spillover effects. Other potential benefits of the project include:

- Add value to the existing production of the company
- Provide direct employment
- Create additional jobs
- Contribute to the socio-economic development of neighboring communities

5.5.2 Significant Negative Impacts

In this section, only activity-receptor relationships resulting in impact significance above ‘low’ are presented and discussed to understand how additional mitigation measures beyond those incorporated in the project design could help bring down the residual impacts to ‘low’ in the least. In the analysis, the environmental

receptors are considered singly or collectively along with the corresponding planned project activities.

5.5.2.1 Evaluation of Potential Impacts of Project Activities

5.5.2.1.1 Plantation boundary demarcation, Opening of roads and tracks, Site forest clearing and Maintenance of tracks and roads.

Existing farms and un-harvested agricultural and economic crops and trees will be destroyed. Economic trees such as timber, raffia palms, cane plant, many trees that produce edible fruits and seeds, alligator pepper, large wide leaves for wrapping kolanuts and food items and some medicinal plants present in the area will be destroyed. Some areas of the fresh water swamps may be lost. Some siltation of rivers may occur if planting activities extend to river banks. These changes in the ecosystem may adversely affect some shellfish and finfish. However, OOPC Plc will retain and maintain at least 50 meters of buffer vegetation on both sides of the river.

Wildlife such as the giant African land snail and amphibians in the sites may be killed. Snakes and mammals will relocate/emigrate to unfamiliar territories and some may get killed in the process. Birds will relocate or emigrate. Bush/forest clearing and exposure of land to wind and storm water will increase the potential for soil erosion and very high rate of evaporative groundwater loss in the area. The erosion control, cooling, shading and watershed-protection effect which trees provide will therefore be lost. However, the planting of cover crop immediately after land clearing will minimize the erosion to a great extent. On the other hand, these activities will create employment for unskilled labour in the communities around the project area.

5.5.2.1.2 Vegetation and Spoil Disposal

Soil accumulated during stumping and felled vegetation will have to be removed and deposited somewhere. Accumulation of soil spoils, if not removed, may alter water drainage pattern and reduce landscape beauty. Disposal of the vegetation and soil spoils will give opportunity for employment in the communities.

5.5.2.1.3 Ploughing, Grading and Leveling of Tracks and Roads

There is the possibility of initiation of erosion because of the nature of the topsoil and the topography.

5.5.2.1.4 Increased Transportation and use of Heavy Machinery during Land Preparation

Wildlife presence in the affected area may be reduced due to unusual and frequent high level noise from heavy machinery. During the raining season, the access earth roads/tracks may be rendered inaccessible due to activity of heavy machinery and vehicles.

5.5.2.1.5 Weeding

In mature oil palm plantation, unwanted weeds are removed from the ground cover by manual clearing with cutlass. There is then the problem of disposal of removed weeds which are therefore allowed to gradually decay or rot. Many invertebrate fauna may be killed during or after weeding. Weeding removes the cover for wildlife such as amphibians, snakes and small mammals. Predator birds such as the black kites and owls increase in numbers in recently weeded plantations to locate exposed and moving prey.

5.5.2.1.6 Herbicides, Fungicides and Insecticides Application.

Agrochemicals are used in both the nursery and plantation and could be improperly handled or residues may contaminate surface water. However, the handling of agrochemicals will follow the company's procedures and guidelines for hazardous chemical thus making direct contamination or carriage of residues into surface water extremely remote.

5.5.2.1.7 Fertilizer Application

In order to increase productivity of oil palm fruit bunches per unit area, fertilizers are applied at various stages. At the nursery, in each bag of soils, fertilizers are applied such as NPK, borax, potash, sulphate of ammonia. Not all nutrients added to the soil as fertilizers are taken up by the growing palm. Residues ($NO_{3,}$ PO_4) may remain in the soil and end up in surface waters through storm water runoffs or be leached out of the soil and enter groundwater. High nitrate level in drinking water sources cause health risks particularly in children. It reacts with

haemoglobin causing methehaemoglobinema which impairs respiratory gases transport. Nitrites and nitrates can form nitrosamines, which are carcinogenic, mutagenic and tetratogenic (Odiete, 1999). Nursery seedlings are transferred with the soil in the bags during planting and transplanting. Therefore, the possibility of high levels of nitrite and nitrates in groundwater is very remote.

5.5.2.1.8 Decommissioning and Abandonment

- Permanent and casual workers will be laid off resulting in loss of employment and income, although severance payment will also be made to permanent workers. But this can itself give rise to strained relations between workers/community and the company.
- The plantation will no longer be regularly and properly maintained including no weeding, no pest control, no maintenance of roads and tracks, no pruning of palm fronds. There will be great economic loss to the company and shareholders and the nation. The plantation will become densely populated by weeds, pests and many invertebrates' fauna and small to medium size wildlife.
- The land area might need to be restored back to its original state and this includes felling the palm trees as well as planting trees. This will portend a great economic loss to the company in addition to the already incurred losses.
- Removal of equipment and ancillary facilities such as chemicals, ploughs, tractors, harrows, trucks and other farm machinery will generate excessive noise and also a potential for accident.
- Return of land area to State Government which can generate conflicts between the host communities and the local authority.

5.5.3 Significant Impact Producing Activities

Based on a score of 6 points and above (i.e. 6, 9 and 12) as shown in Table 5-8 and Table 5-9, the significant impact producing activities (IPA_S) are as follow:

- Plantation boundary demarcation which may be a source of conflict with the neighboring communities.
- Opening of roads and tracks in swampy areas will initially adversely impact water quality of freshwater swamps; it will provide access

roads to farms of communities and provide opportunity for employment during construction and maintenance phases of the project.

- Site Forest clearing will produce many beneficial and adverse impacts.
- Stacking, Stumping and restacking may create huge cavities in the soil and become a source of soil erosion.
- Peg Preparation will impact negatively on both wildlife fauna and flora.
- Holing and transplanting seedlings can impact negatively in terms of safety of workers if not handled carefully.
- Weeding in young plantation and manual removal of unwanted weeds with cutlass in mature planting.
- Fertilizer Application; chemical fertilizer application may affect groundwater as a result of runoffs and leaching.

Others include:

- Pruning, harvesting and collection of FFB
- Use of diesel machinery and powered generators for electricity
- Transportation of Fresh Fruit Bunches (FFB) for processing
- Laying off workers/Severance Payment
- Lack of care of plantation
- Decommissioning and abandonment have three main activities which will produce adverse impacts as listed in section 5.5.2.1.8.

5.5.4 Cumulative Impacts

Cumulative impacts are changes to the environment that are caused by an activity in combination with other past, present and future human activities. (GSI, 2003]. The concept of cumulative effects is an important one. It holds that, while impacts may be small individually, the overall impact of all environmental changes affecting the receptors taken together can be significant. When a resource is nearing its tolerance threshold, a small change can push it over. The objective of the cumulative impact assessment is to identify those environmental and/or socio-economic aspects that may not on their own constitute a significant impact but when combined with impacts from past, present or reasonably foreseeable future

activities associated with this and/or other projects, result in a larger and more significant impact[s].

5.5.4.1 Project Specific Cumulative Effects' Assessment

This section evaluates the cumulative effects of the individual impacts evaluated in the preceding sections.

5.5.4.1.1 Land Based Traffic

It is envisioned that land based traffic will also increase as a result of the proposed project. Land based traffic is expected to increase mainly during the operation phase to allow the FFB collected in the field to be processed at Main estate (headquarters). Activities at the project site during construction will however be varied and limited to the construction phase. The proposed project will result in a negligible impact on traffic, circulation and parking at the project site and its vicinity. It would be unlikely that the rate of motor vehicle accidents would increase due to the project. No additional cumulative transportation impacts would result from the proposed action. Therefore it is anticipated that no long term environmental impact will be forthwith in considering the land based traffic.

5.5.4.1.2 Public Services

There would be no impact to public services under the proposed project action. The project will not introduce any additional long-term population or employment into the area, and thus, would not result in any additional demand for police or fire services or the need for new or altered facilities. No damage to roadways is expected beyond that which would be considered normal wear and tear and it is basically within the company's land concession. Therefore, the proposed project would result in negligible impact on public utilities.

5.5.4.1.3 Employment Opportunities

There will be some beneficial impacts that are cumulative that are in the employment sector. During the operational phase of the project, the plantation will employ workers – all Nigerian. Positive cumulative social

benefits include gainful employment and tax being paid to government coffer.

5.5.5 Known Overall Impacts of Large Oil Palm Plantation Cultivation and Management

These include:

- Loss of resources of lowland rainforest and land for indigenous people.
- Transformation of the forest into a monoculture farm.
- Many insects and insect pests flourish in Oil Palm plantation due to absence of natural enemies.
- Loss/disappearance/displacement of many wildlife species.
- Employment and income generation will be enhanced
- Pollution of the soil and adjacent surface water and groundwater by pesticides and excessive use of fertilizers.
- Build-up of dry and decaying fronds and other organic matter under plantation posing a fire hazard.
- Rapid spread of unwanted weeds.

5.5.6 Identification and Analyzing of Social Impacts

A number of simple tools exist to systematize field observations, think through potential impacts, and to help evaluate their significance. Simple logical process of impact evaluation was the focus, supported by the Small-Scale Guidelines.

The key findings of the socio-economic study were that the proposed oil palm plantation development project will contribute to socio-economic development of the host communities in the landscape. Specific potential positive impacts include employment creation, improvement in infrastructure particularly road network and other business opportunities for the population in the project catchment area and beyond during the plantation development and processing of Fresh Fruit Bunches (FFB). The proposed project will also maximize the economic potential of the proposed project land, which has been held down by low production thus denying the communities and state government to realize the full economic potential of the land.

This notwithstanding, the implementation of the proposed Extension Two project may potentially cause negative environmental and social impacts such as pollution. The proposed project may also have impact on farmlands for the production of food crops, which when occur could jeopardize the food security potential of the area and could cause a rise in food crop prices.

At the state and national level, the project will contribute to enhancing the wider state economy through improved revenue from corporate and personal income tax due to the company meeting its tax obligations and employments that will be generated for the local population. Besides, it will contribute to Nigeria overcoming its palm oil demand/supply deficit. Nigeria currently imports palm oil from South-East Asia. This project has the potential to bridge this consumption-production gap which could contribute to Nigeria's policy of reducing imports to enhance its international trade balance.

5.5.7 Potential Positive Social Impacts

The following are some of the potential positive social impacts of the proposed Extension Two project:

Creation of Employment: The proposed project if implemented can create thousands of new jobs. The various activities including palm nursery development and maintenance, plantation land preparation, planting and harvesting are all labour intensive activities and can also give employment to the ten affected and contiguous communities; a potential tool for reducing rural unemployment and rural poverty. From the findings of socio-economic survey, the cumulative population of the ten affected communities is 25,500 and the population distribution is skewed towards youth and the implication is that unless they are productively engaged in the proposed project they may constitute a security risk as soon as their farmlands are lost to the proposed project.

Improved Planting Material: Introduction of high yielding types of oil palm and sustainable management of palm plantation practices.

Capacity Building*:* Training and capacity building for employees and smallholders including knowledge and technology transfer in the application of best practices and delivery of World class products and services in the oil palm industry.

Corporate Social Responsibility*:* Development of the local communities through Corporate Social Responsibility of Okomu Oil Palm Company Plc.

Taxes: Tax revenue for the Edo state government.

Smallholder Development: Potential for smallholder schemes.

SME Development*:* Commercial opportunities for small and medium scale enterprises including petty trading.

Infrastructure Development: It is anticipated that the corporate social responsibility of Okomu Oil Palm Company Plc will include different infrastructure development projects for the communities. It was obvious from socio-economic survey that all the affected communities of proposed Extension Two project lack the desirable infrastructure out of prolonged government neglect. All the communities are therefore of the opinion that the proposed Extension Two development will come with considerable infrastructure development in their respective communities.

5.5.8 Potential Negative Social Impacts

The potential negative social impacts of the proposed oil palm development project include:

i) Loss of farmlands, community conservation and forest products collection areas.
ii) Impacts on food insecurity and prices of food products.
iii) Influx of plantation workers and potential impacts on family structures and social networks.
iv) Water pollution due to agro-chemicals, sewage from worker's camps
v) Potential conversion of traditional conservation areas including riparian vegetation.

vi) Pollution from hazardous substances.
vii) Impacts of increased traffic including heavy vehicles and construction activities.
viii) Noise pollution from mill and plantations machineries.
ix) Exposure to health hazards including HIV.
x) Adulteration/destruction of indigenous cultural values.
xi) Impacts on public facilities (e.g. public structures)
xii) Impacts on already deplorable infrastructure (roads, water)
xiii) Potential for air pollution through burning during land development stage.
xiv) Potential for conflicts with farmers whose farmlands have been taken over and no proper resettlement plan designed for them.
xv) *Potential for communal conflicts:* the entry and operation of Okomu Oil Palm Company Plc may give rise to intra and inter communal conflicts through the promotion and entrenchment of vested interests within and among the communities. The allocation of resources and support (employment, contracts, CSR projects etc.) by the company may raise equity question and thus become a source of conflict, chaos and anarchy within and between the communities
xvi) *Cultural mix of values*: this is another source of social conflicts. Since people from different backgrounds and all walks of life will come to the proposed project to work, they will definitely mix with other members of the communities. The process of blending and integration will result to certain influences which if not properly managed will affect the overall cultural values of the various communities.

In view of demographic distribution of all the affected communities of which more than 80% of the population are energetic youth and children, it is imperative that any intervention that will influence these youth and children positively and giving them sense of belonging should be accorded priority by O Plc. Therefore, human capital development should be accorded priority.

5.5.9 Social Action Plan to Mitigate Potential Negative Effects of the proposed Extension Two Project

i) Some of the communities expressed distrust in the capacity of the former owner; A & Hatman to effectively and transparently handle the compensation and resettlement programme for farmers on the proposed project land. It is therefore advised that Okomu Oil Palm Company Plc should be directly involved in ensuring that the people farming on the land are properly disengaged and resettled.
ii) Design and implement a disengagement/resettlement plan to give the farmers on the land ample opportunities to be properly resettled for alternative livelihoods or farm locations.
iii) Involve the various stakeholders both at the community and company levels to address sensitive social issues related to the proposed Extension Two project.
iv) Design a proper information management mechanism that will include a dedicated Community Liaison Officer (CLO) that will handle all the community related matters for the communities and Okomu Oil palm company Plc. When operations have commenced Okomu Oil Palm Company Plc should undertake some infrastructure development projects in the communities as part of its corporate social responsibility.
v) Give proper orientation to workers who are coming from outside the communities on the traditional values of the people. This will concretize and reinforce existing social values.
vi) Okomu Oil Palm Company Plc together with all stakeholders should proactively engage the Fulani herdsmen with a view to addressing the social and security issues associated with them.
vii) Okomu Oil Palm Company Plc should earnestly engage the communities with a view to addressing the critical element of perception and misunderstanding relating to the status of the project land and the operational strategy and approach to plantation development by the company.

5.6 Health Impact Assessment (HIA) of the Proposed Extension Two Project

The health impact assessment of the proposed project is a rapid appraisal of the likely health impacts the project might have on the totality of the environment. The assessment will consist simply of a summary table and a conclusion. The summary table shall list the intermediate factors and their likely impacts with minimal qualification.

5.6.1 Identifying Intermediate Factors that Impact on Health

Many proposals that are not intended to affect health directly have indirect effects on health and wellbeing. Often these indirect effects have not been recognized. Proposals may affect things such as employment, income, air quality or housing which in turn affect health. These factors which are not health indicators but do influence health are referred to as intermediate factors. (They may also be called determinants of health).

Some of the identified intermediate factors of the proposed project are:

- Air Quality
- Water Quality and Hydrology
- Noise and Vibration
- Health and Safety
- Traffic and transport
- Waste Management
- Workers' Welfare
- Social cohesion
- Corporate Image

Table 5-10: Summary of Health Impacts of the Proposed Extension Two Project.

Intermediate Factor	Affected Group	Health Impact	Mitigation measures
Air quality Dust and gaseous emissions from land preparation and vehicular emission leading to high suspended particulates in the atmosphere.	All*	- Allergy - Eye irritation - Nose irritation - Respiratory Tract Infections	OOPC Plc shall ensure the following: - Low-emission/high efficiency engines shall be used. - Regular maintenance of vehicles to ensure optimal performance - Movement of men and materials shall be properly coordinated to optimize vehicle use and resultant emissions. - Dust and particulate barriers shall be used during operation. - Avoid burning on site (i.e. zero burning).
Noise and vibration Noise emissions generated by heavy duty vehicles and workers activities and resultant	All	- Hearing impairment, hypertension, annoyance, sleep disturbance of site workers. - Hand-Arm Vibration Syndrome (HAVS)	OOPC Plc shall ensure the following: - Noise attenuation measures such as installation of acoustic mufflers on large engines and equipment; - Hearing protection shall be provided and usage enforced for workers on site. - Plantation operations will be during daytime only.
Water Quality and Hydrology Increased receiving water body turbidity from runoff and from the plantation.	All	- Illnesses including Typhoid, Cholera, Dysentery, Polio, Hepatitis	OOPC Plc shall ensure the following: - Stack demolition materials properly to reduce turbidity effect on surface runoffs;

Improper storage and handling of, hydrocarbons, fuel and other chemicals would inevitably result in spillage during construction activities.			OOPC Plc shall ensure the following: - Put in place adequate contingency measures to curtail accidental spills and ensure spill containment equipment shall be available at the construction site - In order to reduce ground contamination, an impervious sump or container shall be placed under the spigots of fuel drums to collect drippings. - Re-fuelling and maintenance of heavy construction vehicles at the site, shall be done at specified areas or makeshift "depots" where measures are in place to deal with spillages and temporary storage of oily waste. Preferably these depots shall be located in an area that would ultimately be permanently paved (e.g parking lots) thereby covering any contaminated soil. - A thick layer of sawdust or absorbent would be used to absorb any spillages. Subsequently, this layer shall be removed for proper disposal. In the event of a large spill, the latter will be cleaned up immediately by excavating the contaminated soil and removing it in a secure vehicle to an approved disposal site. - Nutrients (such as fertilizer and soil conditioner) application shall be during dry season.

Solid Waste - Solid waste constituting aesthetic nuisance - Sewage nuisance	All	- Improper solid waste handling can lead to the following: - Creating conditions favourable to the survival and growth of microbial pathogens - Causing infectious and chronic diseases especially the waste workers.	OOPC Plc shall ensure the following: - Waste is contained and removed regularly through its own waste management system already in place.
Hostility Land acquisition and take-over Conflicts between the communities and the company. Industrial disputes	Workers and communities	- Youth restiveness - Persistence conflicts between community and company - Hostages	OOPC Plc shall ensure the following: - Grievance and conflict resolution mechanism is instituted. - Employ as much local labour as possible. - Adequate stakeholders forum and information shall be given to stakeholders. - Adequate compensation shall be paid to permanent workers in case of any eventualities.
Health and Safety - Accidents, Vehicular, slips, falls, trips etc - Hearing impairment due to exposure to noise of heavy machineries - Improper storage and handling of hazardous materials (e.g agrochemicals, lubricants, fuels, etc), are potential health hazards workers Carcinogenic/Toxic/Chemical hazards: corrosive	All	Health hazards that can arise from poor health and safety include: - Occupational health problems such as terminal diseases and/or prolonged ill health - Permanent Loss Injury - Temporary Loss Injury	OOPC Plc shall ensure the following: - Wearing of ear protection. - Safe storage areas shall be identified and retaining structures constructed prior to the arrival of material. - Hazardous materials (e.g. agrochemicals, fuels) shall be properly stored in appropriate containers and shall be safely locked away. - Conspicuous warning signs (e.g. 'No Smoking') shall be posted around hazardous waste storage and handling facilities.

substances - Poor chemical handling - Asphyxiating atmosphere - Road Traffic Accident - Wrong use of PPE - Inadequate PPE - Inadequate equipment/surface guard on equipment - Low awareness			OOPC Plc shall ensure the following: - Guideline on safe handling of chemicals (SHOC) and appropriate PPE are provided. - Guideline on traffic control to ensure best traffic safety practices on the road. OOPC Plc shall ensure: - Awareness training - Sufficient PPE are provided OOPC Plc shall ensure: - Equipment specifications are made available. - Provision of adequate training to workers. - Provision of warning signs to workers and commuters.
Waste Management - Wastes constitute aesthetic and pollution issues for the project area - Accumulated waste could lead to contamination of soil/groundwater and breeding grounds for vectors and rodents	All	Health hazards associated with poor waste management include: - Skin and blood infections resulting from direct contact with waste. - Different diseases such as intestinal infections that result from poor waste management. - Genetic mutilation - Reduction in aquatic food supply - Disruption of food chain	OOPC Plc shall ensure the following: - A site waste management plans although already in place shall be prepared prior to project commencement. This shall include designation of appropriate waste storage areas, collection and removal schedule, identification of approved disposal sites, and system for supervision and monitoring. - Preparation and implementation of the plan shall be the responsibility of OOPC Plc with the system being monitored independently. - Waste generation shall be properly contained to avoid contamination of groundwater.

Sewage - Feacal aesthetic issues for the project area. - Spillage of septic liquor	Workers	- Cholera - Dysentry - Infectious and chronic diseases	OOPC Plc shall ensure the following: - Onsite toilets shall be made available for use
Socio-economic - Promiscuity - Sexual harassment - Youth Militancy - Unemployment - grievances	All	- Sexually transmitted diseases (STDs) - HIV/AIDS - Population explosion	OOPC Plc shall ensure the following: - Public enlightenment about potential health risks (STDs). - Facilitate education/enlightenment about the project and its nature. Appropriate policies
Workers' Welfare Especially when worker leaves the organization and/or layoff.	Workers	- Depression - Hypertension - Workers' restiveness	OOPC Plc shall ensure that: - Workers receive their full benefits when leaving the organization.
Corporate Image The negative corporate image arising from day-to-day activities of the organization,	Company /All	- Annoyance - Depression	OOPC Plc shall always: Ensure that its day-to-day activities and operations do not portend bad image about the organization to the general public and therefore operate according to the best industry standards and practice.

*** Totality of the Environment including flora and fauna and humans.**

Table 5-11: Checklist for Health Impact Assessment of the Proposed Project

	Effect on Health		
	Good	**None**	**Bad**
Employment	✓		
Income	✓		
Workplace	✓		
Housing	✓		
Transport	✓		
Built Environment		✓	
Air Pollutants			✓
Water pollutants			✓
Noise			✓
Amenity		✓	
Lifestyle	✓		
Social Cohesion		✓	
Parenting		✓	
Education	✓		
Use of health services	✓		
Other cause of public concern		✓	

The main negative impacts are health, safety, and pollution of air and surface water. However, mitigation measures will be put in place for health and safety through the provision of adequate and appropriate PPE. Similarly, there will be a buffer zone (50-150m) between planting areas and the water bodies and there will be minimal application of fertilizer and agrochemicals.

As a result of the above provisions and measures, the net health impact of the proposed project appears positive.

CHAPTER SIX

6.0 MITIGATION MEASURES

6.1 Introduction

The rationale for impact quantification and significance has earlier been discussed in the previous chapter. The results indicate the various components that would be impacted positively or negatively. In order to preserve the present integrity of the environment, certain steps have been recommended to mitigate or control the major negative impacts identified in this study. The control/mitigation measures have been based on the baseline conditions with regards to the biophysical environment, socio-economic and health status of the host communities. Also considered were the project activities and their envisaged impacts and concerns of stakeholders during consultation meetings and socio-economic/health status of the host communities. Mitigation measures are defined for the identified significant associated and potential impacts based on the following criteria:

- **Prevention –** design and management measures for ensuring that significant potential impacts and risks do not occur,
- **Reduction –** operational and management measures for ensuring that the effects or consequences of those significant associated and potential impacts that cannot be prevented are reduced to a level as low as reasonably practical (ALARP)
- **Control -** Operational and management measures for ensuring that residual associated impacts are reduced to a level as low as reasonably practical (ALARP).

Most of the significant environmental impacts that can likely arise from the construction and operation of the proposed oil palm development project can be mitigated once appropriate precautions are in place. The following tables define the environmental impacts, their sources and the recommended mitigation measures.

Table 6-1: Summary of Impact and Mitigation Measures (Pre-Construction Phase)

	Type of Impact	Residual Impact	Mitigation measures
Land Degradation or near sensitive habitats.	Siting the project on a sloping land may result in higher erosion potential. As a result of soil erosion, soil particles will be transported by run-off water and sediments will be fed into river system. Increased sediment load will induce migration of aquatic fauna. Degradation of sensitive habitats will result in loss of biodiversity and displacement of indigenous species.	High	There will be side pits excavated at intervals to collect soil particles including sediments to avoid sediment load of water bodies. Planting of cover crops (pureira and mucuna) on the exposed portions of the land.
Air quality	Dust and gaseous emissions from land preparation and vehicular emission leading to high suspended particulates in the atmosphere.	Low	OOPC Plc shall ensure the following: - Low-emission/high efficiency engines shall be used. - Regular maintenance of vehicles to ensure optimal performance - Movement of men and materials shall be properly coordinated to optimize vehicle use and resultant emissions. - Dust and particulate barriers shall be used during operation. - Avoid burning on site (i.e. zero burning).
Noise and vibration	Noise emissions generated by heavy duty vehicles and workers activities and resultant hearing impairment on site workers.	Low	OOPC Plc shall ensure the following: - Noise attenuation measures such as installation of acoustic mufflers on large engines and equipment; - Hearing protection shall be provided and usage enforced for workers on site.

Water Quality and Hydrology	Increased receiving water body turbidity from runoff from the plantation.	Low	OOPC Plc shall ensure the following: - Stack demolition materials properly to reduce turbidity effect on surface runoffs;
Solid Waste	- Solid waste constituting aesthetic nuisance - Sewage nuisance	Low	OOPC Plc shall ensure the following: - Waste is contained and removed regularly through its own waste management system already in place.
Hostility	Land acquisition and take-over. Conflicts between the communities and the company. Payment of severance to permanent workers.	High	OOPC Plc shall ensure the following: - Conflict resolution mechanism is instituted. - Employ as much local labour as possible. - Adequate stakeholders' forum and information shall be given to stakeholders. - Adequate compensation shall be paid to permanent workers eventualities.

Table 6-2: Summary of Impact and Mitigation measures (Construction Phase)

	Type of Impact	Residual Impact	Mitigation measures
Air quality	• Dust and gaseous emissions from land preparation leading to high suspended particulates in the atmosphere • Emission of CO and greenhouse gases	Low	OOPC Plc shall ensure the following: - Access roads and exposed ground are regularly wetted in a manner that effectively keeps down the dust. - Movement of men and materials will be properly coordinated to optimize vehicle use and resultant emissions. - Workers on the site are issued with dust masks during dry and windy conditions. - Low-emission/high efficiency engines shall be used. - Vehicles and machines are properly maintained and serviced. - Vegetation and combustible waste will not be burned on the site.
Noise and vibration	Noise emissions generated by construction activities and resultant hearing impairment on site workers.	Medium	- Construction activities that will generate disturbing sounds shall be restricted to normal working hours. - Noise attenuation measures such as installation of acoustic mufflers, on large engines and equipment; - Hearing protection shall be provided for workers on site.
Water Quality and Hydrology	Improper storage and handling of, hydrocarbons, fuel and other chemicals would inevitably result in spillage during construction activities	Low	OOPC Plc shall ensure the following: - Put in place adequate contingency measures to curtail accidental spills and ensure spill containment equipment shall be available at the construction site - In order to reduce ground contamination, an impervious sump or container shall be placed under the spigots of fuel drums to collect drippings. - Re-fueling and maintenance of heavy construction vehicles at the site, shall be done at specified areas or makeshift "depots" where measures are in place to deal with spillages and temporary storage of oily waste. Preferably these

			depots shall be located in an area that would ultimately be permanently paved (e.g. parking lots) thereby covering any contaminated soil. - A thick layer of sawdust or absorbent would be used to absorb any spillages. Subsequently, this layer shall be removed for proper disposal. In the event of a large spill, the latter will be cleaned up immediately by excavating the contaminated soil and removing it in a secure vehicle to an approved disposal site.
Erosion	Exposed soils which could leave them vulnerable to erosion.		OOPC Plc shall ensure the following: - Where possible, phase the site clearance exercise so as to reduce the amount of exposed soil at any given time. - Deliberately re-cover exposed soils with plants and other appropriate species (pureira and mucuna) as soon as possible. - Temporarily bund and redirect exposed soil and redirect flows from heavy runoff areas that threaten to erode. - Monitor areas of exposed soil during periods of heavy rainfall throughout the construction phase of the project - Construction of trap pits to collect top soils from being washed away.
Safety	- Accidents, Vehicular, slips, falls, trips etc - Hearing impairment due to exposure to noise of heavy machineries - Improper storage and handling of hazardous materials (e.g agrochemicals, lubricants, fuels, etc), are potential health hazards workers	Low	OOPC Plc shall ensure the following: - Wearing of ear protection. - Safe storage areas shall be identified and retaining structures constructed prior to the arrival of material. - Hazardous materials (e.g. agrochemicals, fuels) shall be properly stored in appropriate containers and shall be safely locked away. - Conspicuous warning signs (e.g. 'No Smoking') shall be posted around hazardous waste storage and handling facilities

Waste Management	- Wastes constitute aesthetic and pollution issues for the project area - Accumulated waste could lead to contamination of soil/groundwater and breeding grounds for vectors and rodents		OOPC Plc shall ensure the following: - A site waste management plans although already in place shall be prepared prior to project commencement. This shall include designation of appropriate waste storage areas, collection and removal schedule, identification of approved disposal sites, and system for supervision and monitoring. - Preparation and implementation of the plan shall be the responsibility of OOPC Plc with the system being monitored independently. - Waste generation shall be properly contained to avoid contamination of groundwater.
Sewage	- Feacal aesthetic issues for the project area. - Spillage of septic liquor	High	OOPC Plc shall ensure the following: - Onsite toilets shall be made available for use
Socio-economics	- Sexual laxity disruption - Youth - Militancy/unemployment/grievances		OOPC Plc shall ensure the following: - Public enlightenment about potential health risks (STDs). - Facilitate education/enlightenment about the project and its nature.

Table 6-3: Summary of Impact and Mitigation measures (Operation Phase)

	Type of Impact	Residual Impact	Mitigation measures
Air quality	- Fugitive emissions from tanks used to store petroleum and other hydrocarbon products. - Combustion emissions from exhausts of machines e.g. pumps power generating sets	Low	OOPC Plc shall ensure the following: - All flanges and vents shall be properly tightened to reduce fugitive emissions. - All systems shall be properly checked to ensure there are no leakages or losses. - All machinery and vehicles for the project shall have high efficiency burner to reduce emission of noxious gases. - Avoid all forms of burning (zero burning).
Solid waste and sewage	- Waste runoff flowing into the surface waters. - Solid waste constituting aesthetic nuisance. - Sewage nuisance.	Low	OOPC Plc shall ensure the following: - Waste is contained and removed regularly through its own waste management system already in place.
Health and Safety	- Carcinogenic/Toxic - Chemical hazards: corrosive substances - Poor chemical handling - Asphyxiating atmosphere - Road Traffic Accident	High	OOPC Plc shall ensure the following: - Guideline on safe handling of chemicals (SHOC) and appropriate PPE are provided. - Guideline on traffic control to ensure best traffic safety practices on the road
	- Wrong use of PPE - Inadequate PPE	High	OOPC Plc shall ensure: - Awareness training - Sufficient PPE are provided

	- Inadequate equipment/surface guard on equipment - Low awareness	High	OOPC Plc shall ensure: - Equipment specifications are made available. - Provision of adequate training to workers. - Provision of warning signs to workers and commuters.
Spills of hazardous materials Accidental spills or release of potentially hazardous materials within the plantation.	- Possible public health hazard if staff and the public come into contact with hazardous materials.	Low	- It must be ensured that all storage and disposal areas are well maintained to prevent accidental release of hazardous materials. - All storage would be provided with secondary containment and there should be provision for spill contingency plan and containment equipment. - The Emergency Response Plan will address potential spills and workers will be trained on the actions that are to be taken if such an event were to occur.
Oil/Fuel Spills Oil spills can occur within and outside the powerhouse, and the fuel and lubricant storage area.	Oil/fuel can enter the drainage system and contaminate the land and water.	Low	- The fuel storage tanks will be surrounded by a bund wall to contain up to 1.5 times the total storage capacity in case of a spill. - All wash down from inside the powerhouse will be directed to a sump equipped with an oil/water separator to trap and filter oil from wastewater before it is discharged to the drains. - Arrangements for the proper disposal of the waste oil collected in the oil/water separator will be made. - An emergency response plan will be developed with detailed procedures for preventing and handling spills.
Water Quality and Hydrology	Increased receiving water body turbidity from runoff from the plantation.	Low	OOPC Plc shall ensure the following: - Stack demolition materials properly to reduce turbidity effect on surface runoffs; - Adequate contingency measures shall be put in place to contain accidental spills, ensure spill containment equipment shall be available on site. - Quarterly monitoring of Surface River to ensure that eutrophication does not arise.

Workers' Welfare	Especially when worker leaves the organization and/or layoff.	High	OOPC Plc shall ensure that: - Workers receive their full benefits when leaving the organization.
Corporate Image	The negative corporate image arising from day-to-day activities of the organization.,	High	OOPC Plc shall always ensure that its day-to-day activities and operations do not portend bad image about the organization to the general public and therefore operate according to the best industry standards and practice.

Table 6-4: Environmental Impacts and Mitigation Measures Associated with Decommissioning of the Proposed Extension Two Project

ENVIRONMENTAL ASPECT	ENVIRONMENTAL IMPACTS	MITIGATION MEASURES
Air Pollutants Generation of dust during plantation crop destruction and also residues retained on the inner surface of the machinery may pose a health risk to the persons dismantling the plantation crops and its ancillary facilities. This risk could spread to the residences if particulates and PM_{10} in the residues are allowed to become airborne through a failure to contain the contaminated parts. Pollutants of particular concern in the residues include PCBs, dioxins and heavy metals.	May cause, contribute to and exacerbate respiratory illnesses. Possible adverse impacts include: • Deterioration of air quality, with particulates in particular causing, contributing to and exacerbating respiratory illnesses. The effect of toxins (persistent organic pollutants) such as dioxins and PCBs which have the greatest long term health effects on animals at the top of the food chain (such as humans) causing adverse effects upon reproduction and development, suppression of the immune system, disruption of hormonal systems, and cancer. Negative impacts on human health, flora and fauna and contamination of land and water from heavy metals	Follow approved decommissioning procedures.
Noise The dismantling and demolition of the plantation crops and its ancillary facilities will generate minimal noise.	The demolition activities are not expected to give rise to any significant noise impact and any associated noise would be for a temporary period.	Ensure good preparation according to the approved decommissioning procedures to ensure that schedule is adhered to. Use only hand-held tools.
Wastewater Though quantities of wastewater may be small, this needs to be appropriately contained to prevent release into any near-by waterways or leaching into soil.	Contamination of land and water.	Use water only if absolutely required. Convey wastewater to sewage/wastewater/effluent treatment facility.

ENVIRONMENTAL ASPECT	ENVIRONMENTAL IMPACTS	MITIGATION MEASURES
Solid Waste Large quantities of plantation trees of which are organic in nature pose no problems but the small quantities of steel, metal, wooden and concrete waste will be accumulated after demolition and dismantling of the machinery may be contaminated with residues of PCBs, dioxins and heavy metals.	Improper disposal of the scrap material obtained may cause: • Public health concerns for those that handle the waste or casually come into contact with it as a result of improper disposal. • Aesthetic problems. • Contamination of flora, fauna, land and water resources which in turn can cause bioaccumulation in the food chain.	Follow approved decommissioning procedures particularly the recommendations for disposal.

CHAPTER SEVEN

7.0 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLANS (ESMP)

Environmental monitoring will be required to monitor the effectiveness of the mitigation measures and to report to the regulatory agencies. Through sound environmental management, many avoidable adverse impacts from the construction and operation of the proposed plantation expansion project can be prevented.

7.1 Environmental Management and Monitoring – Construction

- All mitigation measures outlined in Table 6-2 will be adhered to by the plantation department of the company and contractors where applicable.
- The plantation manager and project coordinator will be responsible for ensuring that the mitigation measures are implemented.

7.2 Environmental Management and Monitoring – Operation

The following environmental management and monitoring measures will be implemented during operation of the plantation expansion project:

- All mitigation measures outlined in Table 6-3 will be adhered to by the Environment, Health and Safety department of the company.
- Emissions testing and reporting must be done in accordance with the regulatory requirements and record submitted to FMEnv.
- Fire prevention precautions must be in place as required by the State Fire Service.
- All fire-fighting equipment will be inspected and maintained regularly.
- Regular inspections will be conducted to verify the integrity of the fuel tanks. Written procedures governing the operation of the fuel tanks and precautions to be taken will be developed.
- An organizational structure shall be developed to implement the EMP, and personnel including the HSE manager, lab technologist, production and maintenance engineer and the company's environmental consultants will be involved in the implementation of the EMP.
- The occupational health, safety and environmental policies shall be implemented.

- Capacity building programme for plantation staff including awareness, in-plant training, seminars, workshops and short courses shall be undertaken regularly to enhance the implementation of the EMP.

7.3 Environmental Monitoring Programme

An environmental monitoring programme is required to set out the means to determine whether or not the project operates in line with the environmental quality standards established by the FMEnv. For the proposed project, the monitoring programme would cover a number of parameters including meteorology, ambient air quality, surface water quality, groundwater quality, vegetation (biodiversity), health indices and noise levels. The monitoring programme is scheduled in Table 7-1:

Table 7-1: Schedule of Environmental Monitoring

Parameter	Variables	Period
Meteorology	Rainfall, temperatures, Wind Speed, Sunshine Hours	Daily
Groundwater quality	pH, BOD, COD, microbiology	Quarterly
Surface water	pH, TSS, TDS, Heavy metals, THC, Pesticides, microbiology	Quarterly
Vegetation (Biodiversity Plot)	Monitoring of Wildlife (Biodiversity)	3-5 Years
Ambient Air Quality	CO_2, CO, NO_x, SO_x, VOC, Particulates	Quarterly
Noise Levels	Noise generating Facilities	Monthly
Health	Occupational diseases and/or Medical statistics	6 Months

Table 7-2: Environmental Management Plan for the proposed Oil Palm Development Project

Potential Impact	**Action that shall be taker**	**Responsibility for Mitigating Action**	**Monitoring of Mitigation/Impacts**	
			Parameter	**Timing & Frequency**
Excavated soil disposal	Efficient and constant removal from site	Plantation Manager, Supervisor; Project Coordinator/Engineer	Persistent accumulation	Daily and during site preparation
Accidents from heavy machinery movement and assemblage	a) Operators must wear PPE b) Traffic control into/out of site.	Project Coordinator/Engineer	Influx of machine and material movement into the site	Daily; Duration of site preparation.
Siltation of rivers	Creation of buffer Zone of about 50m along river banks	Plantation Manager / HSE department	Non compliance and poor plantation maintenance practice	Throughout project life span.
Water/Land Pollution from plantation maintenance.	a) Creation of buffer zone of about 50m along river banks.	Plantation Manager /HSE departme	Non compliance and poor plantation maintenance practices	Throughout project life span.
Particulate emissions to the atmosphere from all point operation sources	Particulates emission from generators shall be monitored quarterly	HSE department	Particulates in smoke	During operation quarterly
Water quality and other aquatic impacts	Quarterly analysis of borehole water and surface river.	HSE department	Drinking water parameters	Quarterly analysis during operations
Noise and Vibration	Site noise shall be minimized by implementing good working practices, installing acoustic mufflers in large machines. Equipment shall be maintained in good order	Project Coordinator/ Engineer/ HSE department	Excess of 90dBA levels at all work places and the powerhouse	Quarterly measurement and when desirable
Occupational Health effects on workers	OOPC Plc shall develop and implement its Occupational Health and Safety Policy to	Managing Director/ HSE Committee/ HSE department	Non compliance and poor housekeeping practices	Daily

	address hazards to workers			
Fire Hazards inside the plantation	Creation of fire belt along the plantation boundaries and constitution of fire surveillance team.	Plantation Manager /HSE departme	Burning activity around adjoining farms	Especially during dry season
Protected Vegetation	-Constant monitoring of conserved vegetation and habitats -Assessment of Wildlife status (flora and fauna).	Plantation Manager/HSE departmer	Encroachment and illegal logging and hunting.	-Regularly (Everyday) - Every 3-5 Years.

7.4 Social Impact Management Plan

The detailed mitigation measures are contained in the Social Impact Management Plan (SIMP) Table 7-3 below:

Table 7-3: Social Impact Management Plan (SIMP)

Action/Control to Mitigate	Responsibility	Timeframe
Mitigation Target: Avoidance of Loss of Farmlands and Destruction of Community Conservation Areas		
Aim to avoid loss of farmlands by individual farmers.	Okomu Oil Palm Company Plc	Prior to and during project development.
Where farmlands are to be converted to oil palm plantations, ensure that Free, Prior and Informed consent of farmers are obtained and appropriate compensations paid prior to conversion.	Okomu Oil Palm Company Plc	Prior to and during project development.
Continue engagement with local communities and develop and implement community engagement plan.	Okomu Oil Palm Company Plc and communities	Throughout the development and operation of the project.
Ensure HCV management recommendations are adopted and fully implemented.	Okomu Oil Palm Company Plc	Prior to and during project implementation.
Mitigation Target: To Eliminate or Minimize the Impacts of the Proposed Project on Food Security of the Area		
Implement the proposal to allocate part of the concession to the local communities for food crop farming or oil palm smallholders' scheme.	Okomu Oil Palm Company Plcand communities	Within the first 3 years of project implementation.
Assist the communities with procurement and distribution of agricultural inputs to boost agricultural production.	Okomu Oil Palm Company Plc	Within the first 3 years of project implementation.
Implement skills acquisition and vocational	Okomu Oil Palm	After the third year of

training for the communities aimed at improving the capacity of the people for increased agricultural production and improved livelihoods.	Company Plc	project implementation.
Mitigation Target: To Minimize Influx of Plantation Workers and its Implications on Communities' Family Structures and Social Networks		
Priority is given to host communities for all categories of workers to be recruited provided they have the requisite qualification and expertise.	Okomu Oil Palm Company Plcand communities	Throughout the project's life.
Develop database of local service providers and ensure they are informed of opportunities and tenders.	Okomu Oil Palm Company Plc	Within the first 3 years of project implementation.
Undertake orientation and induction on local communities' culture, tradition and values for workers from outside of the communities.	Okomu Oil Palm Company Plc and Community Liaison Officer (CLO)	Throughout the project's life.
Mitigation Target: To Avoid use of Hazardous Substances and Minimizing Water Pollution due to Agro-chemicals, Sewage from Worker's Camps and POME		
Minimal use of agrochemicals and only agro-chemicals registered by the National Environmental Standards and Regulations Enforcement Agency NESREA or those allowed under Nigerian laws should be used.	Okomu Oil Palm Company Plc	Throughout project life.
Develop and implement manual for the application and handling including disposal of agro-chemicals and hazardous waste.	Okomu Oil Palm Company Plc	Before planting and upkeep activities.
Application of agro-chemicals should be in strict compliance with manufacturer's instructions and specific Material Safety Data Sheet (MSDS).	Okomu Oil Palm Company Plc	Throughout project life.
Mitigation Target: To Avoid or Minimize the Exposure of Workers and Local Communities to Health and Safety Risk including HIV Aids		
Conduct risk assessment for all tasks and provide personal protective clothing to all workers.	Okomu Oil Palm Company Plc	At the commencement of operation.
Provide decent and adequate toilet and sanitation facilities for workers at all their camps and quarters.	Okomu Oil Palm Company Plc	During plantation development and construction phases.
Develop and implement waste management plans.	Okomu Oil Palm Company Plc	Throughout the project life.
Undertake regular medical check-up for workers.	Okomu Oil Palm Company Plc	Throughout the project life.
Formulate and release HIV/AIDS policy for workplace.	Okomu Oil Palm Company Plc and	Throughout the project life.

	Workers Unions	
Design and implement health education programmes for workers.	Okomu Oil Palm Company Plc	Throughout the project life.
Establish an in-plant clinic to provide healthcare services to workers and their families.	Okomu Oil Palm Company Plc	At commencement of project implementation.
Mitigation Target: To Minimize Impacts of Operations on Public Facilities and Structures		
Ensure that damage caused to public facilities are appropriately fixed and within reasonable timeframe.	Okomu Oil Palm Company Plc and contractors	Soon after damage is identified.
Identify and develop guidelines for key activities that have the potential to impact on public facilities	Okomu Oil Palm Company Plc	Before commencement of project implementation.
Regular and effective monitoring of operation's impacts on public facilities and infrastructure	Okomu Oil Palm Company Plc	To be part of monitoring.
Support to the development of public facilities and infrastructure (e.g. schools, roads, electricity, etc.)	Okomu Oil Palm Company Plc	Throughout project life.
Mitigation Target: To Maximize Local Employment and Ensure Reasonable Quality of Life and Working Conditions of Workers in Plantation and Mill		
Ensure workers' conditions of service including salaries and wages compare favorable as applicable in the oil palm industry in Nigeria.	Okomu Oil Palm Company Plc,service providers and contractors	Throughout project life.
Dialogue, engage regularly and communicate effectively with workers union.	Okomu Oil Palm Company Plcand Workers Union	Throughout project life.
Ensure workers have appropriate and safe means of transport to and from work site.	Okomu Oil Palm Company Plc	Throughout project life.
Adopt and implement mechanism for disputes and grievance resolution.	Okomu Oil Palm Company Plc	Throughout project life.
Mitigation target: To Avoid Displacement of Communities and People		
Take measures to avoid displacement of communities and people.	Okomu Oil Palm Company Plc	Throughout project life.
Obtain Free, Prior and Informed Consent where displacement of people and/or communities are necessary.	Okomu Oil Palm Company Plc	Throughout project life.
Pay appropriate and acceptable compensations where displacement of people and/or communities occurs.	Okomu Oil Palm Company Plc	Throughout project life.
Ensure that displacement of people and/or communities is carried out in accordance with Nigeria's legal requirements and international best practice.	Okomu Oil Palm Company Plc	Throughout project life.

Mitigation Target: To Avoid/Minimize Potential Impacts of Pollution, Safety, Noise and Dust and Damage to Roads caused by Heavy Vehicles and Construction Activities		
Ensure all vehicles are roadworthy and drivers receive road safety trainings.	Okomu Oil Palm Company Plc and contractors	Throughout project life.
Institute safe driving culture including sanctions for violators both inside and outside of the plantation.	Okomu Oil Palm Company Plc, customers and contractors	Throughout project life.
Maintain access roads to the plantation.	Okomu Oil Palm Company Plc	Throughout project life.
Undertake a noise mapping of the mill and workshop to identify areas with more than 90 decibels and monitor regularly.	Okomu Oil Palm Company Plc	Throughout project life.
Provide appropriate personal protective equipment (PPE) for all workers especially in the plantation, workshop and the mill.	Okomu Oil Palm Company Plc	Throughout project life.
Mitigation Target: To Avoid Plantation Development in High Conservation Value forests and other Ecosystems		
Ensure recommendations contained in HCV report are implemented to avoid development in HCV areas.	Okomu Oil Palm Company Plc, communities and contractors.	Throughout project life.
Collaborate with government institutions and the communities to conserve and maintain the integrity of HCV management areas.	Okomu Oil Palm Company Plc, Communities, LGAs and Edo State Government.	Throughout project life.
Restore where necessary any degraded HCV management areas	Okomu Oil Palm Company Plc	Throughout project life.
Mitigation Target: To Avoid Pollution or Destruction of Water Bodies and Riparian Vegetation		
Implement the environmental management plan (EMP) as approved by Federal Ministry of Environment.	Okomu Oil Palm Company Plc	Throughout the project life.
Comply with regulations relating to pollution and conservation of natural resources.	Okomu Oil Palm Company Plc and contractors	Throughout the project life.
Avoid environmental pollution at all workplaces.	Okomu Oil Palm Company Plc and contractors	Throughout the project life.
Obtain permits from regulatory bodies for effluent	Okomu Oil Palm	Throughout project life.

discharges and solid waste disposal.	Company Plc	
Monitoring:		
Monitoring of operations impacts on local communities and population.	Okomu Oil Palm Company Plc	3 Years after commencement, then bi-annual.
Implement the approved social impact monitoring programme.	Okomu Oil Palm Company Plc	Annually.

7.5 Emergency Response Plan

An emergency is any unplanned occurrence caused by either natural or man-made events which can lead to deaths, significant injuries, cessation of operations, physical or environmental damage and economic losses. Numerous events can lead to emergencies. These include:

- Fires
- Floods
- Communications failure
- Chemical spills
- Oil Spills
- Structural failure
- Civil disturbance

Emergency management is therefore critical to planning, mitigating, responding and recovering from the potential impacts of these events. The emergency management process however is very site specific and varies according to type of operations, geographic location, proximity to neighbouring communities and the history of such occurrences. Therefore, one of the first stages in developing an Emergency Response Plan (ERP) would be the identification of the potential hazards or threats to the facility, organisation or operation based on the above mentioned factors.

The Emergency Response Plan must be documented and cover all the areas mentioned above. In addition;

- The plan must identify the person(s) responsible for Emergencies and Safety. This person will keep the documentation updated (at least annually) and ensure that it is disseminated to all relevant persons.

- The plan must address the preparatory actions that must be taken in case of emergencies with forewarning such as hurricanes and responsibilities must be assigned.
- The plan should include actions that must be taken when a spill, riot or fire occurs. A safe area (muster) must be designated for persons to congregate during an emergency.
- A system must be in place to account for all staff members in an emergency with the appropriate responsibilities assigned.
- Drills must be conducted on a specified frequency (for example 3 times in the year for fire).
- The plan must include for fire-fighting equipment to be checked on a specified frequency by a competent entity.
- The plan must address clean-up measures after the emergency.

The Emergency Response Plan must be developed in consultation with FMEnv to ensure that it meets their requirements. The Emergency Response Plan for the plantation will form a part of the overall Emergency Response Plan for the company.

7.6 Decommissioning

7.6.1 Decommissioning of a Plantation Project

The approaches to the decommissioning of a plantation would involve the combination of the following activities/options:

7.6.2 Asset Recovery

This would be achieved through a reputable decommissioning services company. The company would offer to purchase the complete asset units or sale of the entire plantation. Assets recovery would be done such as to achieve maximum return for the assets within the specified time.

7.6.3 Dismantling

This is applicable to either the removal of installations or the 'un-building' of structures. Dismantling is generally achieved by a careful reversal of the construction process. Dismantling will be done to optimize asset recovery.

7.6.4 Demolition

Demolition usually applies to structures and plant which have reached the end of their working life, and must be carried out with a high degree of knowledge and expertise. The demolition techniques used include conventional, remote mechanical and the use of controlled explosive charges. However, demolition will not be applicable here as plantation crops can be destroyed and ancillary facilities can be dismantled, while the buildings can be converted for other uses.

7.6.5 Decontamination

Contamination and pollution of the soil and buildings can often be a major problem for those decommissioning industrial premises. The contamination may be in various forms i.e. solid, liquid, vapour, gas or powder. This contamination can be present in the air or on surfaces such as plant items or building fabric. Decontamination will be done according to procedure that will be approved beforehand by FMEnv.

7.6.6 Remediation

Ground remediation and regeneration package will form an integral part of the services to be performed by the company to be appointed for decommissioning.

7.7 Decommissioning Procedure

A decommissioning service company will be contracted to undertake the decommissioning. The company will prepare and submit a manual articulating the procedure and methodology of decommissioning, including approach, type of waste and disposal method. The procedure will be such as to minimize the adverse impacts associated with decommissioning and will be approved by FMEnv before commencement of decommissioning.

7.8 Possible Adverse Impacts on the Environment and Protection Measures

The significant environmental impacts and the mitigation measures that are associated with the decommissioning of the plantation project are presented in Table 6-4.

7.9 Forest Management Plan (FMP) of the Proposed Extension Two Oil Palm Development Project

A forest management/stewardship (FMP) plan is a working guide that allows the landowner to maximize a mix of forest benefits, including wildlife, timber, recreation, aesthetic value and other benefits. Because many changes to a forest are seen over time, a plan is essential to guiding the future of the forest land that is conserved on the proposed Extension Two project. The forest management plan will combine the natural and geographic characteristics of protected forest with OOPC Plc's interests and objectives to produce a set of forest management outcomes. It will be a technical document describing forest management objectives, strategies and commitments of OOPC Plc. Most important, the FMP will help to identify what can be done to enhance and protect the values and aspects, whilst also ensuring that the forest and its resources will be in good condition for future generations.

The major natural features are the riparian forests, which to achieve the objectives of FMP will be set aside for conservation. The proposed forest management plan to conserve the riparian forests of Extension Two will be a detailed document comprising three essential elements as follows:

- A thorough description of the property and the resources on the property
- A specific list of goals or objectives for management of the property, and
- A schedule of activities to be performed on the property to help realize goals and objectives.

The summary of the proposed forest management plan for Extension Two oil palm development is presented in Table 7-4.

Table 7-4: Summary of Forest Management Plan for the Proposed Extension Two oil palm project

Activity	Output	Action
Description of The Property: The management plan will describe protected forest in enough detail to identify	• The location and acreage of the property or portion to be managed. • A description of the topography (level, rolling, steep). • A description of the soils and the	Descriptions and Inventory shall be updated every 5 years.

specific opportunities to realize the objectives. The forest description also should help to identify limitations to management (for example, steep slopes that limit accessibility).	opportunities and limitations posed by the soils. • A description of planned or existing access (i.e., roads and tracks). • A description of the timber resources. This section should include the results of a detailed inventory of the trees in the forest, often referred to as a "timber cruise" or a "cruise." The description of the timber resources should include specific information about the sizes (diameters and heights), species, and ages of trees. Estimates of volumes and values of forest products also should be made. • A description of the wildlife resources in the forest. This section usually describes the food resources, water resources, and cover available for general groups or specific species of wildlife. • A description of other renewable and non-renewable resources of interest in the forest. This might include recreational and aesthetic values, minerals, oil and gas, and harvestable non timber forest products (NTFP). • A history of past and present activity in the forest. • A history of past fire, disease, insect, and livestock grazing impacts on the forest and some indication of future risk. • Maps clearly showing the forest boundaries, existing roads, streams, ponds, and ephemeral, or temporary, drainages.	
Identification of Goals and Objectives A clear understanding of goals and objectives are critical for the plan to be useful.	• Express and document goals. • Express and document objectives. • Communicate goals and objectives to all stakeholders.	Regularly consult with the communities and other stakeholders to see how to partner with them to achieve the objectives.

Schedule of Management Activities The management plan should include specific activities that will be conducted to help meet the objectives. In general, activities for the next 10-20 years should be discussed in detail.	• Plans and activities that help you achieve each management objective should be discussed in detail. • All of the costs and expected revenues associated with each activity should be estimated. • If timber management is one of the goals, a detailed timber management plan should be included. • If wildlife management is one of the goals, a habitat management plan should be included. • Best Management Practices (BMPs) and water quality issues should be discussed in detail. • A specific date for review of the plan should be made. The plan may need to be updated or modified during the course of management.	Protected areas and cultural sites shall be effectively protected. Regularly consult with the communities and other stakeholders to execute the management activities Review activities regularly
Monitoring Indicators of success should be defined for each management objective and then checked at regular intervals	• Management objective. • Indicator of success. • Responsibility. • Results.	On regular basis

CHAPTER EIGHT

8.0 CONCLUSION

The EIA process demonstrates that the Extension Two oil palm estate development project will fully comply with legislative requirements in Nigeria and other relevant international regulations applicable to the planned activities and operations.

The proposed project will result in substantial economic benefits for Nigeria through Employment opportunities generation in particular during the construction and operational phases.

This EIA also indicates that discharges including gaseous emissions and noise are expected from the operation of the plantation project. However, any such discharges, which can be considered as potential sources of adverse environmental effects, can be fully managed through preventive actions and mitigating measures. This means that no significant negative impact on the natural, health and social environmental sensitivities of the project area is expected to result from discharges, let alone the occurrence of a residual impact.

The study has gathered and analyzed some baseline data. The data seem adequate and have assisted to determine the natural and socio-economic status of the project environment and the kinds of effects and responses that may result from the interaction of the proposed project. However, the proposed project is not expected to have significant adverse effects on the natural, cultural, environmental and socioeconomic life in the project area.

The existing environmental management programme of OOPC Plc has put in place good solid waste management system, which will fully complement the waste management requirement of the proposed project.

The communities shall be carried along throughout the development of the project and shall be given employment opportunities appropriately during the project construction and operation.

There would appear to be no legal, administrative, natural and socio-economic limitations to prevent the proposed project from going ahead as proposed by

OOPC Plc. The project shall be implemented in accordance with the proposed environmental and social management plans (ESMP).

An EMP involving environmental management and supervision organizations, and environmental monitoring has been established to ensure the environmental performance of the Project. To ensure successful implementation of these measures, the EMP covers major relevant aspects such as institutional arrangement for environmental management and supervision and environmental monitoring. With implementation of the mitigation measures defined in the EIA and EMP, all the likely adverse environmental impacts associated with the project will be prevented, eliminated, or minimized to an environmentally acceptable level.

The Project is environmentally sound, and will promote balanced and environmentally sustainable operation of OOPC Plc. It is therefore recommended that OOPC Plc should implement the proposed Extension Two oil palm development project by fulfilling its obligations as outlined in the respective environmental and social management plans in this report.

References

Adejuwon, J.O. 1971. The ecological status of fresh water swamp savannas in the forest zone of Nigeria. *Journal of the West African Science Association.* 16(2), pg 133-154

Agboola, S.A. 1979. *An Agricultural atlas of Nigeria*. Oxford University Press, Oxford. 248pp

Ahn, M.P. 1970. *West African Soils*. Vol 1 Oxford University Press, London. 332pp

Allen J.R. 1965. *Late quaternary Niger Delta and adjacent areas: sedimentary environments and lithofaceies*. A.A.P.G. Bull. 49, 541-600.

Allison P.A. 1973. A historical sketch of the forests of Benin. *Bulletin of the Nigerian Forestry Departments* vol. 33 No. 1 1-30

Alloway, B.J. (ed) 1990. *Heavy metals in soils*. Blackie, Glasgow and London. 330pp.

APHA, 1985. *Standard methods for the examination of water and wastewaters 16th ed*. American Public Health Association, Washington D.C. 1268pp.

Boorman, J. 1991. *West African insects*. Longman, Essex,. 98pp.

Borror, D.J. and White, R.E. 1970. *A field guide to insects of America North of Mexico*. Houghton Mullflim Company, Boston, 403pp.

Davis, C.C. 1958. *The marine and freshwater plankton*. Michigan State University Press, Michigan. 562pp.

Federal Environmental Protection Agency (FEPA) 1991. *Guidelines and standards for Environmental Pollution Control in Nigeria*. Federal Republic of Nigeria.

Federal Environmental Protection Agency (FEPA) 1991. *National Effluent Limitations Regulations* S.I.8. Federal Republic of Nigeria.

Federal Environmental Protection Agency (FEPA) 1991. *Waste Management and hazardous waste regulations* S.I.15. Federal Republic of Nigeria.

Federal Government of Nigeria (FGN), 1985. *The endangered species Decree II* (Control of International Trade and Traffic), Federal Government of Nigeria.

Federal Military Government 1992. *Environmental Impact Assessment Decree No. 86* Federal Military Government of Nigeria.

Glendhill, D. 11991. *West African Trees*. Longman, Essex. 67pp.

Hill, F.W. 1952. *Economic Botany*. 2nd edn. MacGraw-Hill, NewYork.

Hendy, N.I. 1964. *An Introductory account of small algae of British coastal waters*. Fishery investigation. HMSO. London. Part iv. 317pp.

Holden, M. and Reed, W. 1991. *West African freshwater fish*. Longman, Essex. 68pp.

Hutchingson, J. and Daiziel, J.M. 1952-1974. *Flora of West Tropical Africa*. Crown Agents for Overseas Government and Administrations. London

International Union for the Conservation of Nature, IUCN 1992. *Red List of Threatened Species*. Gland, Switzerland.

Kinako, P.D.S. *Structure and function of some Nigerian wetland ecosystems in Nigeria Nigeria wetlands*. Akpata, T.V.I., Okali, D.U. (eds). Man and Biosphere, Lagos, pp48-54

Leopold, L.B., Clarke, F.E., Henshaw, B.B. and Balsley, J.T. 1971. *A procedure for evaluating environmental impacts*. Geological survey circular 645. Government Printing Office, Washington, D.C.

Madge, D.S. AND Sharma, G.D. 1969. *Soil Zoology*. Ibadan University Press, Ibadan.

Olaniyan, C.I.O. 2975. *An introduction to West African Animal Ecology*, 2nd ed., Heinemann Educational Books, Ltd, London. 170pp.

Slingsby, D. and Cook, C. 1989. *Practical ecology*. Macmillan Education, Bainstoke. 210pp.

Southwood, T.R.E. 1992. *Ecological Methods* 2nd ed., Chapman and Hall, London.

Wood, C. 1996. *Environmental impact assessment*. *A comparative review*. Longman, Harlow Essex, 337pp.

World Bank, 1991. Operational directive 4.01 Annex C. *Environmental Management Plan*. The World Bank Operational Manual.

World Bank 1995. Plantation and large scale agricultural development Annex E.: *Defining an environmental development strategy for the Niger Delta*. Vol. 11, pp 17-21. Industry and Energy Operations Division. West Central Africa Department.

ANNEXURE I

APPROVED TERMS OF REFERENCE

FEDERAL MINISTRY OF ENVIRONMENT

Environment House

Independence Way South, Central Business District, Abuja - FCT.
Tel: 09-2911 337 . www.environment.gov.ng, ea-environment.org

ENVIRONMENTAL ASSESSMENT DEPARTMENT

FMEnv/EA/EIA/2712/Vol.1/82
8th January, 2014.

The Managing Director,
Okomu Oil Palm Company Plc.
Okomu-Udo, Ovia South West LGA,
P.M.B 1449, Benin City,
Edo State.

RE: ENVIRONMENTAL IMPACT ASSESSMENT (EIA) OF THE PROPOSED OIL PALM ESTATE DEVELOPMENT IN EDO STATE.

Please refer to your letter dated 23rd July, 2013 and the Ministry letter ref. FMEnv/EA/EIA/2712/vol.1/13 dated 28th August, 2013 on the above project.

2. Following the conclusion of site verification exercise, the Ministry has placed the project in Category One (1) requiring EIA mandatory studies and a panel review process. Please be informed that the Terms of Reference submitted to the Ministry should address all identified issues that are relevant to the project during the scoping workshop.

3. The field data gathering and laboratory analyses of the environmental component of the study which will be Two (2) seasons include the underlisted as minimum. The sampling point should be geo-referenced with coordinates in UTM format and tables in spread sheet (excel).

S/N	ENVIRONMENTAL PARAMETERS.	PARAMETER DETAILS	NUMBER OF SAMPLES/ DISTRIBUTION	PARAMETERS TO BE MONITORED.
1	**Climate/ Meteorology**	Microclimate/ Regional Climatic features	In-situ measurement, secondary data	Temperature, Rainfall, Relative humidity, Wind direction and speed, visibility, cloud cover and their local effects.
2	**Surface water**	Physico-Chemical & Microbial, fisheries and plankton	10 nos. in each water body + control sample	Colour, pH, turbidity, Salinity, hardness, heavy metals – Cu, Pb, Fe, DO, BOD, COD, THC, Electrical conductivity, Phosphate, SO_4, NO_3, TSS. Microbiology – (faecal coli form, total coliform, total plate), water body depth and width, flow direction and flow rate, fisheries and fish spawning areas, planktons, benthos, aquatic macrophyte and hydrodynamics.
3	**Ground water**	Physico-chemical &	2 no. + control sample	Depth to and thickness, hydraulics, recharge and, uses.

		Microbial.		Colour, pH, turbidity, Salinity, hardness, heavy metals - Cu, Pb, Fe, K, Ba, DO, BOD, COD, THC, Electrical conductivity, Phosphate, SO_4, NO_3, TSS.
4	**Soil**	Physical	20 Nos. + controls samples	Profile (depth, type) colour, permeability, porosity, bulk density, texture (grain size).
		Chemical	20 Nos. + controls samples	Heavy metals (V, Ni, Fe, Pb, Cu, Zn),pH, moisture content, sulphate, nitrate
		Soil Microbiology	20 Nos. + controls samples	Total heterogenic bacteria (total hydrocarbon, T. fungi, total hydrocarbon bacteria (THB), faecal coliform.
5	**Land Use**	Land cover	-	Land Use types: Recreational, agricultural, forestry, industrial, residential, institutional, commercial. Trends etc
6	**Ambient Air Quality**		10 Nos. (in-situ @ different elevations)	Suspended particulate matter, NO_x, SO_x, CO_2, CO, VOCs, H_2S.
7	**Noise**	Noise level	10 Nos. (in-situ)	Db
8	**Ecology**	Vegetation		Flora and fauna, Habitat status, floral composition, density and distribution, vegetation structure, plant pathology
9	**Geology**	Local and regional		Stratigraphy, structure, fractures patterns, flow direction, aquifer level, Regional geology, Stratigraphic/Lithologic properties
10	**Socio-Economic**			Education, culture, distribution of livelihood, land use, etc. with structured questionnaire administration.
11	**Health Impact Assessment**			Health status and prevalent diseases within and around the project area and host community.

You are to facilitate the participation of Ministry officials and also ensure full quality assurance/quality control (QA/QC) measures for the laboratory analyses in line with standard practices. You should notify the Ministry in good time to enable us plane our participation in the field work.

5. I am further directed to request you to pay the sum of Five Hundred Thousand Naira (500,000:00) only in bank draft to the Ministry, as the Initial processing fee. Upon completion of the EIA studies, you are to submit Five (10) hard copies and One (1) soft copy of the draft EIA report to the Ministry.

6. Thank you for your co-operation.

J.A. Alonge
For: Honourable Minister

ANNEXURE II

INTERIM APPROVAL

FEDERAL MINISTRY OF ENVIRONMENT

Environment House

Independence Way South, Central Business District, Abuja - FCT.
Tel: 09-2911 337 www.environment.gov.ng, ea-environment.org

ENVIRONMENTAL ASSESSMENT DEPARTMENT

Ref: No. FMEnv/EA/EIA/123:271/Vol.1/28

Date: 22nd September, 2015

The Managing Director,
Okomu Oil Palm Company Plc.,
Okomu-Udo, Ovia South West LGA,,
P.M.B. 1449, Benin City,
Edo State.

Attention: Managing Director, Okomu Oil Palm Company

INTERIM ENVIRONMETNAL IMPACT ASSESSMENT (EIA) FOR THE PROPOSED OIL PALM ESTATE DEVELOPMENT PROJECT IN OVIA NORTH EAST/UHUNMODE L.G.A. EDO STATE

Please refer to your request for an Interim EIA approval for the above project.

2. I am directed to convey the Ministry's Interim EIA Approval subject to the following conditions.

i. The Interim EIA Approval is for the preliminary development activities only.
ii. The validity for the Interim approval is three (3) months only.
iii. The EIA shall be carried out to its logical conclusion.
iv. There shall be continuous consultation with relevant stakeholders.

3. Thank you for your co-operation.

J. A. Alonge
Director, Environmental Assessment Dept.
for: Honourable Minister

APPENDIX I

SOCIAL IMPACT ASSESSMENT REPORT

OKOMU

THE OKOMU OIL PALM COMPANY PLC

(RC 30894)

PROPOSED EXTENSION TWO OIL PALM DEVELOPMENT PROJECT

SOCIOECONOMIC AND SOCIAL IMPACT ASSESSMENT (SIA)

FINAL REPORT

Prepared by

FOREMOST DEVELOPMENT SERVICES LIMITED
21 Mercy Eneli Street, Surulere, Lagos. Tel: +2348033314800, +2348022236228
Email:foremost.development@gmail.com, Website: www.foremostdevelopmentservices.com

DECEMBER, 2014

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ACRONYMS

BOD	-	Biological Oxygen Demand
EFB	-	Empty Fruit Bunches
ESG	-	Edo State Government
FFBs	-	Fresh Fruit Bunches
FGDs	-	Focus Group Discussions
FGN	-	Federal Government of Nigeria
FPIC	-	Free Prior and Informed Consent
HCVs	-	High Conservation Values
HCVF	-	High Conservation Value Forest
IFC	-	International Financial Cooperation
LGA	-	Local Government Area
MDGs	-	Millennium Development Goals
NDDC	-	Niger Delta Development Commission
NSE	-	Nigerian Stock Exchange
OOPC	-	Okomu Oil Palm Company
POME	-	Palm Oil Mill Effluent
PRA	-	Participatory Rural Appraisal
RSPO	-	Roundtable on Sustainable Palm Oil
SIA	-	Social Impact Assessment
SIMP	-	Social Impact Management Plan
ONELGA	-	Ovia North East Local Government Area
ULGA	-	Uhumwonde Local Government Area

SIA Study Team

Facilitator: F. A. Afolabi

Team Lead: Professor (Mrs)KokunreAgbontaen-Eghafona; Dr. Samuel O. Fadare

Team Members: Godson Ilevbare; Augustine Alenkhe; JimohAwarra; Clement Imoh

Local Guide: Mr. Phillip

EXECUTIVE SUMMARY

Extension Two is the name of the partly developed plantation that has just been acquired by Okomu Oil Palm Company Plc. The Socio-Economic survey and Social Impact Assessment study was desirable to provide baseline social and socio-economic data required by the company to plan and take the necessary actions in relation to the communities that are located within the area of influence and that would be affected by the proposed Extension Two Oil Palm Development Project.

The study involved the processes of analyzing, monitoring and managing the intended and unintended, both positive and negative social consequences, of the proposed development and the social change processes that may result from it. Its primary purpose is to bring about a more equitable and sustainable biophysical and human environment. The affected communities of extension Two are ten (10) in number cutting across two Local Government Areas of Ovia Northeast Local Government Area (ONELGA) and Uhumwonde Local Government Area (ULGA) of Edo state, Nigeria. Quantitative and qualitative data gathering were the two main methodologies adopted for the study.

In accordance to the guidelines, the SIA engaged all relevant stakeholders in consultations and public hearings through FGD; provided a detailed description and analysis of the social pre-project baseline situation as a basis for development, mitigation and future monitoring, also provided an assessment based on collected baseline data to identify both positive and negative social impacts. The assessment as well focused on the optimization of positive impacts and mitigation against negative impacts from the proposed plantation activities throughout the project lifetime; and finally development of a Social Action Plan.

It was obvious that all the ten affected communities of the proposed Extension Two project have been kept out the scheme of things by the previous owners and developers of the plantation before the coming of Okomu Oil Palm Company Plc. There were also many evidences of government neglect; the communities really need government attention as they lack virtually all the desirable basic infrastructure needed.

The result of baseline situation in relation to the affected communities can be summarized as that the ten communities have similar culture in the way of greetings, marriage, tradition and other norms and values and they tend to be more bonded by the common interests they share as farmers. It is their belief that River Owan-"is not friendly to strangers" – hence, it is advised that strangers beware.One of the major problems in some of the communities is soil erosion and flooding. During the peak of rainy season the western part of Owan land is cut off from the community for about three months. The physical safety of most of the communities is threatened at a particular period of the year because of the activities of armed Fulani Herdsmen who without regard enter into farmlands with their cattle, and when challenged for this provocative action they either attack the males or rape the females.

Some of the potential positive socio-economic benefits of Extension Two include creation of employment, introduction of high yielding varieties of oil palm and sustainable management of palm plantation practices, training and capacity building for employees and smallholders, revenue to local communities through royalties payment to landlord communities, tax revenue for the Edo state government and commercial opportunities for small and medium scale enterprises including petty trading.

While some of the potential negative impacts envisaged by community stakeholders include; Loss of farmlands, community conservation and forest products collection areas, Impacts on food insecurity and prices of food products, Influx of plantation workers and potential impacts on family structures and social networks, Water pollution due to agro-chemicals, sewage from worker's camps and Palm Oil Mil Effluent (POME), Pollution from hazardous substances, Exposure to health risks (e.g. HIV), Adulteration/destruction of indigenous cultural values, Impacts of operations on infrastructure (roads, water) and Potential conflicts with farmers whose farmlands have been taken over and provide proper resettlement plan in the action plan designed for them.

The following management and mitigation measures have been suggested for adoption and implementation to address the significant potential social impacts in order to make the proposed Extension Two project socially acceptable and beneficial. These include; Proper community engagement, Implementation of FPIC, Avoidance of displacement of communities and people,

Ensuring proper participatory disengagement and payment of compensation to farmers using the land, Prevention of pollution of water resources and corporate social services to communities and diligent implementation of social impact management plan.

1.0 INTRODUCTION

1.1 Background Information

Okomu Oil Palm Company was established in 1976 as a Federal Government pilot project aimed at rehabilitating oil palm production in Nigeria. At inception, the pilot project covered a surveyed area of 15,580 hectares out of which 12,500 hectares could be planted with oil palm. It was incorporated on December 3, 1979 as a limited liability company.

The privatisation of the Okomu Oil Palm Company Plc has been a great success and a huge encouragement for the Nigerian agricultural sector for the future, with profound positive consequences of stable socio–economic growth for the region where it is implanted. The success of the company was further exemplified by the strong increase of its net income which allowed doubling of its dividend. This company has consistently posted huge profits in the last 10 years, a period during which most other agricultural initiatives in the country had either folded up or were performing sub-optimally.

Just as it is expanding in size, its corporate environment is also expanding. Currently, the company employs over 800 permanent and several independent sub-contractors. All these have added up to place it on top in the burgeoning oil palm business.

In its expansion drive to increase the local supply of crude palm oil in Nigeria, the company acquired A &Hatman plantation of about 11,400 hectares. The A &Hatman plantation comprises planted area of less than 1,000 hectares while over 10,000 hectares is unplanted land. This new acquisition is called Extension Two.

In consideration of the requirements of the Roundtable on Sustainable Palm Oil (RSPO)for new oil palm plantation, Okomu Oil Palm Company Plc in its usual standards and application of best management practices in oil palm production has commissioned this socioeconomic and social impact assessment study of the proposed Extension Two project prior to the commencement of the development in order to establish the baseline social conditions of the communities that fall within the area of influence and hence could be affected by the project.

1.2 Social Impact Assessment (SIA) Objectives

The major objective of the Social Impact Assessment (SIA) is to identify the sensitive elements existing in the project environment, determine the project components likely to affect the environment, assess the importance of such impacts and recommend mitigation measures and actions, where necessary.

Specifically, the SIA for the proposed Extension Two project is prepared to;

- Identify and analyze social impacts;
- Recommend initiatives to build on opportunities;
- Help to mitigate adverse social impacts;
- Help to preserve cultural values and traditions; and
- Help to realize sustainable development opportunities.

2.0 Project Location

The proposed Extension Two project area is located across two Local Government Areas namely; Ovia North East and Uhunmwonde Local Government Areas (LGAs) of Edo State, Nigeria. The project site of approximately 11,400 hectares lies specifically between Latitude $6^0$38’ 37’’N and 6^0 47’ 31’’N and Longitudes 5^0 48’ 5’’E and 5^0 54’ 39’’E. It is located about 2 kilometers from Uhiere junction along Benin-Akure Road. The location map is presented in Map 1.

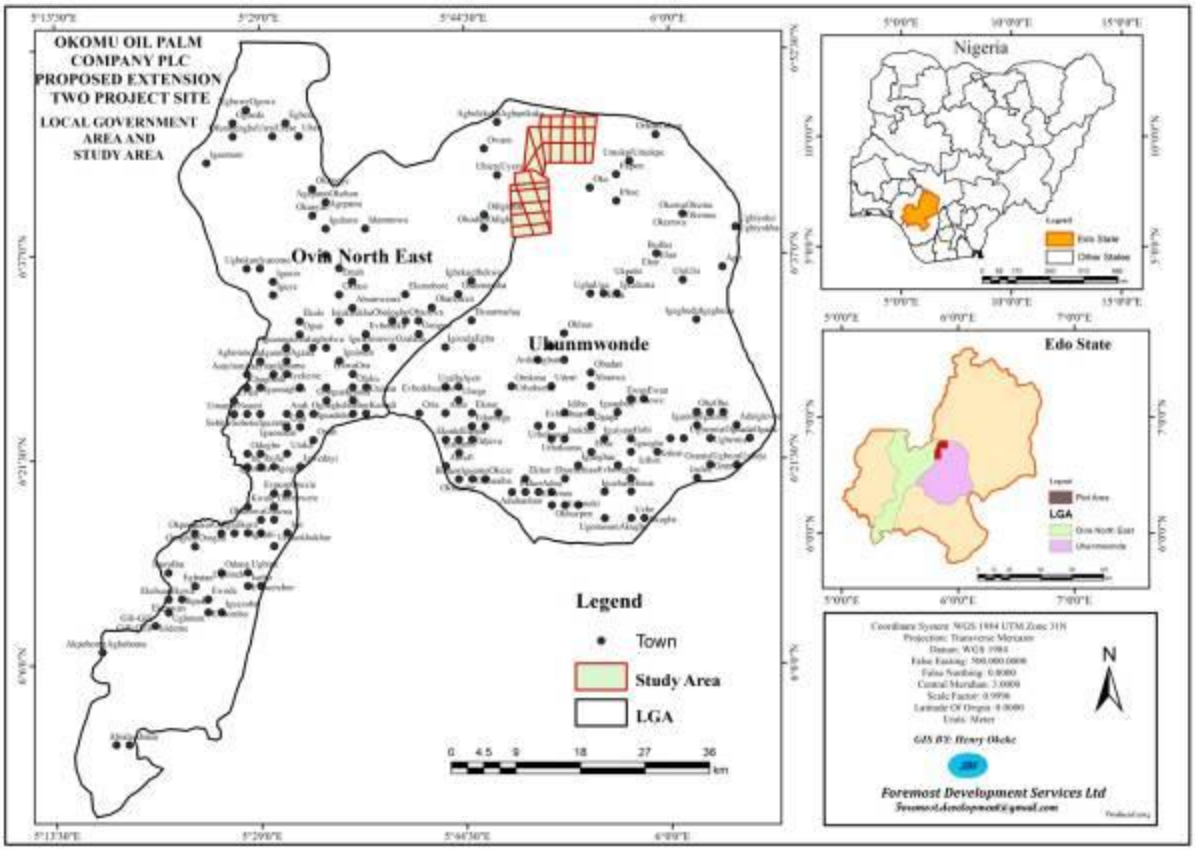


Figure 1: Project Site Location Map in relation to Nigeria, Edo State and Host Local Government Areas

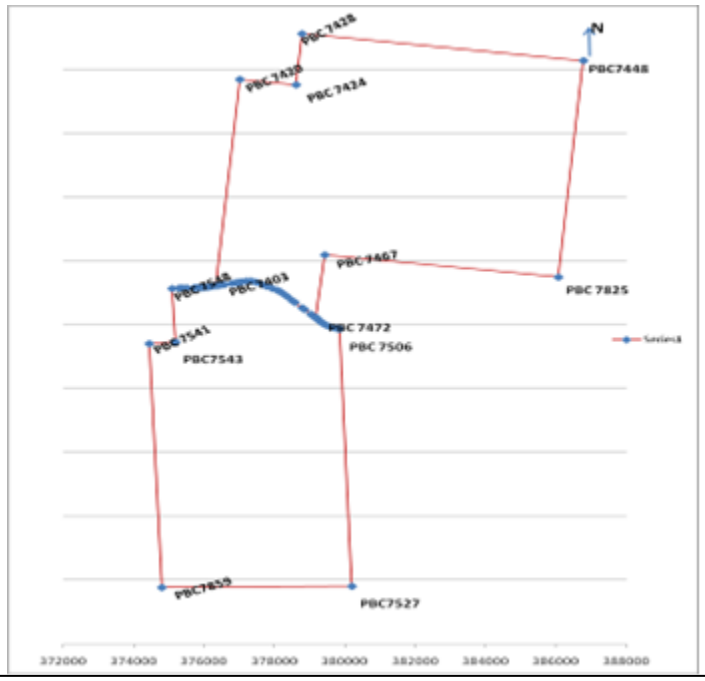


Figure 2: Survey Map showing the boundaries of Extension Two

Extension Two Communities

There are ten communities surrounding Extension Two. The respective locations of the communities in relation to Extension Two are as follows:

2.1 Agbanikaka Community

Agbanikaka, which translates to "The Land of Peace", is an Uhobe community in Ovia North East Local Government Area in Edo State, Nigeria. The community is in the North-West of the Extension and shares boundaries with Sabogida, Ijagba, Owan, and Sobe in the North, South, East and West respectively.

2.2 Owan Community

Owan, which translates to "The land that protects its children", is an Uhebe community in Ovia North East Local Government Area in Edo State, Nigeria. The community is in the North-West of Extension Two, and shares boundaries with Sabongida, Ofutabe, Uhiere, and Agbanikaka in the North, South, East and West respectively.

2.3 Uhiere Community

Uhiere, which translates to "The Land of Peace", is an Ishan community in Ovia North East Local Government Area in Edo State, Nigeria. The community is in the West of the project site and shares boundaries with Oke, Ofutabe, Odigwetue and Owan, in the North, South, East and West respectively.

2.4 Odiguetue Community

Odiguetue, which translates to "The Land of dignity", is an Edo community in Ovia North East Local Government Area in Edo State, Nigeria. The community is in the South-West of the project site and shares boundaries with Okokhuo, Oke, Uhiere and Odighi in the North, South, East and West respectively.

2.5 Odighi Community

Odighi, which translates to "The Land of honey", is an Ozoguo community in Ovia North East Local Government Area in Edo State, Nigeria. The community is in the South-West of the

project site and shares boundaries with Idunmowo, Oke, Osasimoba, and Uhiere in the North, South, East and West respectively.

2.6 Ihrue Community

Ihrue, which translates to "The Land of evil blood", is a Benin community in Uhunmwonde Local Government Area in Edo State, Nigeria. The community is in the East of the project site and shares boundaries with Oke, Iruekpe, Ekpan and Ikhuo in the North, South, East and West respectively.

2.7 Oke-Irhue Community

Oke, translates to "The Land surrounded by hills", is a Benin community in Uhunmwonde Local Government Area in Edo State, Nigeria. The community is in the East of the project site and is one of the oldest communities based on oral history.

2.8 Ekpan Community

Ekpan, which translates to "The Land of Peace", is a Benin community in Uhunmwonde Local Government Area in Edo State, Nigeria. The community is in the East of the project site. The community which is about 2 square kilometers in size (in-dwelling) is made up of four quarters namely Dumeso, Idueke, Ukpoka and Egohie. It shares boundaries with Isa West, Owan, Irhue and Umukpe-Irhua in the North, South, East and West respectively.

2.9 Umuokpe Community

Umuokpe, which translates to "The Land of Prosperity", is a Benin community in Uhunmwonde Local Government Area in Edo State, Nigeria. The community is in the North-East of Extension Two. It is about 2 square kilometers in size (in-dwelling) and is made up of three quarters and seven compounds. The community shares boundaries with Orhua, Ekpan, Isan West and Owan in the North, South, East and West respectively.

2.10 Orhua Community

Orhua, which translates to “The Land of humility”, is a combination of Ishan and Benin community in Uhunmwonde Local Government Area in Edo State, Nigeria. The community is in the North-East of the project site and shares boundaries with Iruekpen, Umuokpe, Isan West and Owan in the North, South, East and West respectively.

3.0 Brief Project Description

The proposed project is a new acquisition by Okomu Oil Palm Company Plc totaling 11,400 hectares of land. The land has been partly developed into oil palm plantation and palm oil mill upon acquisition. The company intends to expand and fully develop the land into an oil palm estate. Apart from the extensive oil palm plantation, the other developments shall include; palm oil mill, earth roads, housing, workshop and powerhouse.

The proposed development will be done in phases, with the first planting intended for 2015 and subsequent plantings phased over five years to terminate in 2020. The planting materials to be used for the oil palm plantings will be sourced from the Nigerian Institute for Oil Palm Research (NIFOR) and other verifiable sources. The types and varieties of the planting materials will be those that are high yielding and very well adaptable to the Nigerian environment and local conditions.

The products of the plantations including palm oil and palm kernel oil will be sold to the downstream industrial operators for further processing and manufacturing purposes.

The project will generate substantial organic solid waste. The bulk of the organic waste will be managed by recycling within the plantation. The operation of the project will also generate liquid waste (effluent). The liquid effluent will initially be impounded in serial ponds and later treated by anaerobic digestion to produce biogas and electricity.

4.0 Study Approach and Methodology

Methodology adopted for the study in the selected communities involved triangulation of various sources of data with the use of tools relevant to Participatory Rural Appraisal (PRA) and Socio-Economic Assessment.

The following steps were undertaken at ensuring the successful outcome of the study:

- Formal stakeholders' meetings with the ten local communities of the proposed Extension Two.
- Scoping: This is the process of identifying, defining and prioritizing the social components to be addressed in the social assessment. The impact of the proposed Extension Two was assessed in terms of the following impact criteria:

  - ✓ *Scale*: Physical scale/areas which the impact would be felt (local or regional).
  - ✓ *Duration*: Length of time the impact would likely be felt (short term, medium term and long term).
  - ✓ *Severity*: The intensity of the impact.
  - ✓ *Direction*: Whether the impact would be positive (beneficial) or negative (adverse)[i].

4.1 Data collection

To facilitate accurate information dissemination from each community,

- structured check-lists were used to enlist information and data in the ten communities as well as other internal and external stakeholders of the respective communities such as community executives, Local Government representatives, CBOs and NGOs, and so on.
- Interview of key informants in each community to obtain divergent views on the issues at stake and how to address them.

4.2 Review of relevant document

Secondary data were gathered from journals, archives, publications and internet. The gathering and review of published and unpublished baseline/project data were not left out.

4.3 Delineation of study area for assessment

Delineation can be viewed as description, explanation and marking out of the study area for assessment. Initially five communities in the west of the project site were scheduled for assessment because of their location along Benin-Akure road while the other five communities which are in the east of the project site and somehow interior were scheduled to be assessed later but field reality did not permit it. This field reality included local politics, availability of stakeholders, market day and people's livelihood and misconception of the Extension Two project and the SIA study team. At last the study team adopted flexibility to achieve the study objectives as enumerated under the field work section.

4.4 Field Work

Socio-economic survey and SIA of the proposed project communities were concurrently conducted as outlined in Table 1.

*Table 1:***Schedule of SIA exercise**

Communities	**SIA Field Exercise**	**Attendance**	**Checklist authentication**
Agbanikaka	18th March, 2014	27	Ikpefuran Sunday - 08038157678
Owan	19th March, 2014	28	Elder Clement Ugboiyobo
Uhiere	20th March, 2014	35	FranciseObanor - 08182731748
Odigwetue	20th March, 2014	36	John Ehigia - 08182401090
Odighi	24th March, 2014	27	Flamingo Dajide - 08077220988
Oke- Irhue	20th March, 2014	53	Ohiengbe Sylvester - 08134266005
Ihrue	24th March, 2014	15	Samuel Alohan (08031259221)
Umuokpe	25th March, 2014	15	(Community Secretary - 08086792306)
Epkan	24th March, 2014	13	Matthew Omoniyi (07031259895)
Orhua	25th March, 2014	10	O.C. District Forest Chairman - 08066318167

Preparation of this report has included the following stages:

4.5 ***Scoping exercise***

The scoping exercise was undertaken between Monday, 17th March and Tuesday, 8th April, 2014. This involved field visits and the gathering and review of published and unpublished baseline/project data. The scoping identified the key social impacts and directed the detailed assessment for the project. This SIA therefore considers the potential social impacts of the proposed project activities, as identified within the scoping stage of the project, through construction, operation and decommissioning.

Potential Impacts were identified from critical analysis of the proposed operation in relation to their environment setting.

Mitigation measures are proposed programs or processes to be implemented to eliminate or minimize the potential impacts identified for each system studied. The nature of the predicted impact is described and its significance determined by reference to appropriate standards or guidelines.

Social Management Plan encompasses all aspects of mitigation, management, monitoring, and institutional measures.

4.6 ***Duration of Study***

The socioeconomic and social impact assessment study including data collection and fieldwork in the ten communities was conductedbetween March and May 2014.

4.7 ***Assumptions and limitations***

The initial dates and time slated for SIA study activities in Oke-Irhue community was altered by non-availability of the acting community chief and opinion leader, which necessitated the change of dates and timing. On arrival on the appointed date, there was division among the community representatives whether to allow the exercise or not. Their reason was that the company had already started destroying their farmlands and/or crops with bulldozer as they were marking round the plots without recourse or compensation to them. The team was dismissed summarily when the tension was rising. All the four adjacent communities to Oke-Irhue had a consensus

meeting not to cooperate with the team as a show of solidarity to Oke because of that belief, which was later discovered to be erroneous. Therefore, there was little success in enlisting information from those communities and their attendance was not encouraging.

In addition the road terrain of five communities especially along Oke side was terrible and dusty; and the only means of effective transport is motor cycle with exorbitant fares.

SECTION A

SOCIOECONOMIC ASSESSMENT

5.0 GENERAL BASELINE SOCIOECONOMIC CONDITIONS

5.1 Household Demographics

From communities sources the demographic data are summarized in Table 2 below while the cumulative population of all the affected communities is **25,500**. A dominant feature of the structure of the population of the Extension Two affected communities is its significant level of young people with over 80% of the population below the age of 45 years. Adults in the age group 45 years and above constitute about 16 % of the population.The male to female ratio is more or less even.

Table 2: Demographic Data

s/n	Community	Children	Youth	Adult	Total	LGA	Male	Female
1	AGBANIKAKA	1,200	800	300	2,300	OVIA NORTH EAST	1,300	1,000
2	OWAN	1,500	1,000	500	3,000	OVIA NORTH EAST	1,400	1,600
3	UHIERE	600	1,200	200	2,000	OVIA NORTH EAST	1,000	1,000
4	ODIGWETUE	1,500	2000	1000	4,500	OVIA NORTH EAST	2,200	2,300
5	ODIGHI	1,000	1500	500	3,000	OVIA NORTH EAST	1,400	1,600
	SUB-TOTAL	**5,800**	**6500**	**2500**	**14,800**		**7,300**	**7,500**
6	IHRUE	400	800	300	1,500	UHUNWONDE	800	700
7	OKE-IHRUE	2,000	1600	400	4,000	UHUNWONDE	2,100	1,900
8	EKPAN	500	700	300	1,500	UHUNWONDE	700	800
9	UMUOKPE	400	600	200	1,200	UHUNWONDE	500	700
10	ORHUA	600	1,600	300	2,500	UHUNWONDE	1,300	1,200
	SUB-TOTAL	**3,900**	**5,300**	**1500**	**10,700**		**5,400**	**5300**
	GRAND TOTAL	**9,700**	**11,800**	**4,000**	**25,500**		**12,700**	**12,800**

The population distribution is skewed towards youth and the implication is that unless they are productively engaged in proposed Extension Two project, they may constitute a social/security risk as soon as their farmland is taken over by the project.

5.2 Housing

Housing is one of the three essential things of life and the housing pattern of the people in the ten affected communities of proposed Okomu Extension Two project is below MDG goals with only 29% living in cement block houses. The **Table 3** below shows the housing summary on community basis.

Table 3: Housing Patterns of affected Communities

S/N		Thatched roof (%)	Shed (%)	Zinconly (%)	Mud (%)	Block &Cement (%)
1	Agbanikaka	3	10	12	50	25
2	Owan	3	7	20	60	10
3	Uhiere	1	2	2	80	15
4	Odigwetue	1	2	2	10	85
5	Odighi	1	5	14	60	25
6	Ihrue	4	3	8	50	35
7	Oke- Ihrue	1	4	5	70	20
8	Umuokpe	1	3	6	70	20
9	Orhua	4	3	3	65	25
10	Ekpan	5	5	10	45	35
	AVERAGE	**2**	**5**	**8**	**56**	**29**

5.3 Infrastructure

It was obvious that all the ten affected communities of the proposed Extension Two project lack virtually all the desirable basic infrastructural facilities. There are four (4) abandoned reticulated water & three (3) neighbourhood water schemes which are malfunctioning therefore, no

Umuokpe malfunction water scheme

portable water for most population in the affected communities.

Odiguete abandoned water scheme

Oke-Irhue community is one of the oldest communities based on oral history, and till date the little infrastructure there, such as road, health centresetcare all dilapidated. Odighi community though has some infrastructural facilities, which are mostly non-functional.

Irhue community road

Odighi malfunction reticulated water scheme

5.4 Agriculture and Household Nutrition

Farming and agricultural activities are rain fed and on subsistence level. Men are more into farming (usually with the assistance of children/youth) than women. A wide range of crops is cultivated especially cocoa, plantain/banana, maize, cassava, vegetables and root/stem crops. Apart from being one of the main traditional occupations of the people, it is also practiced mostly by the natives due to the community's land ownership structures.

The assets used in agricultural activities are as follows:

Human Assets:The people employ traditional farming skills such as:

- Land management skills, like rotational bush fallowing, in cultivation of crops

- Maintenance of local farm tools
- Fairly good marketing skills but growth and opportunity in the commodity value chains have not been used to their advantage.

Natural Assets: These include farmland, soil and topography and favorable climate.

Physical Assets: Farmers own hoes, cutlass, spades, wheelbarrow, basins, basket and other equipment.

Social Assets: There is low level of social cooperation due to subsistence level of farming practice as well as poverty.

The rainy season (March/April to September/October is associated with peak cropping seasons especially arable crop cultivation whilst the dry season is used for harvesting, marketing and land preparation for the next farming season.

The level of poverty in all the communities is pretty high as the standard of living is really low. Though the communities are rich in agricultural produce, due to the lack of processing facilities, most of their crops get spoilt early because of lack of storage facilities for these produce.

Water resources and forest natural resources (such as honey, snail etc) are continuously utilised over the years, while over dependence on forest resources for domestic energy requirement (fire wood) has considerably led to deforestation and vegetation depletion.

The nutrition/food security issue in the all the Extension Two affected communities is contained in the **Table 4**below:

Table 4: Household Nutrition and Food Issue

Issue	Subject	Objective Analysis
Food Security	• Food consumption pattern • Access to food • Diet diversity • Number of meals • Difficult periods of the year • Changes in food consumption • Differences in consumption - Gender - Age	Garri + Native soup, Plantain + peppersoup, Throughout the year. High consumption (January – June) & Low consumption (July – December) Available 3 times daily July – September None Male & female eat the same food No difference.

5.5 Education

There is no marked discrimination in access to education gender wise although the only few primary schools and two secondary schools in the Extension Two affected communities have positive correlation with the school enrolment rate. The informal education facilities and the adult learning programmes are non-existent in all the communities. It is worth mentioning that the educational attainment / literacy level amongst the community people is below average. There is however skewed literacy rate in favor of men compared to women.

Orhua Secondary School

Odiguete Primary School

The summary of education related issue in all the Extension two affected communities is contained in the **Table5.**

Table 5: Summary of Education Issues.

Issue	Subject	Objective Analysis
Education	• Level of education • Quality of education • Skills building programme • Education by gender	Medium Low Nil Not applicable

5.6 Health

All the four (4) health centersin the affected communities areneedstaffing, equipment and drugs.The summary of health related issue in all the Extension Two affected communities is contained in the **Table6**.

Table 6: Health and related Issues

Issue	Subject	Objective Analysis
Health	• Level of health • Access to clean water • Access to latrine • Hygiene behavior	Poor Extremely difficult Poor Fair

Odiguete health Centre

Umokpe Nursing Home

5.7Livelihood Strategies

Economic activities of Extension Two affected communities are relatively diverse although on small and medium scales. Traditional occupations of the people of the affected communities include subsistence farming, lumbering and agro-based trading. These livelihoods are practiced alongside other gainful non-traditional economic activities such as commercial transportation, civil service, contracting and artisans. There are fertile soils for farming; rivers for fishing & water transport, timber for lumbering as well as forest products as natural resource use in the most of the affected communities. The assets of non-traditional livelihoods are summarized in the **Table 7** below.

Table 7: **Assets of non-traditional Livelihoods Systems**

S/N	Livelihoods	Human	Natural	Physical	Social	Political
1	Contracting	• Skills in business management. Patience and humility	Nil	• Certificate of registration with CAC and DPR, etc	• Credit reality through cooperative	Access to the strong and mighty in the community
2	Civil service	• Skills in chosen profession • Ability to work without much supervision	Nil	• Certificate, books, journals, magazines etc	• Membership of various civil service unions and the attendant benefits	Recognition accorded due to excellent performance / achievement
3	Artisans	• Skills in various chosen vocations • Skills in the use of machines and tools for the profession	• Customers • Solid minerals (cement for masons) • Land (sand for masons)	• Machine • Tools • Protective gears • Store / workshop	Membership of relevant associations, unions and cooperative groups and the attendants	-Honour received due to the success achieved in the livelihoods

			• Forest Resource (wood / timber for carpenters)		benefits	-Executive positions in various groups and association
4	Transporter	• Knowledge of water signs and codes • Ability to drive for long distance without stress, good eyes sight	• Water ways	• Boats • Tool boxes	Membership of relevant unions especially Pessu Market Union and the attendant benefits	-Recognition accorded due to outstanding achievement -Executive position in various groups and association

5.8 Income and Expenditure

The measurement of income level is generally a major problem in Nigeria because of the reluctance of respondents to give accurate information on their real income. Moreover, there are problems in quantifying the real income of the rural working population because a good proportion of their produce is consumed directly and does not enter the market.

There are various forms of social capital available to households in the community notably family support, exchange of labour, group activities, association and cooperative groups. The main sources of income of households and individuals are from occupations / activities like farming, trading and rendering of various services. Generally, there is poor income security in virtually all the Extension Two affected communities.

5.9 Belief Systems and Sacred Sites

Sacred sites are places within the landscape that have a special significance under Aboriginal tradition. Hills, rocks, waterholes, trees, plains and other natural features may be sacred sites. In coastal and sea areas, sacred sites may include features which lie both above and below water. There are sacred sites in some of the communities such as Agbanikaka and Odighi. In Agbanikaka, there are two shrines that is, Osun Shrine and a sacred shrine called Ose River Shrine. It was said that Odigwetue community has a lake called Odighi Lake and they have a shrine beside the lake.The locations of these sacred sites in Extension Two land are in the South West and North West.

Some belief systems are localized while some cut across the ten affected communities. Uhiere has two main rivers (Ikpesira and Abumeri). The Ikpesira River has great law guiding it like; no one is allowed to visit it at night, no woman in her period is allowed to visit it, it forbids fishing and the pouring of oil on it; while the Abumeri River forbids the killing of its fishes only.

The community frowns greatly at having sex with married women (another man's wife), the use of "juju" is a taboo and also no use of gun or cutlass when fighting, and stealing is also a taboo. The Oke River is one of their main sources of water but the River forbids the washing of oil and killing of the fish.

6.0 COMMUNITY BASELINE SOCIOECONOMIC CONDITIONS

This section is an exhaustive narration of the communities addressing the following elements in specific terms:

a. Housing
b. Demographics
c. Infrastructure
d. Agriculture and Household Nutrition
e. Health
f. Education
g. Livelihood Strategies
h. Income and Expenditure
i. Belief Systems and Sacred Sites

6.1 Agbanikaka Community

Agbanikaka community is situated north of Ovia Northeast Local Government Area of Edo state. According to Pa David Aigbokhan, a community elder, the people of Agbanikaka migrated from Sobe, and the first man to settle in the community was Mr. Gambari who was said to have migrated about 110 years ago and his father's name was Agbanikaka (the supposed name of the community). Gambari was a farmer and hunter. When Mr. Gambari was coming he came with the people of Ijagba, and after that the people of Uzebba came accompanied by the people of Obiazu. Leadership in Agbanikaka community is based on seniority as they are patrilineal in nature and the head of the community is called the Odionwere.

Settlement pattern and housing characteristics

The settlement is generally gentle slope susceptible to flood, water and air pollution. Agbanikaka has a combination of linear and nuclear settlement patterns with different types of housing pattern in the community to wit; complete thatched roof account for 3% of the total houses, sheds 10 percent, zinc only 12%, block/cement plastered houses account for 25% and mud houses 50%.

Demography: The present estimated population of Agbanikaka obtained from community sources is about 2,300 persons made up of 1,300 male and 1,000 female. This is depicted in Figure 3. An average of seven persons constitutes a family. The ratio of in-migration to out-migration is 1:5 principally due to limited opportunities, inadequate social infrastructures, desire for greener pastures and other reasons.

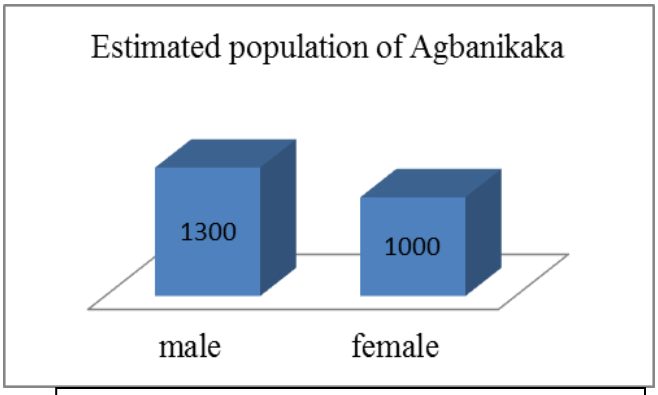


Fig 3: Agbanikaka estimated population

Social composition

Agbanikaka is over 90% indigenous community with the remaining less than 10% made up of other tribes across the country. It has five (5) churches of various denominations, no mosque, while one public cemetery (Agbanikaka Cemetery) is located within the community. The community is made up of over 85% Christians, 14% Muslim and less than 1% African Traditional Religionists.

The Community Based Organizations (CBOs) are relatively above average in the community and they perform various activities at ensuring economic empowerment, poverty eradication, human capital development and provision of basic needs to individuals and various groups. Notable CBOs are Agbanikaka Cocoa farmers Association, Omoarughe progressive Association and Agbanikaka youth Association.

The Agbanikaka people speak Uhobe language and Pidgin English. The time of day and different occasions such as wedding, burial etc attract different greetings. The formal greetings of Good Morning, Good Afternoon and Good Evening translate to “Esse, Esse and Esse” respectively while “Esse” and “Omuye” translate to Welcome and Thank you.

Infrastructural Characteristics

Agbanikaka has an array of social amenities put in place by both the external and internal stakeholders (Government and community inclusive) as summarized in **Table 8.**

Table 8: **Agbanikaka Social Projects - Infrastructural**

S/N	Amenities	Source	Estimated Population Served	Year Completed	Status	Remarks
1.	Water Mono-pump	Edo State Government (ESG)	The Entire community	1999	Not in use	Abandoned and not in use.
2.	Market	Community Effort	The entire community	1988	In use	In use but not in good condition
3.	Telecommunication MTN Mask	MTN Nig.	The entire community & its environs	2005	In use	Functioning effectively
4.	Inter road	Federal Government	All road users	1970s	Functional	Yearly maintained by FERMA

Agriculture and Household Nutrition

The farming systems in the community are principally traditional subsistence crop farming. They are characterized by small-sized farm holdings of less than one hectare per household. Cassava remains the largest arable grown crop produced followed by yam and maize. Other crops grown for commercial purpose are cocoa and plantain.

Fertilizers, agro chemicals and improved seeds have not been widely adopted or available. Harvesting methods are manual, while, processing/storage facilities are grossly inadequate. This leads to significant losses resulting from spoilage.

From the forestry point of view, the economically significant resources are timber for sawn logs, electricity transmission poles, building poles, bamboo, fuel wood and chewing stick. Other types of non-timber forest resources that are also important to the local economy include oil palm, various fruits, such as bush mango, spices, various roots, tree barks, a variety of leaves, various climbers, and animal protein sources like giant snails and wild game. Rural dwellers rely to a large extent on non–timber forest products for their vegetable and protein sources.

The forest products gathering from the proposed Extension Two is not for commercial purpose but for family consumption especially honey, mushroom and snail.

The land use in relation to Extension Two is mainly for farming and gathering of forest products and there is no case of share-cropper in the community at present. The community claimed that part of the Extension Two project land belongs to them and none of their representatives were involved in the negotiation when Okomu OPC was acquiring the land.

Health

The situation analysis of certain basic needs of the community populace as related to health is appalling because there is no access to qualitative healthcare. Only one chemist store is available in the community with the possibility of fake drugs being sold to unsuspecting victims. This challenge at times leads to fatality, especially child and maternal mortality. The people of the community travel long distance in search of drugs and medical treatments. Other health related issues are summarized in the **Table 9** below.

Table 9: Situation Analysis of Agbanikaka Basic Need

s/n	Category	Availability / source	Accessibility	Challenges	Remarks
1	Portable water	None, except a stream	Poor	High cost of drinking water. Trekking Long distance in search of water for	Water borne diseases are prevalent.

				domestic use	
2	Good sanitation	No facility	poor	• Human wasteis discharged into bush and nearby water. • Kitchen wasteis usually disposed at the backyard.	This constitutes health hazards.

Education

There is no formal or informal school in Agbanikaka which affects early child education in the community. The nearby primary and secondary schools are in Owan, and Okada riders charge a minimum of N100 per trip from pupils.Any day the parents cannot afford N200 transport the child will have no option than absence from school that day. Therefore, attainment of qualitative education is costly and coupled with poverty incidence and intensity, only 60% of school age children are found in school. This is against Millennium Development Goals (MDGs) especially MDG 1 of primary education for all by year 2015.

Livelihood

The traditional occupations of the people of Agbanikaka include subsistence farming, lumbering and agro-based trading. These livelihoods are practiced alongside other gainful non-traditional economic activities such as commercial transportation and artisans. **Table 10**summarises the ranking of key occupations and the percentage of community stakeholders' engagement.

Table 10: **Ranking of Occupation and Percentage Engagement in Agbanikaka**

Rank	**Economic Activity**	**% Engagement**					**Remarks**
		Native Men	**Native Women**	**Non Native Men**	**Non Native Women**	**Seasonal Contractors**	
1	Farming	55%	35%	6%	4%	-	Mainstay of the community's economy and the largest employer

							of labour with almost 60% engagement
2	Trading	20%	55%	5%	20%	-	More women are into petty trading
3	Fishing	65%	10%	20%	5%	-	More men are into fishing
4	Hunting	80%	-	20%	-	-	Male dominated occupation such as carpentry, mason etc
5	Gathering	50%	15%	25%	10%	-	Men gather than women
6	Commercial motorcycle riders motor vehicle drivers	95%	-	5%	-	-	Male dominated occupation
7	Civil Servant	98%	-	2%	-	-	Mostly teachers and local government employees Male dominated occupation
9	Hairdressing	-	100%	-	-	-	Women dominated occupation
10	Artisans	80%	-	20%	-		Male dominated occupation such as carpentry, mason etc

Income and Expenditure

Crop production is both for domestic consumption and commercial sales, although it is skewed towards domestic consumption than commercial sales, hence relative low income accruing to farmers.Notable CBOs are Agbanikaka Cocoa farmers Association, Omoarughe progressive

Association and Agbanikaka youth Association which provide social capital for their members but far below the need of most of them.

Belief Systems and Sacred Sites

The people of Agbanikaka are basically farmers, with little of them into hunting, it was said that the people from Agbanikaka forbid men having sex with other married women, stealing and making love inside the farm (bush). There are two shrines namely; Osun Shrine and Osse River Shrine.

6.2 Owan Community

It was said that the people of Owan community and those from Agbanikaka are brothers and do many things in common. The first man to settle in Owan community was called Isiyekpen (he founded the community) at about 1910, he migrated from Sobe, which is their ancestral home. The main language of the Owan people is called Uwebe, though they have other dialects summing up to eleven (11). Leadership in Owan community is based on seniority as they are patrilineal in nature and the head of the community is called the Odionwere. The name of the recent Odionwere is Pa Clement Ugbiyobo.

Settlement pattern and housing characteristics

Owan settlement is generally gently scopingwhich is susceptible to flood, erosion and water pollution. It has a combination of linear and nuclear settlement patterns with different types of housing in the community namely: complete thatched roof account for three percent (3%) of the total houses, sheds 7%, zinc only 20%, block/cement plastered houses account for 10% and mud houses 60% percent.

Demography

The present estimated population of Owan obtained from community sources is about 3,000 persons made up of 1,400 male and 1,600 female. There are more children (≤17 years) accounting for 1,500 or 50% of the

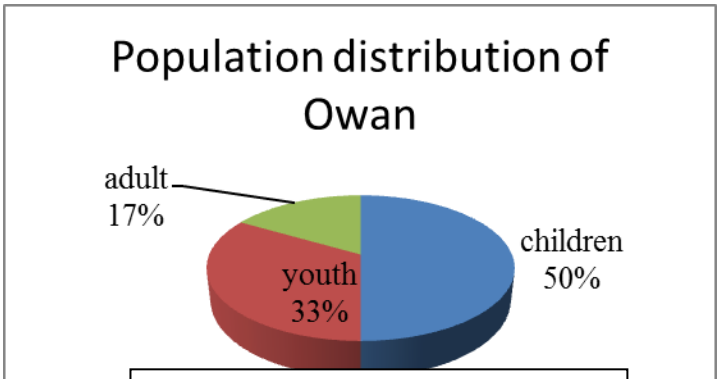


Fig 4: Population distribution

population than the youth (18-45 year) and the adult over 46 years) who constitute 1,000 (33%) and 500 (17%) respectively.This is depicted in Figure 4. An average of seven persons constitutes a family.

Social Composition

Owan is about 30% indigenous community with the remaining 70% made up of other tribes across the country.It has twenty (20) churches of various denominations, no mosque and no shrine nor sacred forest as well as no public cemetery within the community. The community is made up of over 94% Christians, 1% Moslem and less than 5% African Traditional Religionists. Owan is over 30% indigenous community with the remaining less than 70% made up of other tribes across the country. The Community Based Organisations (CBOs) are relatively above average in the community and they perform various activities at ensuring economic empowerment, poverty eradication, human capital development and provision of basic needs to individuals and various groups. Notable CBOs are AwewheregbeWomen - 24 members, Owan farmers Association – 22 members' and Immaculate brothers club – 23 members.

Institutional and Infrastructural Characteristics

Community social projects are classified into infrastructures and socioeconomic. The full details are captured in Tables 11 and 12.

Table 11: **Owan Social Projects- Infrastructural**

S/N	Amenities	Source	Estimated Population Served	Year Completed	Status	Remarks
1.	• Market	ONELGA and community effort	The entire community	1980	In use	Functioning but needs lock up shop
2.	• GLO Cellular	GLO Nig.	Entire community	2009	In use	In good condition and in use

	Mast					
3.	• Etisalat Mast	Etisalat Nig.	Entire community	2011	Functioning	Effectively functioning
4	• Police Station	Nigeria Police Force		1981	In use	In use but the structures are dilapidated
5	Owan health centre	NDDC	Entire community	2011	In use	In use but needs medical personnel and health care facilities
6	Owan primary School (Two blocks of six class room each)	Mid-West Govt.	Entire community	1955	In use	Functioning but needs teachers and other educational materials (see Table 8 for school's data)
7	Owan Secondary School (A block of six class rooms)	Bendel State Govt	Entire community	1980/1981	In use	The school needs teachers and other educational materials
8	Water: Reticulated water scheme	European Union (EU)	Entire community	2009	Not in use	Abandoned

Abandoned reticulated water scheme

Owan River

Table 12: **Owan Socio-Economic Programme**

S/N	Programmes	Sponsor / Funder	Year	Comments
1.	• Deployment of NYSC corpers to secondary schools	FGN AND NYSC	Yearly	At least four corpers yearly to complement insufficient teachers. Also for positive impact among the students.
2.	• Micro Credit Scheme	Bank (Micro finance bank in Benin)	2010	Assist the cooperatives to purchase farm implements and increase production of economic crops.

Agriculture and Household nutrition

The people of Owan are mainly cocoa and plantain farmers and they have abundance of timber. The major source of drinking water is the Owan River.The fishing activity takes place in two(2) major rivers that is; Oyemide River from the north flowing down to Owan River, at the lower downstream where there is a confluence - Ose River and OwanRiver.

Other types of non-timber forest resources that are also important to the local economy include oil palm, various fruits, such as bush mango, spices, various roots, tree barks, a variety of leaves, various climbers, and animal protein sources like giant snails and wild game. Rural dwellers rely to a large extent on non – timber forest products for their vegetable and protein sources.

The forest products gathering from the proposed Extension Two is not for commercial purpose but for family consumption especially honey, mushroom and snail.

The land use and ownership as related to Extension Two is mainly for farming and gathering of forest products and there is no case of share-cropper in the community at present. The community is claiming that the land belongs to them and none of their

One major cash crop - Plantain

representative has been engaged in negotiation as per Okomu land acquisition process.

Health

The situation analysis of certain basic needs of the community populace as pertaining to portable water, good sanitation and qualitative health care is below expectation because the Owan health centre built in 2011 inspite that it is in use,urgently needs medical personnel and health care facilities. Even the reticulated water scheme sponsored by EU in 2009 had been abandoned therefore, no portable water for domestic use. This has forced the community populace to depend on Owan River for their domestic need with serious attendant effects.

Education

Owan is blessed with both primary and secondary schools but the situations in the two schools if not address will affect qualitative education delivery. That is, the two schools need qualified teaching staff as well as instructional materials. The enrolment rate at the primary school is encouraging while the dropout rate is within the acceptable limit (see **Table 13** for other vital data).

Table 13: Education: School Vital Information

Description	**Primary School**			
Name of School 1.Owan primary school			**Other needs**	
Year Established	**1955**			
Total no of pupils	360		Identified infrastructural development need	At least a block of six class rooms
• Male	124			
• Female	236			
Total No of Teachers	2		Identified teachers gap	At least 4 qualified teachers
• Male	2		Identified educational / instructional materials needed	text books, note books, chalks

• Female	-			
No of classrooms	12			
No of classes (pry 1 to 6)	6			
Annual enrolment rate	45			
Annual dropout rate	1			

Livelihood Strategies

The traditional economic activities of the community fall into two main categories:

- land based type, which includes farming, fishing, collecting and processing palm fruits, as well as hunting
- water based type of economy include fishing and farm produce transportation, with a less diversified economy.

These livelihoods are practiced alongside other gainful non-traditional economic activities such as commercial transportation and artisans. Table 14summarises the ranking of key occupations and the percentage of community stakeholders' engagement.

Table 14:**Ranking of Occupation and Percentage Engagement in Owan**

RANK	Economic Activity	% Engagement					Remarks (% of Community Workforce Included)
		Native Men	Native Women	Non Native Men	Non Native Women	Seasonal Contractors	
1	Farming	25%	15%	40%	20%	-	Mainstay of the community's economy and the largest employer of labour with almost 60% engagement
2	Trading	15%	30%	35	20	-	More women are into petty trading
3	Logging	40%		60%	-	-	Male dominated occupation. Mostly teachers and local government employees
4	Gathering	30%	10%	45%	15%	-	
5	Hunting	100%	-	-	-	-	Traditional occupation

							being exclusively practiced by native men
6	Commercial motorcycle riders and vehicle drivers	30%	-	70%	-	-	Male dominated occupation
7	Mechanics (vehicle and motorcycle)	100%	-	-	-	-	Native men dominated occupation
8	Hairdressing	-	100%	-	-	-	Women dominated occupation
9	Civil Service	50%	5%	40%	5%	-	Mostly teachers and local government employees
10	Artisans	40%	-	60%	-		Male dominated occupation such as mason, carpentry etc

Income and Expenditure

Allowing for the difficulties of measurement, the community estimates of earned income per month in the agricultural sector, which excludes individuals' consumption directly from their production activities, indicate that more than 60% in the surveyed households earn less than 5,000 Naira per month. This is an indication of poverty incidence because people in this category have less than a $1 per day.

In 2010 micro-credit scheme was implemented in the community through Benin based micro-finance bank. This scheme assisted the cooperatives to purchase farm implements and increase production of economic crops. Motorist and traders get periodic income (about a week interval) due to plantain / banana market being patronized by people from outside the environment.

Belief Systems and Sacred Sites

It is their belief that River Owan **IS NOT FRIENDLY TO STRANGERS** – hence, it is advised that strangers beware. No sacred site is mentioned or noticed during the study.

6.3 Uhiere Community

It was said that the name Uhiere means rest, as the community came into existence about 160 years ago. One of the first settlers was called Pa ImehrinOzogula, and he migrated from Sobe, when coming he met the people of Oke before finally settling in Uhiere. Many tribes formed the present Uhiere community, they include; the Sobe, the Esans, the Binis, the Owans and other tribes. Leadership in Uhiere community is based on seniority as they are patrilineal in nature and the head of the community is called the Odionwere, though he takes directives from Enogie of Odighi (HRH Chief OsaretinAkenzuwa). The recent Odionwere is called Pa Alex Obazu. The Uhiere people speak Oke-Orhue language, formal English Language and Pidgin English. The time of day and different occasions such as wedding, burial etc attract different greetings. The formal greetings of Good Morning, Good Afternoon and Good Evening translate to "Kalu, Kor, and Kada" respectively while "Obokwan" and "Uwese" translate to Welcome and Thank you.

Settlement pattern and housing characteristics

The settlement is generally gently sloping susceptible to erosion. Uhiere has a combination of linear and nuclear settlement patterns with different housing patterns in the community. Complete thatched roof accounts for 1%, sheds; 2%, zinc only; 2%, block/cement plastered houses account for 15% while mud houses account for 80%. This is depicted in Figure 5.

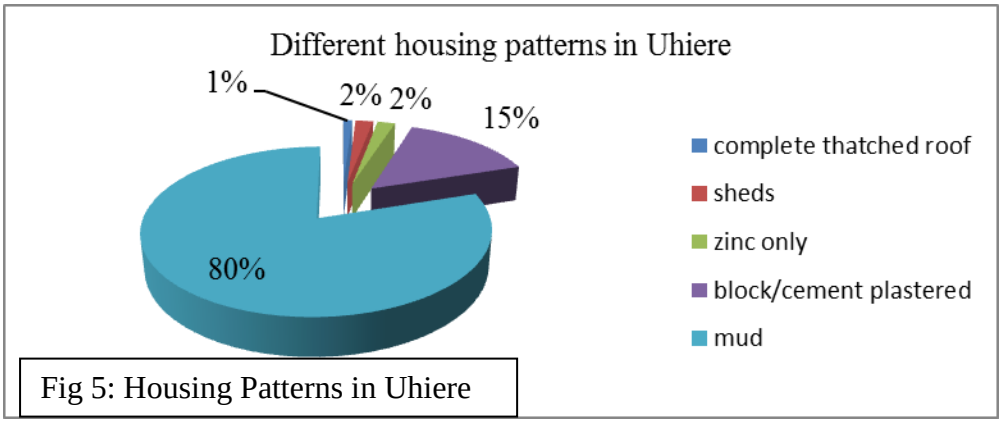


Fig 5: Housing Patterns in Uhiere

Demography

The current estimated population of Uhiere obtained from community sources is about 2,000 people made up of 1,000 males and 1,000 females. Furthermore, the ratio of in-migration to out-migration is 1:3 principally due to limited opportunities, inadequate social infrastructure, desire

for greener pastures and other reasons. Uhiere is over 75% indigenous community with the remaining less than 25% made up of other tribes from across the country. An average of nine persons constitutes a family in the community.

Social Composition

Uhiere is over 75% indigenous community with the remaining less than 25% made up of other tribes across the country.It has eight (8) churches of various denominations, 5 mosques and three shrines (Ulele, Edugun, Ikpesire) as well as one public cemetery (Uhiere Cemetery) located within the community. The community is made up of over 80% Christians, 8% Moslem and less than 12% African Traditional Religionists.

The Community Based Organisations (CBOs) are relatively above average in the community and they perform various activities at ensuring economic empowerment, poverty eradication, human capital development and provision of basic needs to individuals and various groups. Notable CBOs are Uhiere Women Organisation;100 members, Uhiere Men Association; 150 members and Uhiere Fadama 3 Co-operatives Association.

Institutional and Infrastructural Characteristics

Both external and internal stakeholders have in one way and the other contributed to the socio-economic development of Uhiere. The community can boast of some social amenities although it still lacks many others. The details for infrastructural projects and socio-economic programmes are captured in **Tables 15 and 16** respectively.

Table 15: Uhiere Social Projects- Infrastructural

s/n	**Amenities**	**Source**	**Estimated Population Served**	**Year Completed**	**Status**	**Remarks**
1.	• HEALTH Uhiere health centre	Edo State Govt. (ESG)	The entire community	1987	Not in use	Dilapidated, needs renovation and medical personnel
2	• Town Hall	Private (constructed by	Entire community	2011	In use	In good condition but not in effective

		Iyayi)				use
3	• Road	FGN and State Govt	Entire community	1978/79	functioning	In good state and effective use
4	• ELECTRICITY Electric pole& Transformer	FGN		2013	Not in use	Not yet completed
5	• WATER Bore-hole(3No.)	Private	Entire community	2007/2008	In use	functioning
6	• SCHOOL Uhiere primary school	Mid-West Govt	Entire community	1942	In use	Needs teachers and at least a block of six classrooms.

Intra-road in good state

Transformer left uninstalled

Table 16: Uhiere Socio-Economic Programme

S/N	Programmes	Sponsor / Funder	Year	Comments
1	• Micro credit scheme (Used for pig & poultry)	FADAMA 3	2013	Assist in economic empowerment of the farmers.

Agriculture and Household nutrition

The fertile soils for farming; rivers for domestic water use & water transport, timber for lumbering as well as forest products are natural resource used in the community. The forest products gathering from proposed Extension Two is summarized in Table 17.

Table 17: Forest products usually gather by Uhiere from the proposed Extension 2

Products	Estimated Quantity during the season	Value (N)
Honey	60 litres @ N1,000	60,000
Snail	300 pieces @ N100	3,000
Mushroom	2 baskets @ N2,000	4,000
Bush mango	4 baskets @ N5,000	20,000

The land use in relation to Extension Twois mainly farming and gathering of forest products and there is no case of share-cropper in the community at present. The community also claimed to be the owners of the Extension Two land.

The Food consumption pattern is the same among the ten communities as enumerated earlier and there is access to food throughout the year. There are no differences in consumption either by Gender or by Age.

Health

The situation of certain basic needs of the community pertaining to health is worrisome because Uhiere health centre built in 1987 is dilapidated, needs urgent renovation and medical personnel. Hence, qualitative health care delivery is very poor. Consequently there may be need to establish Community Health Committee with terms of reference as:

- Provision of equipment and personal to man the community health centre so as to ensure sound medical care and health delivery
- And to liaise with relevant government agencies to post qualified health personnel.

Other related health issues are summarized in the **Table 18** below

Table 18: Situation analysis of certain basic needs

s/n	Category	Availability/ source	Accessibility	Challenges	Remarks
1	Portable water	Borehole	Easy	It is expensive	It is privately owned and

					maintained.
2	Good sanitation	Few modern Toilets	Easy	None	

Education

There is only one primary school in the community established in 1942 and situation analysis revealed that it needs teachers and at least a block of six classrooms.The community may establish an education committee with the following mission:

- Ensure access to education for all children, and
- Maintain ongoing oversight of issues including building maintenance, personnel issues, parental/community involvement, linkages with government agencies, scholarships, etc.
- Explore mechanisms to provide better incentives for teachers, including provision of adequate teachers' quarters.

Livelihood

The traditional occupations of the people of the community include subsistence farming, lumbering and agro-based trading. These livelihoods are practiced alongside other gainful non-traditional economic activities such as commercial transportation and artisans. **Table 19** summarizes the ranking of key occupations and the percentage of community stakeholders' engagement.

Table 19: Ranking of Occupation and Percentage Engagement in Uhiere

RANK	Economic Activity	% Engagement					Remarks (%) of Community Workforce Included)
		Native Men	Native Women	Non Native Men	Non Native Women	Seasonal Contractors	
1	Farming	45%	25%	20%	10%	-	Mainstay of the community's economy and the largest employer of labour with almost 60% engagement.

2	Trading	45%	55%	-	-	-	More women are into agro trading.
3	Logging	45%	-	55%	-	-	Male dominated occupation such as carpentry, mason etc.
4	Hunting	45%	-	55%	-	-	Traditional occupation being exclusively practised by native men.
7	Commercial motorcycle riders Vehicle drivers	30%	-	70%	-	-	Male dominated occupation
8	Mechanics (vehicle and motorcycle)	100%	-	-	-	-	Native men dominated occupation.
9	Gathering	20%	40%	10%	30%	-	Women dominated occupation.

Income and Expenditure

The main sources of income of households and individuals are from occupations/activities like farming, trading and rendering of various services. The opportunities to develop capacity are curtailed by insufficient accessibility to funds and training. The finding shows that subsistence farming is resulting in low productivity and coupled with small scale trading, all leading to poor income security.

Belief Systems and Sacred Sites

Uhiere has two main rivers (Ikpesira and Abumeri). The Ikpesira River has great law guiding it like; no one is allowed to visit it at night, no woman in her period is allowed to visit it, it forbids fishing and the pouring of oil in it; while the Abumeri River forbids the killing of its fishes only. The community frowns greatly at having sex with married women (another man's wife), the use of "juju" is a taboo and also no use of gun or cutlass when fighting. Stealing is also a taboo.

6.4 Odigwetue Community

The people of Odigwetue formerly settled at the boarder of River Aimufua (which is also the source of their drinking water). They later left for their present location due to the un-conducive nature in the former location.

On the their leadership system it is no different from that of Uhiere community, as it is based on seniority as they are patrilineal in nature and the head of the community is called the Odionwere, though they take directives from Enogie of Odighi (HRH Chief OsaretinAkenzuwa).The Odigwetue people speak Oke language, formal English Language and Pidgin English. The time of day and different occasions such as wedding, burial etc attract different greetings. The formal greetings of Good Morning, Good Afternoon and Good Evening translate to "Lalo, Obodome and kada" respectively while "Obokiya" and "Obilu" translate to Welcome and Thank you.

Settlement pattern and housing characteristics

Odigwetue has a combination of linear and nuclear settlement patterns with different housing patterns in the community as follows; complete thatched roofs accounts for 1%, sheds; 2%, zinc only 2%, block/cement plastered houses account for 85% while mud houses account for 10%.Odigwetue has a combination of linear and nuclear settlement patterns.

Demography

The present estimated population of Odigwetue obtained from community sources is about 4,500 persons made up of 2,200 males and 2,300 females. Odigwetue is over 85% indigenous community with the remaining less than 15% made up of other tribes from across the country. An average of eleven persons constitutes a family.

Social Composition

It has five (5) churches of various denominations and no mosque. The community is made up of 90% Christians,

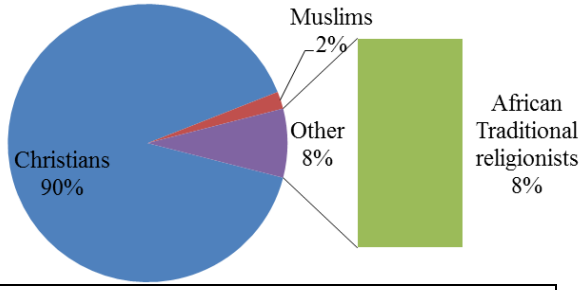


Fig 6: Social composition of Odigwetue

2% Muslims and less than 8% African Traditional Religionists.

The Community Based Organisations (CBOs) perform various activities at ensuring economic empowerment, poverty eradication, human capital development and provision of basic needs to individuals and various groups. Notable CBOs are Odigwetue Women Organisation, Odigwetue Youths Association and Odigwetue Development Union.

Institutional and Infrastructural Characteristics

The infrastructure base of Odigwetue is generally poor. The presence of both the External and internal stakeholders in terms of social amenities provision can best be described as non-existent. Table 20summarises the list of existing infrastructure and amenities in the community.

Table 20:Odigwetue Social Projects- Infrastructural

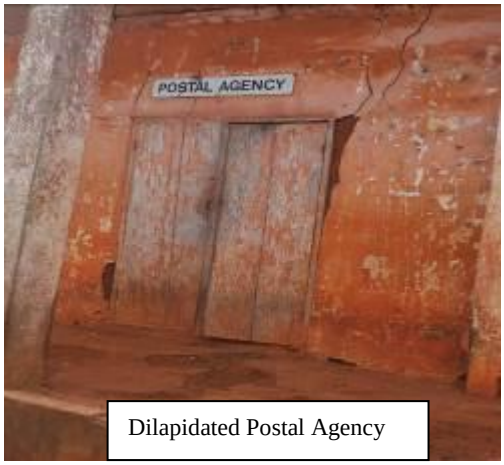
S/N	Amenities	Source	Estimated Population Served	Year Completed	Status	Remarks
1.	Market	Community	The entire community	2004	In use	Functioning effectively
2	Postal Agency	ESG	Entire community	1973	Not in use	Dilapidated
3	WATER (Bore-hole)	ESG	Entire community	2013	Not in use	Abandoned but the community needs a functional bore-hole
4	Tarred Roads	ESG	Entire community		In use	In use but some roads need rehabilitation
5	Telecommunication	Etisalat Nig.	Entire community	2009	In use	Functioning

			& its environs			
6	Odigwetue Maternity	Bendel State Govt.	Entire community	1979	In use	In use but need renovation and medical personnel

Maternity Centre

Abandoned water scheme

Inter-road begging for rehabilitation



Dilapidated Postal Agency

Agriculture and Household nutrition

There is fertile soil for farming; rivers for fishing and water transport, timber for lumbering as well as forest products are natural resources used in the community. It has a river called Imofua and a lake called Odighi Lake. **Table 21** presents the full details of livelihood outcome in respect of food security in the community which are the general features in the other communities of Extension Two.

Table 21: Food Security Data in Odigwetue

Issue	Subject	Objective Analysis
Food Security	• Access to food	Throughout the year. High consumption (January – June) & Low consumption (July – December)
	• Diet diversity	Available
	• Number of meals	3 times daily
	• Difficult periods of the year	July – September
	• Changes in food consumption	None
	• Differences in consumption - Gender - Age	Male & female eat the same food No difference.

The forest products gathering from proposed Extension Two is summarized in **Table 22**.

Table 22: Forest products usually gather by Odigwetue from the proposed Extension 2

Products	Estimated Quantity during the season	Value (N)
Honey	40 litres @ N1,000	40,000
Snail	3000 pieces @ N100	30,000
Mushroom	3 baskets @ N2,000	6,000
Bush mango	5 baskets @ N5,000	25,000

The land use and ownership as related to Extension Two is mainly for farming and gathering of forest products and there is no case of share-cropper in the community at present. The community claimed that the Extension Two project land belongs to them and were not happy that they were left out in the negotiation for its acquisition by Okomu OPC Plc.

Health

The situation of certain basic needs pertaining to qualitative healthcare in the community is poor due to absence of medical personnel in Odigwetue Maternity centre. Human waste is dumped in nearby bush because there is no modern toilet facility. There is poor access to safe drinking water (no functioning water scheme in the community. This health related issues are summarized in **Table 23** below:

Table 23: Situation Analysis of Odigwetue Certain Basic Need

s/n	Category	Availability/ source	Accessibility	Challenges	Remarks
1	Portable water	None, except a river	Poor	High cost of drinking water. Trekking Long distances in search of water for domestic use.	Water borne diseases are prevalent.
2	Good sanitation	No facility	poor	• Human waste is discharged into bush and nearby water. • Kitchen waste is usually disposed at the backyard.	This constitutes health hazards.

Education

The level of education and quality of education is both low because there is no formal school in the community. The Skills building programme is non-existence but desirable for teeming youths in the community.

Livelihood

Traditional occupations of the people of the community include subsistence farming, lumbering and agro-based trading. These livelihoods are practiced alongside other gainful non-traditional economic activities such as commercial transportation and artisans. **Table 24**summarises the ranking of key occupations and the percentage of community stakeholders' engagement.

Table 24: Ranking of Occupation and Percentage Engagement in Odigwetue

RANK	Economic Activity	% Engagement					Remarks (% of Community Workforce Included)
		Native Men	Native Women	Non Native Men	Non Native Women	Seasonal Contractors	
1	Farming	40%	20%	20%	10%	-	Mainstay of the

							community's economy and the largest employer of labour with almost 60% engagement.
2	Fishing	70%		30%			Male dominated occupation
3	Trading	35%	30%	20%	15%	-	More women engage in trading
4	Logging	45%	-	55%	-	-	Male dominated occupation such as carpentry, mason etc.
5	Hunting	65%	-	35%	-	-	Traditional occupation being exclusively practised by native men.
6	Commercial motorcyclist	40%	-	60%	-	-	Male dominated occupation
7	Gathering	50%	20%	20%	10%	-	Women dominated occupation.

Income and Expenditure

There are notable CBOs such as Odigwetue Women Organisation, Odigwetue Youths Association and Odigwetue Development Union which provides a meagre social capital to their members for their livelihoods. The main sources of income of households and individuals are from occupations / activities like farming, trading and rendering of various services. The proportion of the employed household members earning less than 5,000 Naira a month is still alarming in the community.

Belief Systems and Sacred Sites

It was said that Odigwetue community has a lake called Odighi Lake and a shrine beside the lake called Ogwedion. There is no public cemetery.

6.5 Odighi Community

It was said that Odighi community migrated from Ozogua. It comprises basically farmers and hunters. There is the presence of Odionwere, who takes directives from the Enogie (HRH. Chief Osaretin Akenzuwa). Enogie is the chief custodian of custom and authority in the community and other two neighbouring communities. The Odighi people speak Benin and Ishan languages. They also speak formal English Language and Pidgin English. The time of day and different occasions such as wedding, burial etc attract different greetings. The formal greetings of Good Morning, Good Afternoon and Good Evening translate to "Lamole, Obavan and Obuta" respectively while "Obohikhian" and "Uvbiese" translate to Welcome and Thank you.

Odighi political characteristics hinge on unitary governance system, which is a mixture of traditional and modern institutions.

Settlement pattern and housing characteristics

Odighi has a combination of linear and nuclear settlement patterns with different types of housing pattern in the community to wit; complete thatched roof account for 1% of the total house, shed 5%, zinc only 14%, block/cement plastered house account's 20%, mud house 60%.

Demography

The present estimated population of Odghi obtained from community sources is about 3,000 persons made up of 1,400 males and 1,600 females. Odighi is over 90% indigenous community with the remaining less than 10% made up of other tribes across the country. There are more youth (18-45 years) accounting for 1,500 or 50% of the populace than adults (46 years and above) and children (<17 years) who constitute 500 (17%) and 1,000 (33%) respectively. Both men and women often contribute to the cost of maintaining the family. An average of eight persons constitutes a family.

Social Composition

Odighi is over 90% indigenous community with the remaining less than 10% made up of other tribes across the country.It has five (5) churches of various denominations, no mosque and no

shrine as well as no public cemetery. The community is made up of over 90% Christians, and less than 10% African Traditional Religionists.

The Community Based Organisations (CBOs) perform various activities at ensuring economic empowerment, poverty eradication, human capital development and provision of basic needs to individuals and various groups. Notable CBOs are Odighi Development Union, Cocoa Union Association of cooperatives and Odighi Development Union.

Institutional and Infrastructural Characteristics

The infrastructural base of the Odighi community is relatively above average. There exists relative presence of both the external and internal stakeholders in terms of social amenities provision as summarized in **Table 25**.

Table 25:Odighi Social Projects- Infrastructural

S/N	Amenities	Source	Estimated Population Served	Year Completed	Status	Remarks
1.	• Market	Community effort	The entire community	1981	In use	Functional but needs lock up shops.
2.	• GLO Cellular Mast	GLO Nig.	Entire community	2004	In use	In good condition and in use.
	• Mtn Mast	Mtn Nig.	Entire community	2003	Functional	Effectively functioning.
	• Airtel Mast	Airtel Nig		2006		
	• Nitel Mast	Nitel Nig.		1984		
3	Town Hall	community		2003	In use	In use

4	Odighi health centre	Mid-West Govt.	Entire community	1942	In use	In use but needs medical personnel and health care facilities.
5	Odighi primary school (Two blocks of six classrooms each)	Mid-West Govt.	Entire community	1955	In use	Functioning but needs teachers and educational materials.
6	Odighi Grammar School (A block of six classrooms)	Bendel State Govt.	Entire community	1973	In use	Needs teachers and educational materials.
7	Water: -Reticulated water scheme -2 Nos. Bore-hole	ESG NDDC	Entire community	2012 2011	 In use	Abandoned Functioning
8	Electricity 1 No. Transformer	ESG Private	Entire community	2007 2009	In use	In use

Agriculture and Household nutrition

Farming is done based on the combined principles of cultural communalism and interdependence. Timber for lumbering as well as forest products are natural resource uses endowment of the community. The economically significant forest resources are timber for saw logs, electricity transmission poles, building poles, bamboo, fuel wood and chewing stick.

The land use as related to Extension Two is mainly for farming and gathering of forest products and there is no case of share-cropper in the community at present. The community is claimed that it owns the Extension Two and that Okomu OPC Pc did not consult with the community before acquiring the land. The **Table 26** shows major economic crops statistics of the community.

Table 26: Kind of economic crops being or can be cultivated in the Extension Two area

S/N	Identified crops	Estimated area of cultivation	Output	Storage types/ Rate of spoilage	Cost of production	Demand for and selling price of products
1	Yam	Less than 1 acre per farmer	Medium	Tying in barns/very low	Expensive	High N250 per tuber
2	Plantain	Average of 100 stands per farmer	High	Expose to air/ Low	High	High N450 per bunch
3	cassava	Average of 1 acre per farmer	High	Processed/ very low	High	High N2500 per basin

Health

The situation of certain basic needs of the community pertaining to potable water, good sanitation and qualitative healthcare is below expectation because the Odighi health centre built in 1942 in spite of the fact that it is in use needs medical personnel and healthcare facilities to function well. Also, the reticulated water scheme sponsored by Edo state government in 2012 had been abandoned, leaving the community with no potable water.

Education

It is worth mentioning that the educational attainment/literacy level amongst the community people is a little above average. There is however skewed literacy rate in favour of women compared to men at primary and secondary schools' level. Both primary and secondary schools are present in the community, but more qualified teachers and educational materials are daring need. The vital data from schools are summarized in the **Table 27** below:

Table 27: School Vital Information of Odighi Community

Description	Primary School	Secondary School
Name of School:	Odighi primary school	OdighiGrammer school
Year Established	**1955**	**1973**
Total no of pupils	85	80
• Male	30	20
• Female	55	60
Total No of Teachers	4	6
	1	4

• Male • Female	3	2
No of classrooms	6	5
No of classes	6	6
Annual enrolment rate	10	-
Annual drop out rate	1	
Identified scholarship need (*Primary and Secondary)*	-	10 person per year
Identified infrastructural development need	At least a block of six class rooms block for the primary school	At least a block of six class rooms, laboratory and administrative block
Possibility of Youth Corp members as substitute teachers (*Secondary only*)		Yes. Yearly at least 5 Corpers
Identified educational/instructional materials needed	Text books, note books, chalks, etc	Text books, note books, laboratory equipment, tables, chairs, chalks etc

Livelihood

Economic activities are quite diverse in Odighi. The available occupations range from traditional to modern ones. **Table 28** summarises the different occupations and the degree of involvement of different groups.

Table 28: Ranking of Occupation and Percentage Engagement in Odighi

RANK	Economic Activity	% Engagement					Remarks (% of Community Workforce Included)
		Native Men	Native Women	Non Native Men	Non Native Women	Seasonal Contractors	
1	Farming	40%	20%	20%	10%	-	Mainstay of the community's economy and the largest employer of labour with almost 60% engagement level.
2	Fishing	70%		30%			Male dominated occupation.
3	Trading	35%	30%	20%	15%	-	More women are

							engaged in petty trading.
4	Logging	45%	-	55%	-	-	Male dominated occupation such as carpentry, mason etc.
5	Hunting	65%	-	35%	-	-	Traditional occupation being exclusively practised by native men.
6	Commercial motorcycle riders Vehicle drivers	40%	-	60%	-	-	Male dominated occupation
7	Gathering	50%	20%	20%	10%	-	Women dominated occupation.

Income and Expenditure

The principal sources of income within the community are through the engagement in various income-generating activities prevailing in the community and neighborhood such as farming, trading, and others. In addition, provision of services by individuals and groups for government establishments and the organised private sector also attract income and wages. Due to the low income base that pervades in the community, a significant percentage of the populace has minimal saving habits.

Belief Systems and Sacred Sites

The community forbids the use of dogs in the environment; same also goes for pigs and cats. The community is without public cemetery, implying that the dead is buried in family compounds.

6.6 Ihrue Community

From a document given, it was realized that the name Irhue came from the title *Irhue-Nwidanhie* meaning 'We cover all the bad things'. This was as a result of the then Oba of Benin sending some chiefs (precisely the Iwebo chiefs) to overcome some troubled areas. So the Oba gave them some medicine, Okpan, Uguere and fro-Uriema; he ordered them to bury it in that community.

They were told to report back and when they were reporting back, they came up with name *Irhue-Nwidanhie.* We were told orally that the community is over 100 years old.
It was said that they settled there before they discovered all the nearby villages and brought them to Benin. The Ihrue people speak Edo language, formal English Language and Pidgin English. The formal greetings of Good Morning, Good Afternoon and Good Evening translate to "Obowia, Obavia and Obota," respectively while "Obokhia" and "Iruege" translate to Welcome and Thank you. Leadership is by age (seniority) and the community is ruled by the Odionwere.

Settlement Pattern and Housing

Ihrue has linear settlement patterns. There are different types of housing pattern in the community to with; complete thatched roof account for 4 percent of the total house, shed 3 percent, zinc only 8 percent, block/cement plastered house account's 35 percent, mud house 50 percent.

Demography

The current estimated population of Ihrue obtained from community sources is about 1,500 people made up of 800 males and 700 females. The children (≤17 years) account for 400 or 27% of the population while the youth (18-45 year) and the adult (over 46 years) constitute 800 (53%) and 300 (20%) respectively. An average of nine persons constitutes a family.

Social Composition

Ihrue is over 85% indigenous community with the remaining less than 15% made up of other tribes across the country. It has five (5) churches of various denominations, and one shrine (Idionobie). The community is made up of over 95% Christians and less than 5% African Traditional Religionists.

The Community Based Organisations (CBOs) in the community perform various activities at ensuring economic empowerment, poverty eradication, human capital development and provision of basic needs to individuals and various groups. Notable CBOs are Ihrue Women Organisation, Club 77 Irhue and Ihrue Youths Association.

Institutional and Infrastructural Characteristics

Ihrue has an array of social amenities put in place by both the external and internal stakeholders (Government and community inclusive) as summarised in **Table 29**.

Table 29:Ihrue Social Projects- Infrastructural

S/N	Amenities	Source	Estimated Population Served	Year Completed	Status	Remarks
1.	Electricity with 1 Transformer	State Govt	The entire community	2002	Not functioning	Not functioning and abandoned.
2.	Airtel Cellular Mast	Airtel Nig.	Entire community	2009	In use	In good condition and in use.
3.	MTN Mast	MTN Nig.	Entire community	2007	Functioning	Effectively functioning
4	Police Station	State Govt		1982	Not in use	Not In use. The structures are dilapidated.
5	Ihrue Primary School (Two blocks of six classrooms each)	State Govt	Entire community	1953	In use	Functioning but needs teachers and educational materials.
6	Water: Reticulated water scheme	State Govt.	Entire community	2013	Not in use	Abandoned.

Agriculture and Household Nutrition

Agriculture and related activities are the mainstay of the community's economy and the largest employer of labour with almost 60% engagement. Agriculture, because of limited inputs, vegetation and prevailing climatic conditions, is predominantly at subsistence level. Water resources and forest natural resources are continuously utilized over the years.

Health

The healthcare situation of the community is appalling because there is no access to qualitative health care facility.Moreover, the reticulated water scheme sponsored by Edo state government in 2012 had been abandoned, leaving the community with no potable water. The only source of water for the community is the Ogemieden River.

Education

It is worth mentioning that the educational attainment/literacy level amongst the community people is below average. There is however skewed literacy rate in favour of men compared to women. Only one primary school is situated in the community but the pupils population worrisome may due to absence of adequate teaching force. **Table 30** shows summary of vital school information as given by the Headmaster.

Table 30: School Vital Information of Ihrue Community

Description	**Primary School**
Name of School	Ihrue primary school
Year Established	**1953**
Total no of pupils	50
• Male	30
• Female	20
Total No of Teachers	3
• Male	2
• Female	1
No of classrooms	Two blocks of six classrooms each
No of classes	6
Annual enrolment rate	10
Annual drop out rate	2
Identified infrastructural development need	Staff quarters
Possibility of Youth Corp members as substitute teachers (*Secondary only*)	NA
Identified educational / instructional materials needed	Computers with accessories, Text books, note books, chalks, etc

Livelihood

Traditional occupations of the people of the community include subsistence farming, lumbering and agro-based trading. These livelihoods are practiced alongside other gainful non-traditional economic activities such as commercial transportation and artisans. **Table 31** summarises the ranking of key occupations and the percentage of involvement by the community stakeholder.

Table 31: Ranking of Occupation and Percentage Engagement in Ihrue

S/N	Economic Activity	% Engagement					Remarks (% of Community Workforce Included)
		Native Men	Native Women	Non Native Men	Non Native Women	Seasonal Contractors	
1	Farming	40%	20%	30%	10%	-	Mainstay of the community's economy and the largest employer of labour with almost 60% engagement.
2	Trading	45%	55%	-	-	-	More women are into petty trading.
3	Civil service	60%	40%	-	-	-	Mostly teachers and local government workers.
4	Hunting	80%	-	20%	-	-	Traditional occupation being exclusively practised by native men.
5	Commercial motorcycle riders	54%	-	56%	-	-	Male dominated occupation.
6	Mechanics (vehicle and motorcycle)	70%	-	30%	-	-	Native men dominated occupation.

Income and Expenditure

InIrhue, there exists daily contribution system of savings and loan facilities due to the absence of formal financial institution in the community. Due to the low income base that pervades in the community, a significant percentage of the populace has minimal saving habits. Money lending activities are significantly tied to the active participation in the daily contribution scheme (ESUSU) at agreed payment terms and interest.

Belief Systems and Sacred Sites

The community forbids sex with a married woman in the bush; but there is no sacred site within the community land.

6.7 Oke - Irhue Community

Oke-Irhue community was said to have been founded over a century ago by one hunter by name "Osugbe", who migrated from Iruekpen. Mr. Osugbefounded the community in the process of hunting in the company of his friend called "Ekpenvbokhae", also a hunter. The Oke people speak Benin language, formal English Language and Pidgin English. The time of day and different occasions such as wedding, burial etc attract different greetings. The formal greetings of Good Morning, Good Afternoon and Good Evening translate to "Lalu, Lalu and Kada" respectively while "Obokhian" and "Wese" translate to Welcome and Thank you. Leadership in Oke is by age (seniority) and they are ruled by the Odionwere.

Settle Pattern and Housing

The settlement is generally gentle scope which is susceptible to erosion. Oke has a combination of linear and nuclear settlement patterns with different types of housing pattern in the community to with; complete thatched roof account for 1 percent of the total house, shed 4 percent, zinc only 5 percent, block/cement plastered house account's 20 percent, mud house 70 percent.

Demography

The current estimated population of Oke obtained from community sources is about 4,000 people made up of 2,100 males and 1,900 females. There are more children (≤17 years) accounting for 2,000 or 50% of the population than the youth (18-45 years) and the adult over 46 years) who

constitute 1,600 (40%) and 400 (10%) respectively. An average of seven persons constitutes a family.

Social Composition

Oke is over 85% indigenous community with the remaining less than 15% made up of other tribes across the country. It has ten (10) churches of various denominations. There is no shrine or public cemetery. The community has no sacred forest/shrines and is made up of over 95% Christians and less than 4% African Traditional Religionists.

The notable community based organisations (CBOs) include Oke Women Organisation, Oke Youths Association and Oke Development Union. The CBOs perform various activities at ensuring economic empowerment, poverty eradication, human capital development and provision of basic needs to individuals and various groups.

Institutional and Infrastructural Characteristics: Oke has an array of social amenities put in place by both the external and internal stakeholders (Government and community inclusive) as summarised in **Table 32**.

Table 32:Oke Social Projects- Infrastructural

S/N	Amenities	Source	Estimated Population Served	Year Completed	Status	Remarks
1.	Electricity with one Transformer	State Govt.	The entire community	2008	Not functioning	Not functioning and abandoned.
2.	MTN Cellular Mast	MTN Nig.	Entire community	2007	Functioning	Effectively functioning

3	Health centre	State Govt.		1975	In use	In use
4	Oke-Irhue Primary School (Two blocks of six classrooms each) Oke-Irhue Mixed Secondary School	State Govt.	Entire community	1947 1980	In use	Functioning but needs teachers and educational materials.
5	Water: Reticulated water scheme	State Govt.	Entire community	2014	In use	Functioning

Oke community overview showing abandoned electrification poles

MTN Cellular Mast

Agriculture and Household nutrition

There are fertile soils for farming; river for domestic water need and timber for lumbering. Forest products are the major natural resources used in both Oke &Ihrue communities. The forest products gathering from the proposed Extension Two is summarized in **Table 33.**

Table 33: Forest products usually gathered by Oke community from the proposed Extension Two

Products	Estimated Quantity during the season	Value (N)
Honey	1,200 litres @ N1,000	1,200,000
Snail	16,000 pieces @ N100	1,600,000
Mushroom	200 baskets @ N2,000	400,000
Bush mango	120 baskets @ N5,000	600,000

The land use as related to Extension Two is mainly farming and gathering of forest products. The community claimed that it owns the Extension Two land, however, official information revealed that the Extension Two land is a forest reserve, which had been encroached by the community for their livelihood especially farming of permanent crops like cocoa and plantain.

There are varieties of traditional delicacies ranging from those prepared without cooking to simmering and proper cooking. They include garri and native soup, plantain portage, and yam with stew. Presently, menus like rice and stew, jollof, fried rice, plantain chips (dodo) etc have gradually encroached on the traditional ones.

Health

The situation of certain basic needs of the community pertaining to potable water, good sanitation and qualitative healthcare is below expectation. The Oke health centre built in 1975 by then State government is still in use but lacks medical personnel and healthcare facilities. Access to latrine is poor but Hygiene behavior is fair in the community

Education

The level of education in Oke is medium but the quality is low due to insufficient qualified teachers in both the primary and secondary schools. Likewise there is no a formal skill building programme for the youths in the community. The coping strategy for insufficient teaching staffs in the secondary school is posting of at least 5 NYSC corps members on yearly basis to the school.

Livelihood

Oke is a community surrounded by hills, and the people are basically farmers and some are also hunters, with their main crops being plantain, cassava and cocoa. The people also engage in other gainful non-traditional economic activities such as commercial transportation and artisans. **Table** 34summarises the ranking of key occupations and the percentage of community stakeholders that are involved.

Table 34: Ranking of Occupation and Percentage Engagement in Oke

S/N	Economic Activity	% Engagement					Remarks (% of Community Workforce Included)
		Native Men	Native Women	Non Native Men	Non Native Women	Seasonal Contractors	
1	Farming	40%	20%	30%	10%	-	Mainstay of the community's economy and the largest employer of labour with almost 60% engagement.
2	Trading	35%	40%	10%	15%	-	More women are involved petty trading.
3	Hunting	95%	-	5%	-	-	Traditional occupation being exclusively practised by native men.
4	Commercial motorcycle riders	90%	-	10%	-	-	Male dominated occupation.
5	Mechanics (vehicle and motorcycle)	100%	-	-	-	-	Native men dominated occupation.

Income and Expenditure

In addition to cocoa there is reasonable level of income generated from sale of plantain while other farming enterprises attract no significant income to household but for household food security.

Belief Systems and Sacred Sites

The Oke River is one of their main sources of water in the community. The River forbids the washing of oil and killing of the fish in its water.

6.8 Epkan Community

Ekpan community is arable in terms of land mass and is very fertile for agricultural purpose, they take authority from the Odionwere, who is the eldest man in the community, and they speak languages like Ishan and partly Owan. We were informed from some sources that they migrated from Ishan and another version asserted that they migrated from Benin.

Settlement pattern and Housing

The settlement is generally gentle slope which is susceptible to erosion. Ekpan has a linear settlement patterns with different types of housing pattern in the community to with; complete thatched roof account for 5 percent of the total house, shed 5 percent, zinc only 10 percent, block/cement plastered house account's 35 percent, mud house 45 percent.

Demography

The present estimated population of Ekpan obtained from community sources is about 1,500 persons made up of 700 males and 800 females. The children (≤17 years) account for 500 or 35% of the population while the youth (18-45 years) and the adult (over 46 years) constitute 700 (45%) and 300 (20%) respectively. An average of eight persons constitutes a family.

Social Composition

The settlement is generally gentle slope which is susceptible to erosion. Ekpan has a linear settlement patterns. There are five (5) churches of different denominations, but no shrine or

public cemetery. The community is made up of over 88% Christians and less than 12% African Traditional Religionists.

There are a few Community Based Organisations (CBOs) performing various activities aimed at ensuring economic empowerment, poverty eradication, human capital development and provision of basic needs to individuals and various groups. Notable CBOs are Ekpan Women Organisation, Ekpan Men Organisation and Ekpan Youths Association.

Institutional and Infrastructural Characteristics

The infrastructure base of Ekpan is generally poor. The presence of both the External and internal stakeholders in terms of social amenities provision can best be described as non-existent. **Table 35**summarises the list of existing infrastructures and amenities in the community.

Table 35:Ekpan Social Projects- Infrastructural

S/N	Amenities	Source	Estimated Population Served	Year Completed	Status	Remarks
1.	• Electricity	State Govt.	The entire community		Not in use	Abandoned.
2	• Primary School	State Govt	The entire community	1947	In use	In use but need teachers and a block of six classrooms.

Agriculture and Household nutrition

Highly skilled individuals with more men than women are engaged in agriculture with the use of local tools and implements. Household nutrition is similar with other communities in the Extension Two area.

Health

The Level of health in the community is poor and access to latrine is difficult but Hygiene behavior is fair. Due to the dearth of standard and government recognized health clinic in the community, there is upsurge in the activities of the quacks, traditional healers and in self-medication practice. Only few who have the logistic of transportation go to the nearby health centre is at Oke which also is at abysmal condition.

Education

It is worth mentioning that the educational attainment / literacy level amongst the community people is below average. The only school in the community –primary school- has total pupils population of 40 while demographic data shows that there are 500 children in the community. There are only two teachers in this school and they are all female. There is need for education committee in this community to awaiting the parents as well as children interest in education in this jet age. The committee should also liaise with relevant stakeholders to come to aid of school.

Livelihood

The traditional occupations of the people of the community include subsistence farming, lumbering and agro-based trading. These livelihoods are practiced alongside other gainful non-traditional economic activities such as commercial transportation. **Table 36**summarises the ranking of key occupations and the percentage of the community stakeholders that are involved.

Table 36: Ranking of Occupations and Percentage Engagement in Ekpan

S/N	Economic Activity	% Engagement				Remarks (% of Community Workforce Included)
		Native Men	Native Women	Non Native Men	Non Native Women	
1	Farming	40%	55%	4%	1%	Mainstay of the community's economy and the largest employer of labour with almost 60% engagement.
2	Trading	42%	5%	3%	5%	More women are into petty trading.
3	Hunting	100%	-	-	-	Traditional occupation being exclusively practised by native men.
4	Commercial motorcycle riders	98%	-	2%	-	Male dominated occupation.
5	Mechanics (vehicle and motorcycle)	100%	-	-	-	Native men dominated occupation.

Income and Expenditure

There are various forms of social capital available to households in Ekpan notably family support, exchange of labour, group activities, association and cooperative groups. The self-sustaining farming enterprise attracts no income to household consumption except for food security.

Belief Systems and Sacred Sites

The beliefs and taboos are similar to that of Oke but there is no sacred site in the community land area.

6.9 Umuokpe Community

The Umuokpe people speak Benin language, formal English Language and Pidgin English. The time of day and different occasions such as wedding, burial etc attract different greetings. The formal greetings of Good Morning, Good Afternoon and Good Evening translate to "Alao, Alao and Alialuo" respectively while "Obokhia" and "Uwese" translate to Welcome and Thank you.

Umuokpe has a linear settlement patterns and is ruled by an Odionwere (who is the eldest man in the community).

Settlement Pattern and Housing

Umuokpe has a linear settlement patterns with different types of housing pattern in the community to with; complete thatched roof account for 1 percent of the total house, shed 3 percent, zinc only 6 percent, block/cement plastered house account's 60 percent, mud house 30 percent. The settlement is generally gentle slope which is susceptible to erosion.

Demography

The present estimated population of Umuokpe obtained from community sources is about 1,200 persons made up of 500 males and 700 females. The children (≤17 years) account for 400 or 33% of the population while the youth (18-45 years) and the adult (over 46 years) constitute 600 (50%) and 200 (17%) respectively. This is depicted in Figure 7. An average of eight persons constitutes a family.

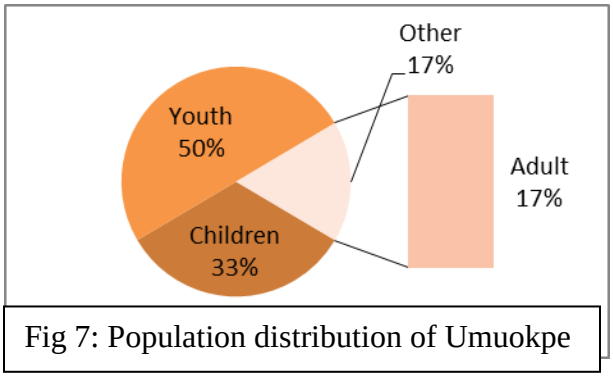


Fig 7: Population distribution of Umuokpe

Social Composition

Umuokpe is over 95% indigenous community with the remaining less than 5% made up of other tribes across the country. It has three churches of different denominations and comprises over 93% Christians, and less than 7% African Traditional Religionists.

Some Community Based Organisations (CBOs) including Umuokpe Women Organisation, Umuokpe Men Organisation and Umuokpe Youths Association exist in the community performing economic and human development activities.

Infrastructure and Community Development Projects

The infrastructural base of the Umuokpe community is small. There exists relative presence of both the external and internal stakeholders in terms of social amenities provision. **Table 37** summarises Umuokpe socioeconomic, cultural and religious infrastructures.

Table 37: A Summary of Umuokpe Socio-Economic, Cultural and Religious Infrastructure

S/N	Facilities / Infrastructures	Remarks
1	Communication	Town crier
2	Transportation	▪ By land
3	Telecommunication	▪ Fairly good access to GSM network but no mast installed in the community.
4	Religious Institutions - Churches - Mosques - Shrines	 3 Nil Nil
5	Education - Primary school	 1 (State Government owned- Umuokpe primary school)
6	Water - Privately owned borehole water scheme	 functioning
7	Market	1 (through community effort)
8	Electricity	By state government but abandoned.
9	Health Centre (by state government)	In use but need drugs and medical personnel

Agriculture and Household nutrition

A general similarity in the farming systems in the Extension Two Communities are principally traditional subsistence crop farming. They are characterized by small-sized farm holdings of less than one hectare per household.

The number of families involved in livestock production (goats, sheep and poultry) at the commercial level is considerably low. There is, however, an increasing level of awareness as to the income potential of this activity.

Health

The situation of certain basic needs of the community pertaining to potable water, good sanitation and qualitative healthcare is poor. The Umuokpe health centre lacks medical personnel and facilities. Commercial boreholes are source of potable water at high cost.

Education

Umuokpe primary school is the only formal institution in the community. Despite the children account for 33% (400) of the community population, only 45 children are found in the whole school with two male teachers in all. This is far below MDG 1 and every effort is needed to boost the interest of the children in education as well making the environment conducive for teachers to stay. Other important data about the school is summarized in Table 38 below:

Table 38: School Vital Information of Umuokpe Community

Description	Primary School
Name of School	Umuokpe primary school
Year Established	**1936**
Total no of pupils	45
• Male	30
• Female	15
Total No of Teachers	2
• Male	2
• Female	-

No of classrooms	6
No of classes	6
Annual enrolment rate	10
Annual drop out rate	2
Identified educational/instructional materials needed	Computer and accessories, Text books, note books,chalks,etc

Livelihood

Traditional occupations of the people of the community include subsistence farming, lumbering and agro-based trading. These livelihoods are practiced alongside other gainful non-traditional economic activities such as commercial transportation. **Table 39** summarises the ranking of key occupations and the percentage of community stakeholders that are involved.

Table 39: Ranking of Occupation and Percentage Engagement in Umuokpe

S/N	Economic Activity	% Engagement				Remarks (% of Community Workforce Included)
		Native Men	Native Women	Non Native Men	Non Native Women	
1	Farming	40%	55%	4%	1%	Mainstay of the community's economy and the largest employer of labour with almost 60% engagement.
2	Trading	45%	55%	-	-	More women are involved in petty trading.
3	Civil service	60%	40%	-	-	Mostly teachers and local government employees.
4	Hunting	100%	-	-	-	Traditional occupation being exclusively practised by native men.
5	Commercial	98%	-	2%	-	Male dominated occupation.

	motorcycle riders					
6	Mechanics (vehicle and motorcycle)	100%	-	-	-	Native men dominated occupation.
7	Logging	90%	-	!0%	-	Predominantly male occupation.

Income and Expenditure

Like other communities in Extension Two area, the proportion of the employed household members earning less than 5,000 Naira a month is very high. Apart from farming the informal sector plays a significant role as source of household income. From the survey at least one out of every five households is involved in the informal sector; common activities in the informal sector as is evidenced on almost every street in community where traders sell anything and everything that can be sold.

Belief Systems and Sacred Sites

Apart from general belief systems there is no specific taboo about the community. Likewise there is no sacred site within the community land.

6.10 Orhua Community

It was gathered that the first man that settled in Orhua migrated from Iruekpen. It was observed that leadership in the community is based on seniority and it is patrilineal in nature. As the Odionwere authority supersedes all other authorities in the community.

The Orhua people speak Ishan and Benin languages, formal English Language and Pidgin English. The time of day and different occasions such as wedding, burial etc attract different greetings. The formal greetings of Good Morning, Good Afternoon and Good Evening translate to “Alao, Alao and Alialuo” respectively while “Obokhia” and “Uwese” translate to Welcome and Thank you.

Settlement Pattern and Housing

The settlement is generally gentle slope which is susceptible to erosion. Orhua has a linear settlement patterns with different types of housing pattern in the community to with; complete thatched roof account for 4 percent of the total house, shed 3 percent, zinc only 3 percent, block/cement plastered house account's 65 percent, mud house 25 percent.

Demography

The present estimated population of Orhua obtained from community sources is about 2,500 persons made up of 1,300 males and 1,200 females. The children (≤17 years) account for 600 or 20% of the population while the youth (18-45 years) and the adult (over 46 years) constitute 1,600 (65%) and 300 (15%) respectively. An average of seven persons constitutes a family.

Social Composition

Orhua is over 90% indigenous community with the remaining less than 10% made up of other tribes across the country. It has four (4) churches of different denominations and the community is made up of over 90% Christians, and less than 10% African Traditional Religionists.

The Community Based Organisations (CBOs) operating in the community include Orhua Women Organisation, Orhua Men Organisation and Orhua Youths Association. Their activities include ensuring economic empowerment, poverty eradication, human capital development and provision of basic needs to individuals and various groups.

Infrastructure and Community Development Projects

There exists the presence of both external and internal stakeholders in terms of social amenities provision. **Table 40** summarizesOrhua socio-economic, cultural and religious infrastructures.

Table 40:A Summary of Orhua Socio-Economic, Cultural and Religious Infrastructure

S/N	Facilities / Infrastructures	Remarks
1	Communication	Town crier
2	Transportation	▪ By land
3	Telecommunication	▪ Fairly good access to GSM network but no mast installed in the community.
4	Religious Institutions - Churches - Mosques - Shrines	 3 Nil Nil
5	Education - Orhua Primary School - Orhua Mixed Secondary School	 1 } State Government owned schools, 1 } but need teachers and instructional Materials.
6	Water - Reticulated water scheme	By State Government in 2000 and in use.
7	Town Hall	By EU in 2005 but abandoned.
8	Electricity	By state government in 2008 but not functioning.
9	Health Centre (built by state government in 1971)	In use but need drugs and medical personnel

Present state community road

Agriculture and Household nutrition

Fertilizers, agro chemicals and improved seeds have not been widely adopted or available for the subsistence farming in practice in the community. Harvesting methods are manual, while, processing/storage facilities are grossly inadequate. This leads to significant losses resulting from spoilage. Agriculture still remains the mainstay of the community's economy and the largest employer of labour with almost 60% engagement.

Health

The situation of certain basic needs of the community pertaining to potable water, good sanitation and qualitative health care is below expectation. The Orhua health centre built in 1971 by then State government needs medical personnel and healthcare facilities. There is access to potable water since reticulated water scheme built in 2000 by Edo state government is still functioning.

Education

Both primary and secondary schools are present in the community but teaching staffs and instructional materials are in dire need. There is no marked discrimination in access to education gender wise although the limited number of primary and secondary schools has positive correlation with the school enrolment rate. It is worth mentioning that the educational attainment literacy level amongst Orhua people is about average.

Livelihood

The traditional occupations of the people of the community include subsistence farming, lumbering and agro-based trading. These livelihoods are practiced alongside other gainful non-traditional economic activities such as commercial transportation. **Table 41**summarizes the ranking of key occupations and the percentage of community stakeholders that are involved..

Table 41:Ranking of Occupation and Percentage Engagement in Orhua

S/N	Economic Activity	% Engagement				Remarks (% of Community Workforce Included)
		Native Men	Native Women	Non Native Men	Non Native Women	
1	Farming	35%	55%	9%	1%	Mainstay of the community's economy and the largest employer of labour with almost 60% engagement.
2	Fishing	80%		30%		Mostly male.
3	Trading	35%	50%	5%	10%	More women are into petty trading.
4	Civil service	60%	40%	-	-	Mostly teachers and local government employees.
5	Hunting	100%	-	-	-	Traditional occupation being exclusively practised by native men.
6	Logging	94%	-	6%	-	Male dominated occupation.
7	Mechanics	100%	-	-	-	Native men dominated occupation.

Income and Expenditure

Apart from income from agricultural enterprises, some sell from shops and kiosks while others hawk their products or display them in traditional open markets to get maintenance income. As experienced by most of the communities in Extension Two area the income security is poor.

The most serious inhibiting factors to the growth of existing small scale enterprises and the start-up of new ones include lack of capital or access to loans, inadequate Infrastructure (i.e. electricity, transport system) and security

Belief Systems and Sacred Sites

Taboos and belief systems are similar to that of Oke community but there is no sacred site within the community land area.

SECTION B:

7.0 SOCIAL IMPACT ASSESSMENT

This chapter presents the data analysis and interpretation of findings, in line with the objectives of the social impact study.

7.1 Baseline Social Situation

A baseline assessment provides information on the situation the study aims to change. It provides a critical reference point for assessing changes and impact, as it establishes a basis for comparing the situation before and after an intervention, and for making inferences as to the effectiveness of the program. Baseline assessments should be conducted **before** the actual programme intervention starts so as to serve as a benchmark for examining what change is triggered by the intervention. The baseline situation information was obtained through DIRECT OBSERVATION and LOCAL TALENT & KNOWLEDGE of communities. The direct observation is nothing less than "Visual inspection" which is the quickest and best way to check issues of location, scale and proximity that determine many impacts. Stakeholders and local communities have local knowledge that you need. And, impacts depend on what those that are affected value and need!

The results of baseline situation as related to the people of the communities to be affected by the proposed Extension Two project are presented as follows:

1. **People's way of life**: Based on the empirical data gathered from the FGD and key informants from the various communities it is obvious that the people are majorly farmers with a few into some forms of trade. They tend to be more bounded by the common interests they share as farmers. Apart from Odiguete and Oke that have internal crisis among themselves and the SIA team identified them as social hot spots, other communities are peaceful and are receptive to strangers. During the study of the various communities we were informed that some criminals from Oke went to the bush and killed a young man from Uhiele who attempted to run when he was about to be robbed. Few days later we also heard that another person was shot dead at Oke due to conflict among

groups of youths. Even during pre-entry visit to the community some members of Oke community presented such a high level of antagonism that neither the study team nor the company is welcomed. Other communities such as Owan, Odighi, Agbanikaka, Uhiele are very harmonious in their day to day live, and tend to work for the overall interest of the community members.

2. **Their culture**: The ten communities have similar culture in the way of greetings, marriage, tradition and other norms and values. Some of their traditions or community dos and don'ts include – no fighting in the bush and with dangerous weapon; no love making in the bush; no sexual advances from any man to a married woman. But a community like Owan places emphasis on no usage of charms against any other person the community. It is their belief that River Owan**IS NOT FRIENDLY TO STRANGERS** – hence, it is advised that strangers beware. The Owan, Agbanikaka and Uhiere are a multi ethnic communities but the predominant language among them is Owan language; for Oke, Umopke, Epkan and Urhua the dialect is basically Ishan. But Odiguete, Odighi and Irhue are Benin speaking people. Odighi and Uhiere both have sacred rivers that are not accessible.

3. **Their environment:** On the general perspective their environment is clean and habitable. No exposures to hazardous and dangerous chemicals; no epidemic outbreak whatsoever. The air is generally clean. However, the pathetic condition of their source of portable water can lead to water borne diseases. Owan river demands an urgent attention due to some community members who deposit waste substances therein or use chemical to kill fish from the river.

   One of the major problems in some of the communities is erosion and flooding. During the peak of rainy season the western part of Owan land is cut off from the community for about three months. To the extent that the two major rivers around Ose and Owan meet at some point and making the major road to Benin partially impassable for about two to three days. Likewise atIrhue – the only security outfit Nigerian police Force was forced out of the location because of flooding.

The physical safety of most of the communities is threatened at a particular period of the year because of the activities of FULANI HERDSMEN armed with sophisticated rifles and who without regard enter into farmlands with their cattle, when challenged for this provoking action they either attack the males or rape the females in the communities.

4. **Their Health and Wellbeing**: The health status is average as in a normal Nigerian community setting. But the people are majorly affected by malaria and typhoid fever. The lack of healthcare facilities in most of the communities also place the community members at risk most especially pregnant and nursing mothers.

5. **Their Level of Education:** Although no educational status related questions were asked but from our observation most men can express themselves either in pidgin or simple English but the case is different with women. However, there are some graduates from various institutions and some other persons with vocational skills. There is opportunity to develop capacity and competencies even further most especially in the agricultural sector.

6. **Their Personal and Property Rights**: The land use and ownership of the proposed Extension Two project communities is mainly for farming and gathering of forest products and there is no case of share-croppers in the community at present. The community is claiming that the proposed project land belongs to them and none of their representatives have been engaged in the acquisition process. Farmers whose farms will be directly affected by the proposed project will be affected economically. However, Odiguete and Oke complained that their farmlands have been encroached upon due to the tracing round the proposed project boundaries by Okomu Oil Palm Company and expected that compensation should be paid to them. The purported incursion into personal and property rights has been identified as topmost of factors that can generate crisis between community members and Okomu Oil Palm Company Plc. Therefore, proper resettlement plans are required to alleviate the economic effects on the affected families.

7.2 Identification and Analyzing of Social Impacts

A number of simple tools exist to systematize field observations, think through potential impacts, and to help evaluate their significance. Simple logical process of impact evaluation was the focus, supported by the Small-Scale Guidelines.

The key findings of the socio-economic study were that the proposed oil palm plantation development project will contribute to socio-economic development of the host communities in the landscape. Specific potential positive impacts include employment creation, improvement in infrastructure particularly road network and other business opportunities for the population in the project catchment area and beyond during the plantation development and processing of Fresh Fruit Bunches (FFBs). The proposed project will also maximize the economic potential of the proposed project land, which has been held down by low production thus denying the communities and state government to realize the full economic potential of the land.

This notwithstanding, the implementation of the proposed Extension Two project may potentially cause negative environmental and social impacts such as pollution. The proposed project may also have impact on farmlands for the production of food crops, which when occur could jeopardize the food security potential of the area and could cause a rise in food crop prices.

At the state and national level, the project will contribute to enhancing the wider state economy through improved revenue from corporate and personal income tax due to the company meeting its tax obligations and employments that will be generated for the local population. Besides, it will contribute to Nigeria overcoming its palm oil demand/supply deficit. Nigeria currently imports palm oil from South-East Asia. This project has the potential to bridge this consumption-production gap which could contribute to Nigeria's policy of reducing imports to enhance its international trade balance.

Potential Positive Social Impacts

The following are some of the potential positive social impacts of the proposed Extension Two project:

Creation of employment: The proposed project if implemented can create thousands of new jobs. The various activities including palm nursery development and maintenance, plantation land preparation, planting and harvesting are all labour intensive activities and can also give employment to the ten affected and contiguous communities; a potential tool for reducing rural unemployment and rural poverty. From the findings of socio-economic survey, the cumulative population of the ten affected communities is 25,500 and the population distribution is skewed towards youth and the implication is that unless they are productively engaged in the proposed project they may constitute a security risk as soon as their farmlands are lost to the proposed project.

Improved Planting Material: Introduction of high yielding types of oil palm and sustainable management of palm plantation practices.

Capacity Building: Training and capacity building for employees and smallholders including knowledge and technology transfer in the application of best practices and delivery of World class products and services in the oil palm industry.

Corporate Social Responsibility: Development of the local communities through Corporate Social Responsibility of Okomu Oil Palm Company Plc.

Taxes: Tax revenue for the Edo state government.

Smallholder Development: Potential for smallholder schemes.

SME Development: Commercial opportunities for small and medium scale enterprises including petty trading.

Infrastructure development: It is anticipated that the corporate social responsibility of Okomu Oil Palm Company Plc will include different infrastructure development projects for the communities. It was obvious from socio-economic survey that all the affected communities of proposed Extension Two project lack the desirable infrastructure out of prolonged government neglect. All the communities are therefore of the opinion that the proposed Extension Two development will come with considerable infrastructure development in their respective communities.

Potential Negative Social Impacts

The potential negative social impacts of the proposed Extension Two project include:

i) Loss of farmlands, community conservation and forest products collection areas.
ii) Impacts on food insecurity and prices of food products.
iii) Influx of plantation workers and potential impacts on family structures and social networks.
iv) Water pollution due to agro-chemicals, sewage from worker's camps and POME
v) Potential conversion of traditional conservation areas including riparian vegetation.
vi) Pollution from hazardous substances.
vii) Impacts of increased traffic including heavy vehicles and construction activities.
viii) Noise pollution from mill and plantations machineries.
ix) Exposure to health hazards including HIV.
x) Adulteration/destruction of indigenous cultural values.
xi) Impacts on public facilities (e.g. public structures)
xii) Impacts on already deplorable infrastructure (roads, water)
xiii) Potential for air pollution through burning during land development stage.
xiv) Potential for conflicts with farmers whose farmlands have been taken over and no proper resettlement plan designed for them.
xv) *Potential for communal conflicts:* the entry and operation of Okomu Oil Palm Company Plc may give rise to intra and inter communal conflicts through the promotion and entrenchment of vested interests within and among the

communities. The allocation of resources and support (employment, contracts, CSR projects etc.) by the company may raise equity question and thus become a source of conflict, chaos and anarchy within and between the communities

xvi) *Cultural mix of values*: this is another source of social conflicts. Since people from different backgrounds and all walks of life will come to the proposed project to work, they will definitely mix with other members of the communities. The process of blending and integration will result to certain influences which if not properly managed will affect the overall cultural values of the various communities.

The potential impacts of the proposed Extension Two project on the individual affected communities as well as its stakeholders are further analyzed along with duration and degree of impact and presented in the **Table 42** below.

Table 42: Positive Impacts of the Proposed Extension Two Project in Order of Priority by Community

Community	Impact		Scale	Duration	Degree of Impact	Remarks
Agbanikaka	Impact on community	Educational Support	Local	Long term	High	If the new owner (Okomu Oil Palm Plc) will undertake human capital development as a priority welfare package.
		Ownership Change from A &Hatman to Okomu Oil Palm Company Plc	Regional	Long term	High	If the community has percentage in the skilled and unskilled employment slots in the proposed Extension Two project.
	Impact on Stakeholders	Individual farmers	local	Long-term	Low	Opportunity as an out-grower to the proposed Extension Two project.
		Ovia North East Local Government Area and Edo state government	Local	long term	Medium	Levies and tax revenues
Owan	Impact on community	More Job Opportunities	Local	Long term	High	If the proposed project extends window of job opportunities to the community.
		Educational	Local	Long term	High	If the proposed project will undertake

		Support				human capital development as a priority welfare package.
		New Opportunities	Local	Short term	Medium	If the proposed project would introduce new development programmes.
		Better Living Conditions	Local	Long term	Medium	Opportunities of local contracting and supplying
	Impact on Stakeholders	Individual farmers	Local	Medium	Medium	Potential for smallholder scheme and opportunity of having high yielding variety
		Ovia North East Local Government Area and Edo state government	Regional	Long term	Medium	Levies and tax revenues
Uhiere						
	Impact on community	New Opportunities	Local	Short term	Medium	If the proposed project would introduce new development programmes.
		More Jobs Opportunities	local	Medium	High	If the proposed project would extend window of job opportunities to the community.

	Impact on Stakeholders	Individual farmers	Local	Short term	Medium	Agricultural supports in the areas of improved seeds and fertilizer.
		Ovia North East Local Government Area and Edo state government	Regional	Long term	Medium	Levies and tax revenues.
Odighi	Impact on community	Ownership Change	Regional	Long term	High	If the ownership change would favour the community in the area of infrastructure development.
	Impact on Stakeholders	Individual farmers	Local	Short term	Medium	Out-grower opportunity for the farmers.
		Ovia North East Local Government Area and Edo state government	Regional	Long term	Medium	Levies and tax revenues.
Odigwetue	Impact on community	Ownership Change	Regional	Long term	High	If the ownership change would favour the community in the area of infrastructure development.
	Impact on Stakeholders	NO RESPONSE				

Ihrue	Impact on community	New Opportunities	Local	Short term	Medium	If the proposed project would introduce new development programmes.
		Financial Gains	Local	Medium	Medium	If the activities of the proposed project would promote community socioeconomic activities.
	Impact on Stakeholders	Individual farmers	Local	Short term	Medium	Out-grower opportunity for the farmers
		Uhunmwonde Local Government Area and Edo state government	Regional	Long term	Medium	Levies and tax revenues.
Oke	Impact on community	NO RESPONSE				
	Impact on Stakeholders	NO RESPONSE				
Ekpan	Impact on	Educational	Local	Long term	High	If the proposed project will undertake

	community	Support				human capital development as a priority welfare package.
	Impact on Stakeholders	New Opportunities	Local	Long term	Medium	If the proposed project would introduce new development programmes.
		Uhunmwonde Local Government Area and Edo state government	Regional	Long term	Medium	Levies and tax revenues.
Umuokpe	Impact on community	**NO RESPONSE**				
		Individual farmers	Local	Short term	Medium	Out-grower opportunity for the farmers.
	Impact on Stakeholders	Uhunmwonde Local Government Area and Edo state government	Regional	Long term	Medium	Levies and tax revenues.
Orhua	Impact on community	Educational Support	Local	Long term	High	If the proposed project will undertake human capital development as a priority welfare package.
	Impact on	Individual farmers	Local	Short term	Medium	Out-grower opportunity for the

	Stakeholders					farmers.
		Uhunmwonde Local Government Area and Edo state government	Regional	Long term	Medium	Levies and tax revenues.

In view of demographic distribution (as contained in the **Table 2** of section A as well reproduced below) of all the affected communities in which more than 80% of the population are energetic youth and children, it is imperative that any intervention that will influence these youth and children positively and giving them sense of belonging should be accorded priority by Okomu Oil Palm Company Plc. Therefore, human capital development should be accorded priority.

s/n	Community	Children	Youth	Adult	Total	LGA	Male	Female
1	AGBANIKAKA	1,200	800	300	2,300	OVIA NORTH EAST	1,300	1,000
2	OWAN	1,500	1,000	500	3,000	OVIA NORTH EAST	1,400	1,600
3	UYIERE	600	1,200	200	2,000	OVIA NORTH EAST	1,000	1,000
4	ODIGWETUE	1,500	2000	1000	4,500	OVIA NORTH EAST	2,200	2,300
5	ODIGHI	1,000	1500	500	3,000	OVIA NORTH EAST	1,400	1,600
	SUB-TOTAL	**5,800**	**6500**	**2500**	**14,800**		**7,300**	**7,500**
6	IHRUE	400	800	300	1,500	UHUNWONDE	800	700
7	OKE-IHRUE	2,000	1600	400	4,000	UHUNWONDE	2,100	1,900
8	EKPAN	500	700	300	1,500	UHUNWONDE	700	800
9	UMUOKPE	400	600	200	1,200	UHUNWONDE	500	700
10	ORHUA	600	1,600	300	2,500	UHUNWONDE	1,300	1,200
	SUB-TOTAL	**3,900**	**5,300**	**1500**	**10,700**		**5,400**	**5300**
	GRAND TOTAL	**9,700**	**11,800**	**4,000**	**25,500**		**12,700**	**12,800**

NB:- Out of cumulative population of 25,500 youth and children accounted for 21,500 that is, 84% of the total population.

7.3 Mitigating Adverse Social Impacts

Impacts are matched to mitigation actions. Mitigation is the implementation of measures designed to reduce the undesirable effects of a proposed action on the people and/or environment. The types of mitigation measures are contained in the **Table 43** below.

Table 43: Types of Mitigation Measure

Type of mitigation measure	**How it works**
Prevention and control measures	Fully or partially prevent an impact/reduce a risk by: -Changing means or technique -Changing or adding design elements -Changing the site -Specifying operating practices
Compensatory measures	Offset adverse impacts in one area with improvements elsewhere.
Remediation measures	Repair or restore the environment after damage is done.

…and sometimes you may need to redesign the project to modify or eliminate problem components[ii]*. Potentially serious impacts/issues must ALWAYS be mitigated to the point that the impact is non- significant. Prevention is best that is, where possible; PREVENT impacts by changes to site or technique. CONTROL of impacts with Operation and Maintenance practices (O&M) is more difficult to monitor, sustain.*

Social Action Plan to Mitigate Potential Negative Effects of the proposed Extension Two Project

1. Some of the communities expressed distrust in the capacity of the former owner; A &Hatman to effectively and transparently handle the compensation and resettlement programme for farmers on the proposed project land. It is therefore advised that Okomu Oil Palm Company Plc should be directly involved in ensuring that the people farming on the land are properly disengaged and resettled.

2. Design and implement a disengagement/resettlement plan to give the farmers on the land ample opportunities to be properly resettled for alternative livelihoods or farm locations.
3. Involve the various stakeholders both at the community and company levels to address sensitive social issues related to the proposed Extension Two project.
4. Design a proper information management mechanism that will include a dedicated Community Liaison Officer (CLO) that will handle all the community related matters for the communities and Okomu Oil palm company Plc. When operations have commenced Okomu Oil Palm Company Plc should undertake some infrastructure development projects in the communities as part of its corporate social responsibility.
5. Give proper orientation to workers who are coming from outside the communities on the traditional values of the people. This will concretize and reinforce existing social values.
6. Okomu Oil Palm Company Plc should proactively engage the Fulani herdsmen with a view to addressing the social and security issues associated with them.
7. Okomu Oil Palm Company Plc should earnestly engage the communities with a view to addressing the critical element of perception and misunderstanding relating to the status of the project land and the operational strategy and approach to plantation development by the company.

Social Impact Management Plan

The detailed mitigation measures are contained in the Social Impact Management Plan (SIMP) Table 44 below:

Table 44: ***Social Impact Management Plan (SIMP)***

Action/Control to Mitigate	**Responsibility**	**Timeframe**
Mitigation Target: Avoidance of Loss of Farmlands and Destruction of Community Conservation Areas		
Aim to avoid loss of farmlands by individual farmers.	Okomu Oil Palm Company Plc	Prior to and during project development.
Where farmlands are to be converted to oil palm plantations, ensure that Free, Prior and Informed	Okomu Oil Palm Company Plc	Prior to and during project development.

consent of farmers are obtained and appropriate compensations paid prior to conversion.		
Continue engagement with local communities and develop and implement community engagement plan.	Okomu Oil Palm Company Plcand communities	Throughout the development and operation of the project.
Ensure HCV management recommendations are adopted and fully implemented.	Okomu Oil Palm Company Plc	Prior to and during project implementation.
Mitigation Target: To Eliminate or Minimize the Impacts of the Proposed Project on Food Security of the Area		
Implement the proposal to allocate part of the concession to the local communities for food crop farming or oil palm smallholders' scheme.	Okomu Oil Palm Company Plc and communities	Within the first 3 years of project implementation.
Assist the communities with procurement and distribution of agricultural inputs to boost agricultural production.	Okomu Oil Palm Company Plc	Within the first 3 years of project implementation.
Implement skills acquisition and vocational training for the communities aimed at improving the capacity of the people for increased agricultural production and improved livelihoods.	Okomu Oil Palm Company Plc	After the third year of project implementation.
Mitigation Target: To Minimize Influx of Plantation Workers and its Implications on Communities' Family Structures and Social Networks		
Priority is given to host communities for all categories of workers to be recruited provided they have the requisite qualification and expertise.	Okomu Oil Palm Company Plc and communities	Throughout the project's life.
Develop database of local service providers and ensure they are informed of opportunities and tenders.	Okomu Oil Palm Company Plc	Within the first 3 years of project implementation.

Undertake orientation and induction on local communities' culture, tradition and values for workers from outside of the communities.	Okomu Oil Palm Company Plc and Community Liaison Officer (CLO)	Throughout the project's life.
Mitigation Target: To Avoid use of Hazardous Substances and Minimizing Water Pollution due to Agro-chemicals, Sewage from Worker's Camps and POME		
Minimal use of agrochemicals and only agro-chemicals registered by the National Environmental Standards and Regulations Enforcement Agency NESREA or those allowed under Nigerian laws should be used.	Okomu Oil Palm Company Plc	Throughout project life.
Develop and implement manual for the application and handling including disposal of agro-chemicals and hazardous waste.	Okomu Oil Palm Company Plc	Before planting and upkeep activities.
Application of agro-chemicals should be in strict compliance with manufacturer's instructions and specific Material Safety Data Sheet (MSDS).	Okomu Oil Palm Company Plc	Throughout project life.
Mitigation Target: To Avoid or Minimize the Exposure of Workers and Local Communities to Health and Safety Risk including HIV Aids		
Conduct risk assessment for all tasks and provide personal protective clothing to all workers.	Okomu Oil Palm Company Plc	At the commencement of operation.
Provide decent and adequate toilet and sanitation facilities for workers at all their camps and quarters.	Okomu Oil Palm Company Plc	During plantation development and construction phases.
Develop and implement waste management plans.	Okomu Oil Palm Company Plc	Throughout the project life.
Undertake regular medical check-up for workers.	Okomu Oil Palm Company Plc	Throughout the project life.

Formulate and release HIV/AIDS policy for workplace.	Okomu Oil Palm Company Plc and Workers Unions	Throughout the project life.
Design and implement health education programmes for workers.	Okomu Oil Palm Company Plc	Throughout the project life.
Establish an in-plant clinic to provide healthcare services to workers and their families.	Okomu Oil Palm Company Plc	At commencement of project implementation.
Mitigation Target: To Minimize Impacts of Operations on Public Facilities and Structures		
Ensure that damage caused to public facilities are appropriately fixed and within reasonable timeframe.	Okomu Oil Palm Company Plc and contractors	Soon after damage is identified.
Identify and develop guidelines for key activities that have the potential to impact on public facilities	Okomu Oil Palm Company Plc	Before commencement of project implementation.
Regular and effective monitoring of operation's impacts on public facilities and infrastructure	Okomu Oil Palm Company Plc	To be part of monitoring.
Support to the development of public facilities and infrastructure (e.g. schools, roads, electricity, etc.)	Okomu Oil Palm Company Plc	Throughout project life.
Mitigation Target: To Maximize Local Employment and Ensure Reasonable Quality of Life and Working Conditions of Workers in Plantation and Mill		
Ensure workers' conditions of service including salaries and wages compare favorable as applicable in the oil palm industry in Nigeria.	Okomu Oil Palm Company Plc,service providers and contractors	Throughout project life.
Dialogue, engage regularly and communicate effectively with workers union.	Okomu Oil Palm Company Plcand Workers Union	Throughout project life.
Ensure workers have appropriate and safe means of transport to and from work site.	Okomu Oil Palm Company Plc	Throughout project life.

Adopt and implement mechanism for disputes and grievance resolution.	Okomu Oil Palm Company Plc	Throughout project life.
Mitigation target: To Avoid Displacement of Communities and People		
Take measures to avoid displacement of communities and people.	Okomu Oil Palm Company Plc	Throughout project life.
Obtain Free, Prior and Informed Consent where displacement of people and/or communities are necessary.	Okomu Oil Palm Company Plc	Throughout project life.
Pay appropriate and acceptable compensations where displacement of people and/or communities occurs.	Okomu Oil Palm Company Plc	Throughout project life.
Ensure that displacement of people and/or communities is carried out in accordance with Nigeria's legal requirements and international best practice.	Okomu Oil Palm Company Plc	Throughout project life.
Mitigation Target: To Avoid/Minimize Potential Impacts of Pollution, Safety, Noise and Dust and Damage to Roads caused by Heavy Vehicles and Construction Activities		
Ensure all vehicles are roadworthy and drivers receive road safety trainings.	Okomu Oil Palm Company Plc and contractors	Throughout project life.
Institute safe driving culture including sanctions for violators both inside and outside of the plantation.	Okomu Oil Palm Company Plc, customers and contractors	Throughout project life.
Maintain access roads to the plantation.	Okomu Oil Palm Company Plc	Throughout project life.
Undertake a noise mapping of the mill and workshop to identify areas with more than 90 decibels and monitor regularly.	Okomu Oil Palm Company Plc	Throughout project life.
Provide appropriate personal protective equipment	Okomu Oil Palm	Throughout project life.

(PPE) for all workers especially in the plantation, workshop and the mill.	Company Plc	
Mitigation Target: To Avoid Plantation Development in High Conservation Value forests and other Ecosystems		
Ensure recommendations contained in HCV report are implemented to avoid development in HCV areas.	Okomu Oil Palm Company Plc, communities and contractors.	Throughout project life.
Collaborate with government institutions and the communities to conserve and maintain the integrity of HCV management areas.	Okomu Oil Palm Company Plc, Communities, LGAs and Edo State Government.	Throughout project life.
Restore where necessary any degraded HCV management areas	Okomu Oil Palm Company Plc	Throughout project life.
Mitigation Target: To Avoid Pollution or Destruction of Water Bodies and Riparian Vegetation		
Implement the environmental management plan (EMP) as approved by Federal Ministry of Environment.	Okomu Oil Palm Company Plc	Throughout the project life.
Comply with regulations relating to pollution and conservation of natural resources.	Okomu Oil Palm Company Plc and contractors	Throughout the project life.
Avoid environmental pollution at all workplaces.	Okomu Oil Palm Company Plc and contractors	Throughout the project life.
Obtain permits from regulatory bodies for effluent discharges and solid waste disposal.	Okomu Oil Palm Company Plc	Throughout project life.
Monitoring:		
Monitoring of operations impacts on local	Okomu Oil Palm	3 Years after

communities and population.	Company Plc	commencement, then bi-annual.
Implement the approved social impact monitoring programme.	Okomu Oil Palm Company Plc	Annually.

7.4 Cross Cutting Socioeconomic Issues and Challenges

The affected communities of the proposed Extension Two project have certain socioeconomic issues and challenges in common as presented in **Table 45**.

Table 45:Cross Cutting Socioeconomic/Social Issues and Challenges in the Communities

Ranks of Major Constraints	Major Constraints		Constraint Subset	Priority Ranking Subset	Comments
Rank 1	Socio-Economic Infrastructural Limitations	i	Electricity	Very High	• All the electricity projects are either abandoned or non-functioning.
		ii.	Health	Most important	• All the six health centres need staffing, equipment and drugs.Theyare located in Owan, Uhiere, Odigwetue, Odighi, Oke and Umuokpe.
		ii	Water	important	• Four abandoned reticulated water and three neighbourhood water scheme malfunctioning. They are found in Owan, Odigwetue, Odighi and Ihrue.

		iii	Education	Important	• Provision of scholarship • Provision of desks, chairs and tables at the primary schools as well as computer with accessories. • Posting of staff • Renovation of deplorable primary school structures.
Rank 2	Environmental Insecurity	i	Erosion and flooding	High in five communities from Oke axis(Ihrue, Oke, Ekpan, Umuokpe and Orhua)	Due to the locations of the communities and limited or no drainage to channel floodwater.
Rank 3	Economic and Social Insecurity	i	Unemployment/ Underemployment	Very High	Mostly among youths leading to youth restiveness and engagement in criminal acts as recorded in Oke recently.
		ii	Poverty	High	Attendant with its full social implication of hunger, moral decadence, violence etc.
Rank 4	Institutional Incapacities	i	Administrative	Moderate	Due to many overlaps. It was generally perceived that there is information gap between the leaders and the led especially in respect of Okomu proposed Extension Two project.

		ii	Conflict resolution	Moderate	The crime frequency is somehow worrisome in Oke due to the effect of narcotics in the life of some youth. The need for conflict resolution in other communities is less.

The population distribution is skewed towards youth and the implication is that unless they are productively engaged in the proposed Extension Two project they may constitute a security risk as soon as they lose their farmland to the proposed project.

It was obvious that all the ten affected communities of proposed Extension Two need government attention as they lack the basic infrastructural facilities needed. The standard of living in all the communities is low and the level of poverty is pretty high.

7.5 **Response from Okomu Oil Palm Company Plc to Community Issues and Concerns**

After the fieldwork, the major issues and concerns raised by the communities were presented to the company for their response. The specific concerns and responses are tabulated below:

Communities' Common Issues and Concerns	**Response by Okomu Oil Palm Company Plc**
The communities claimed that they own the proposed Extension Two project land.	Okomu OPC Plc followed due process in acquiring the land from the former owners; A &Hatman Nigeria Limited. The Ministry of Lands and Surveys were involved to ensure that the boundaries and area of the land conformed to what was defined in the statutory Certificate of Occupancy (C of O). The deed of assignment was accordingly approved and the deed of conveyance duly signed by the Governor of Edo State to signal the formal transfer of the title to Okomu Oil Palm Company Plc. The law therefore recognizes the Okomu Oil Palm Company Plc as the owners of the piece of land defined as Extension Two. The company is not aware of any counter

	claim to the land by anybody corporate or communities. However, if for any reasons the communities feel the land belongs to them, the matter will be in the front burner of the community engagement to resolve all the issues of misunderstanding prior to commencement of development activities on the land.
The Communities were not involved in the negotiation when Okomu OPC Plc was acquiring the land	Yes, it is true that the communities were not involved in the negotiation. This is because conveyancing as in this case is essentially between the transferor and transferee, with government as the approving body. Okomu Oil Palm Company Plc however recognizes the importance of the communities that are likely to be affected by their development activities. The communities will be appropriately and adequately taken on board in the community engagement and FPIC processes. The FPIC process has already been initiated. The former owners have formally introduced Okomu Oil Palm Company Plc to the communities. At the respective meetings held with them, the communities were happy to welcome the company and pledged their cooperation and expressed the hope that Okomu Oil Palm Company Plc would be the vehicle to bring the much desired development to their respective communities. These are developments after the SIA fieldwork.
Encroachment on farmland during boundary tracing.	The boundary tracing and verification was a prerequisite of the title transfer to be undertaken by the transferor; A &Hatman Limited. However, Okomu Oil Palm Company Plc gave a condition that in the event of the boundary tracing affecting farmlands, all the affected farmers must be notified and compensated for losses to be incurred. A &Hatman has provided evidences that such farmers were compensated. Okomu Oil Palm Company Plc will verify and validate these evidences during the community engagement and FPIC processes.
Destruction of farmlands without compensation	The understanding was that the farmers on the land were farming with the permission of A &Hatman, with the

	understanding that they will be given reasonable notice to vacate the land whenever A &Hatman wanted to develop the land. Notwithstanding, Okomu Oil Palm Company gave condition to A &Hatman that such farmers must be compensated. A &Hatman has submitted documentation of compensation paid. Okomu Oil Palm Company is studying the documentation and will subject it to the community engagement for validation. It is important to state that the compensations were paid after the SIA fieldwork was concluded.
Potential pollution of communities water system	The company has noted the concerns of the communities relating to water pollution. However, this fear is allayed given the track record of the company in best management practices including planting of cover crop to control run-off , leaving riparian strips along all rivers as buffer zones, using chemicals which will be denatured when they hit the soil, doingdifferential fertilizer application with foliar analysis as well as correct fertilizer placement to avoid run-off. In addition, there will be an environmental management plan, approved by the Federal Ministry of Environment in place. Suffice it to say that the proposed development will be subjected to an Environmental Impact Assessment (EIA) before it is undertaken.
Neglect of the communities by the former owners (A &Hatman Ltd.)	The company has noted the claim and concerns of the communities over age long neglect. It is to be expected that Okomu Oil Palm Company Plc will operate with high levels of social responsiveness and corporate social responsibility.
Infringement and violation of social norms and values	The company has undertaken a social impact assessment (SIA). The company is obliged to implement the social management plan as articulated in the SIA report.
Assistance and support to provide and maintain basic infrastructure.	The company recognizes the gross lack of basic infrastructure in virtually all the communities and has responded swiftly to initiate some community projects and support, for example, grading of roads of Odighi, Odiguetue and Uhiere. The company has also started the sinking of boreholes for

	Odiguetue and Uhiere. The company intends to develop a community engagement plan that will help in need assessment to prioritize and select quick impact projects to solidify support and galvanize local participation.

Overall the Okomu OPC Plc agreed that the SIA study has revealed the former owners (A &Hatman Limited) as grossly lacking in international best practices in its operations. The company has therefore decided to start on a clean slate by initiating the desirable corrective social actions including:

i) Continuing and concluding the process of obtaining Free Prior Informed Consent (FPIC) from the communities.
ii) Draw and present the Extension Two management plan to the communities and other stakeholders.
iii) Produce and present a community engagement plan to the communities.
iv) Address interactively all the carry-over issues of wrong perception, misunderstanding and transfer aggression by the communities urgently.
v) Present and validate all evidences of engagement and compensations by A &Hatman with the communities.
vi) Present and discuss the social impact management plan with the communities.

7.6 **Summary of SIA**

Based upon the findings, the proposed Extension Two project of Okomu Oil Palm Company Plc showed generally positive social consequences in the affected communities. However, there are considerable adverse social impacts enumerated by community stakeholders and perceived by the study team, which require urgent attention and mitigation measures in order for Okomu Oil Palm Company Plc to achieve social security in the project area.

The following management and mitigation measures are proposed for adoption and implementation to address the significant potential social and environmental impacts in order to make the proposed Extension Two project socially acceptable and beneficial:

- Implement FPIC
- Develop and implement community engagement plan
- Avoidance of displacement of communities and people.
- Identification, demarcation and appropriate management of traditional conservation areas and other high conservation values in the landscape.
- Prevention of pollution of water resources.
- Ensuring proper participatory disengagement and payment of compensation to farmers using the land.
- Fire prevention programmes and zero or controlled burning.
- Corporate social services to communities.
- Provision of healthcare services and HIV prevention.
- Diligent implementation of social impact management pan

7.7 Conclusion

Economic growth and prosperity are central to long-term poverty alleviation for social and environmental sustainability. The Okomu Oil Palm Company Plc's proposed Extension Two oil palm project represents one of the most effective avenues for poverty alleviation in all the affected communities provided adequate and prompt mitigation measures against envisaged adverse social impacts are implemented. The project has the prospects of providing employment for thousands of unskilled and semi-skilled people but this can only be achieved when Okomu Oil Palm Company Plc has gained social security to operate in the affected communities. Therefore, Okomu Oil Palm Company Plc should engage the communities directly, rather than through third parties or self-acclaimed community leaders who seemed to have misinformed the communities about the concept and objectives of the proposed Extension Two project and the good intention of Okomu Oil Palm Company Plc.

From the vantage point of Okomu Oil Palm Company Plc in Nigeria and as a member of RSPO, the proposed Extension Two project should serve as a reference point in the oil palm industry. It should be the benchmark for international standards and best practices for producing sustainable palm oil in Nigeria.

REFERENCES

Anon (2013, August 21). Edo migrant farmers get Okomu Oil Palm support in *Vanguard* Newspaper. www.**vanguard**ngr.com/**2013**/.../

Michelle Kent (2010). Development of social impact assessment methodology and its application to waste for life in Buenos Aires."www.wasteforlife.org/wik/images/c/c2/kent_SIA.pdf"

USAID (2010). Core EIA Skills I - www.encapafrica.org

Internet sites references:

www.encapafrica.org

http://www.leeds.ac.uk/library/training/referencing/definitions.htm

www.nse.com.ng

*www.**okomu**oil**plc**.net*

MINUTES AND ATTENDANCE OF MEETINGS
OOPC EXTENSION TWO SIA

MINUTES OF MEETING WITH IRHUE STAKEHOLDERS DURING SIA EXERCISE SPONSORED BY OKOMU OIL PALM HELD AT THE COMMUNITY ON 24TH MARCH 2014

1.0 Present

Fifteen persons cut across primary stakeholders of the community were in attendance with Mr. Samuel Alohan as contact person.

In attendance

- Mr. Phillip — Local Facilitator
- Godson Ilevbare
- Augustine Alenkhe
- Jimoh Awarra
- Clement Imoh

} SIA Team

2.0 Opening

The meeting started at about 1230hrs.

2.1 Introduction

The local facilitator- Mr. Phillip introduced members of the SIA team from Foremost Development Services to the community.

3.0 Business of the Day

3.1 Socio-economic study

Godson Ilevbare made it clear that the team is of Foremost Development Services and not Okomu. The work of the team is purely Social Impact Assessment. He therefore, appealed for cooperation regarding information concerning community context such as name of community and meaning, boundaries communities, tribe, spoken language, brief history, demography, social characteristics, governance structure, economic activities, community social project and conflicts resolution.

3.2 **Social Impact Analysis**

Jimoh Awarra engaged the community in brainstorming on situation analysis, customary or user right, fears/concerns of community on large scale Okomu Extension 2 plantation, potential direct / indirect impacts and community stakeholders' view about the impact of the project as related to specific sector.

4.0 AOB

The Community stakeholders reiterated that the community is under-developed all areas and Okomu assistant is needed but Okomu must formalize their approach with community leadership.

5.0 Closing

The meeting came to a close by 1430hrs.

MINUTES OF MEETING WITH ODIGHI STAKEHOLDERS DURING SIA EXERCISE SPONSORED BY OKOMU OIL PALM HELD AT THE COMMUNITY ON 24TH MARCH 2014

1.0 Present

Twenty seven persons cut across primary stakeholders of the community were in attendance with Mr. Flamingo Dajide as Opinion leader.

In attendance

- Mr. Phillip — Local Facilitator
- Godson Ilevbare
- Augustine Alenkhe
- Jimoh Awarra
- Clement Imoh

SIA Team

2.0 Opening

The meeting started at about 1015hrs.

2.1 Introduction

The local facilitator- Mr. Phillip introduced members of the SIA team from Foremost Development Services to the community.

3.0 Business of the Day

3.1 Socio-economic study

Godson Ilevbare made it clear that the team is of Foremost Development Services and not Okomu. The work of the team is purely Social Impact Assessment. He therefore, appealed for cooperation regarding information concerning community context such as name of community and meaning, boundaries communities, tribe, spoken language, brief history, demography, social characteristics, governance structure, economic activities, community social project and conflicts resolution.

3.2 **Social Impact Analysis**

Clement Imoh with assistant of Augustine Alenkhe engaged the community in brainstorming on situation analysis, customary or user right, fears/concerns of community on large scale Okomu Extension 2 plantation, potential direct / indirect impacts and community stakeholders' view about the impact of the project as related to specific sector.

4.0 AOB

The community is claimed that it owns the Extension Two and that Okomu OPC Pc did not consult with the community before acquiring the land.

5.0 Closing

The meeting came to close by 1200hrs.

MINUTES OF MEETING WITH EPKAN STAKEHOLDERS DURING SIA EXERCISE SPONSORED BY OKOMU OIL PALM HELD AT THE COMMUNITY ON 24TH MARCH 2014

1.0 Present

Thirteen persons cut across primary stakeholders of the community were in attendance with Mr. Matthew Omoniyi as Opinion leader but they take authority from the Odionwere, who is the eldest man in the community.

In attendance

- Mr. Phillip — Local Facilitator
- Godson Ilevbare
- Augustine Alenkhe
- Jimoh Awarra
- Clement Imoh

— SIA Team

2.0 Opening

The meeting started at about 1515hrs.

2.1 Introduction

The local facilitator- Mr. Phillip introduced members of the SIA team from Foremost Development Services to the community. He apologized on behalf of the team for coming at this time due to other engagements before theirs.

3.0 Business of the Day

3.1 Socio-economic study

Jimoh Awara made it clear that the team is of Foremost Development Services and not Okomu. The work of the team is purely Social Impact Assessment. He therefore, appealed for cooperation regarding information concerning community context such as name of community and meaning, boundaries communities, tribe, spoken language, brief history, demography, social characteristics, governance structure, economic activities, community social project and conflicts resolution.

3.2 **Social Impact Analysis**

Clement Imoh engaged the community in brainstorming on situation analysis, customary or user right, fears/concerns of community on large scale Okomu Extension 2 plantation, potential direct / indirect impacts and community stakeholders' view about the impact of the project as related to specific sector.

4.0 AOB

A concern to community stakeholders is poor infrastructure base.

5.0 Closing

The meeting came to a close by 1630hrs.

MINUTES OF MEETING WITH OKE- IRHUE STAKEHOLDERS DURING SIA EXERCISE SPONSORED BY OKOMU OIL PALM HELD AT THE COMMUNITY ON 20TH MARCH 2014

1.0 Present

Twenty three persons cut across primary stakeholders of the community were in attendance with Mr. Ohiengbe Sylvester as contact person.

In attendance

- Mr. Phillip — Local Facilitator
- Godson Ilevbare
- Augustine Alenkhe
- Jimoh Awarra
- Clement Imoh

} SIA Team

2.0 Opening

The meeting started at about 1530hrs. The team was not well received by community members of Oke community. However, the Focus Group Discussion Meeting on socials matters in relation to the Okomu Extension two project commenced.

2.1 Introduction

The local facilitator- Mr. Phillip introduced members of the SIA team from Foremost Development Services to the community. He apologized for the fact that the team came by this evening because the previous meeting was cancelled for security season.

3.0 Business of the Day

3.1 Socio-economic study

Clement Imoh made it clear that the team is of Foremost Development Services and not Okomu. The work of the team is purely Social Impact Assessment. He therefore, appealed for cooperation regarding information concerning community context such as name of community and meaning, boundaries communities, tribe, spoken language, brief history, demography, social characteristics, governance structure, economic activities, community social project and conflicts resolution.

3.2 **Social Impact Analysis**

As Jimoh Awarra started engaging the community in brainstorming on situation analysis at some point some members of the community advised us to flee for our dear lives when youths from all nooks and crannies started gathering under intense crisis prone crowd. The major issue was that their farms and crops have been destroyed before sending SIA team to them.

4.0 AOB

The Community stakeholders reiterated that

- *No forms of compensation was discussed before Okomu entered their farm land and started destroying their crops*
- *That there is a pending case in house of Assembly concerning this issue.*

5.0 Closing

The meeting came to abrupt end by 1630hrs.

MINUTES OF MEETING WITH UMUOKPE STAKEHOLDERS DURING SIA EXERCISE SPONSORED BY OKOMU OIL PALM HELD AT THE COMMUNITY ON 25TH MARCH 2014

1.0 Present

Fifteen persons cut across primary stakeholders of the community were in attendance with Community Secretary coordinating.

In attendance

- Mr. Phillip — Local Facilitator
- Godson Ilevbare
- Augustine Alenkhe
- Jimoh Awarra
- Clement Imoh

SIA Team

2.0 Opening

The meeting started at about 1115hrs.

2.1 Introduction

The local facilitator- Mr. Phillip introduced members of the SIA team from Foremost Development Services to the community. The team was not well received by community members of Umopke. They however declined to speak with us until they consulted with sisters communities- Ekpan, Oke and Orhua before granting us audience.

3.0 Business of the Day

3.1 Socio-economic study

Godson Ilevbare made it clear that the team is of Foremost Development Services and not Okomu. The work of the team is purely Social Impact Assessment. He therefore, appealed for cooperation regarding information concerning community context such as name of community and meaning, boundaries communities, tribe, spoken language, brief history, demography, social characteristics, governance structure, economic activities, community social project and conflicts resolution.

3.2 **Social Impact Analysis**

Clement Imoh engaged the community in brainstorming on situation analysis, customary or user right, fears/concerns of community on large scale Okomu Extension 2 plantation, potential direct / indirect impacts and community stakeholders' view about the impact of the project as related to specific sector.

4.0 AOB

A concern to community stakeholders is *"we do not understand the extent to which Okomu Oil is going to carry out extension two project"*

5.0 Closing

The meeting came to a close by 1245hrs.

MINUTES OF MEETING WITH ORHUA STAKEHOLDERS DURING SIA EXERCISE SPONSORED BY OKOMU OIL PALM HELD AT THE COMMUNITY ON 25TH MARCH 2014

1.0 Present

Ten persons cut across primary stakeholders of the community were in attendance with O.C. Forest Chairman coordinating.

In attendance

- Mr. Phillip — Local Facilitator
- Godson Ilevbare
- Augustine Alenkhe
- Jimoh Awarra
- Clement Imoh

} SIA Team

2.0 Opening

The meeting started at about 1315hrs.

2.1 Introduction

The local facilitator- Mr. Phillip introduced members of the SIA team from Foremost Development Services to the community. The team was well received by community members.

3.0 Business of the Day

3.1 Socio-economic study

Godson Ilevbare made it clear that the team is of Foremost Development Services and not Okomu. The work of the team is purely Social Impact Assessment. He therefore, appealed for cooperation regarding information concerning community context such as name of community and meaning, boundaries communities, tribe, spoken language, brief history, demography, social characteristics, governance structure, economic activities, community social project and conflicts resolution.

3.2 **Social Impact Analysis**

Jimoh Awarra engaged the community in brainstorming on situation analysis, customary or user right, fears/concerns of community on large scale Okomu Extension 2 plantation, potential direct / indirect impacts and community stakeholders' view about the impact of the project as related to specific sector.

4.0 AOB

Almost all the active members of the labour force in the community are into farming; consequently, the planned take-over of farm lands as a result of the extension two project will affects the farmers in many ways as reiterated by stakeholders.

5.0 Closing

The meeting came to a close by 1500hrs.

MINUTES OF MEETING WITH UHIERE STAKEHOLDERS DURING SIA EXERCISE SPONSORED BY OKOMU OIL PALM HELD AT UHIERE COMMUNITY ON 20TH MARCH, 2014

1.0 Present

Twenty five persons were in attendance cutting across primary stakeholders of the community with Mr. Francise Obanor as Opinion Leader.

In attendance

- Mr. Phillip — Local Facilitator
- Godson Ilevbare
- Augustine Alenkhe
- Jimoh Awarra
- Clement Imoh

(Godson Ilevbare, Augustine Alenkhe, Jimoh Awarra, Clement Imoh) — SIA Team

2.0 Opening

The meeting started at about 10.15 am with an opening prayer and this was swiftly followed by introduction SIA team to the community by Mr. Phillip and accompanied with normal exchange of pleasantries. The community is mixed settlement located along Benin-Akure express road. The SIA team was well received by community members.

3.0 Business of the Day

3.1 Socio-economic study

Godson Ilevbare guided the community elders, women and youth on information needed concerning community context such as name of community and meaning, boundaries communities, tribe, spoken language, brief history, demography, social characteristics, governance structure, economic activities, community social project and conflicts resolution.

3.2 **Social Impact Analysis**

Jmoh Awarrra engaged the community in brainstorming on situation analysis, customary or user right, fears/concerns of community Okomu intended oil palm plantation, potential direct / indirect impacts and community stakeholders' view about the impact of the project as related to specific sector.

4.0 AOB

There was a general discontent among community members towards Okomu Extension2 with this expression "We did not enter into any agreement with Iyayi, A & Artman, and Okomu"

5.0 Closing

Having successfully accomplished the business of the day, the meeting came to a close at 12.15pm.

MINUTES OF MEETING WITH ODIGUETUE STAKEHOLDERS DURING SIA EXERCISE SPONSORED BY OKOMU OIL PALM HELD AT ODIGUETUE COMMUNITY ON 20TH MARCH, 2014

1.0 Present

Thirty six persons were in attendance cutting across primary stakeholders of the community with Mr. John Ehigia as Opinion Leader.

In attendance

- Mr. Phillip — Local Facilitator
- Godson Ilevbare

- Augustine Alenkhe SIA Team
- Jimoh Awarra
- Clement Imoh

2.0 Opening

The SIA team stood under the sun to the declare our motives of coming, before the meeting started at about 1.15 pm with an opening prayer and this was swiftly followed by introduction SIA team to the community by Mr. Phillip.

3.0 Business of the Day

3.1 Socio-economic study

Godson Ilevbare guided the community elders, women and youth on information needed concerning community context such as name of community and meaning, boundaries communities, tribe, spoken language, brief history, demography, social characteristics, governance structure, economic activities, community social project and conflicts resolution.

3.2 **Social Impact Analysis**

Clement Imoh with assistant of Jimoh Awarrra engaged the community in brainstorming on situation analysis, customary or user right, fears/concerns of community Okomu intended oil palm plantation, potential direct / indirect impacts and community stakeholders' view about the impact of the project as related to specific sector.

4.0 AOB

The atmosphere was tensed throughout the FGD because they complained of intrusion of Okomu workers into their farms. The community complaints of general infrastructural decay which evidence on dilapidated schools, roads and maternity.

5.0 Closing

Having successfully accomplished the business of the day, the meeting came to a close at 3.15pm.

MINUTES OF MEETING WITH GBOLE-UBA STAKEHOLDERS DURING SIA EXERCISE SPONSORED BY OKOMU OIL PALM HELD AT OWAN COMMUNITY ON 19TH MARCH, 2014

1.0 Present

Twenty eight persons were in attendance cutting across primary stakeholders of the community with Elder Clement Ugboiyobo as Community leader.

In attendance

- Mr. Phillip — Local Facilitator
- Godson Ilevbare
- Augustine Alenkhe
- Jimoh Awarra
- Clement Imoh

(Godson Ilevbare, Augustine Alenkhe, Jimoh Awarra, Clement Imoh) — SIA Team

2.0 Opening

The meeting started at about 10.15 am with an opening prayer and this was swiftly followed by introduction SIA team to the community by Mr. Phillip and accompanied with normal exchange of pleasantries.

3.0 Business of the Day

3.1 Socio-economic study

Clement Imoh with the support of Godson Ilevbare guided the community elders, women and youth on information needed concerning community context such as name of community and meaning, boundaries communities, tribe, spoken language, brief history, demography, social characteristics, governance structure, economic activities, community social project and conflicts resolution.

3.2 **Social Impact Analysis**

Jmoh Awarrra engaged the community in brainstorming on situation analysis, customary or user right, fears/concerns of community Okomu intended oil palm plantation, potential direct / indirect impacts and community stakeholders' view about the impact of the project as related to specific sector.

Throughout the exercise the environment was friendly because the SIA team was well received by community members.

4.0 AOB

One of the major problems of the community is erosion and flooding according to Community leader. During the peak of rainy season the western part of Owan land is cut off from the community for about three months. We have been hearing rumors that Okomu is coming to our community but no formal approach has been made to us.

5.0 Closing

Having successfully accomplished the business of the day, the meeting came to a close at 1.30pm.

MINUTES OF MEETING WITH GBOLE-UBA STAKEHOLDERS DURING SIA EXERCISE SPONSORED BY OKOMU OIL PALM HELD AT AGBANIKAKA COMMUNITY ON 18TH MARCH, 2014

1.0 Present

Twenty seven persons were in attendance cutting across primary stakeholders of the community with Mr. Ikpefuran Sunday doubling as opinion leader and contact person.

In attendance

- Mr. Phillip — Local Facilitator
- Godson Ilevbare
- Augustine Alenkhe
- Jimoh Awarra
- Clement Imoh

— SIA Team

2.0 Opening

The meeting started at about 10.05 am with an opening prayer and this was swiftly followed by introduction SIA team to the community by Mr. Phillip and accompanied with normal exchange of pleasantries.

3.0 Business of the Day

3.1 Socio-economic study

Jimoh Awarra with the support of Godson Ilevbare guided the community elders, women and youth on information needed concerning community context such as name of community and meaning, boundaries communities, tribe, spoken language, brief history, demography, social characteristics, governance structure, economic activities, community social project and conflicts resolution.

3.2 **Social Impact Analysis**

Godson Ilevbare engaged the community in brainstorming on situation analysis, customary or user right, fears/concerns of community Okomu intended oil palm plantation, potential direct / indirect impacts and community stakeholders' view about the impact of the project as related to specific sector.

In spite of their customary right, w*e have been hearing rumors that Okomu is coming to our community but no formal approach has been made to us.*

4.0 AOB

The Community Secretary said one of their basic need is portable water because the source is stream; that there was a time a team of health care practitioners came to the community to examine the source of drinking water and since then nothing from the government or private organizations has been done.

5.0 Closing

Having successfully accomplished the business of the day, the meeting came to a close at 12.50pm.

OKOMU OIL PALM COMPANY PLC

SOCIAL IMPACT ASSESSMENT ATTENDANCE REGISTER

COMMUNITY UMUOKPE **CORDINATE**_____

DATE 25 March 2014

S/NO	NAME	DESIGNATION	TELEPHONE	SIGNATURE
1	CHIEF IMAFIDON ANTHONY	ELDER		
2-	CHIEF SOLOMON SUNDAY	11		
3	Omoregbe S. Vincent	11	07016596451	
4	Chief ojo francis	Elder		
5	Arasomwan Odion		07059015318	
6	JOHN ENDURANCE		08138374846	
7	Obok Saturday		09057518330	
8	Imagidon florence	Trader		
9	Okunwa Cyril		07083600220	
10	AROMOSE ESTHER	TRADER		
11	Ogede Friday			
12	ojo balogun	member		
13	AROMOSE PAULINE	TRADER		
14	Princess Izevbogie Michelle			
15	Okpia Ogbemudion	Member		

OKOMU OIL PALM COMPANY PLC

SOCIAL IMPACT ASSESSMENT ATTENDANCE REGISTER

COMMUNITY .ORHUA. **CORDINATE**_____

DATE 25 MARCH 2014

S/NO	NAME	DESIGNATION	TELEPHONE	SIGNATURE
1	Enwanta Andy	080 68290412		
2.	Osagiede Hesse	Youth	08067141040	
3.	Samuel. A.	Youth		
4	Ivie omoruyi	member		
5	Daniel Ukoko			
6	S.N. Idahosa	Youth		
7	Happy ojo	Driver	08076072382	
8	Equator Mrj			
9	Victor Ogie	Youth		
10	[illegible] - S.O	Member		

OKOMU OIL PALM COMPANY PLC

SOCIAL IMPACT ASSESSMENT ATTENDANCE REGISTER

COMMUNITY ODIGUETUE **CORDINATE**_____

DATE 20 MARCH 2014

S/NO	NAME	DESIGNATION	TELEPHONE	SIGNATURE
1	Anthony Ighao	Comm. Secretary	08184269255	
2	Markus Aidobogie	Fin. Secretary Youth	-	
3	Mathew Ighuisu	CDA	08095092799	
4.	Phillip Izekor		08187583436	
5	Samson Imansuen			
6	Stella Emokpea	"	08035815572	
7	John Elaho	CDA		
8	Simon Evbodaghe	Odionoere.		
9	IGBINOBA IDAHOSA			
10	Friday E.	Youth		
11	JOHN LAWANI	"		
12	Hillary Omoregie.	Youth		
13	Patrick Omoregie	"		
14	OSAYAME OSAGIBDE	"		
15	MR ETHATO	Elder		
16	EDISON EGHAREUBA	"		
17	S. Oduwa	Youth		
18	Gabriel Eboluwa	Student		
19	Phillip. Izekor.		08187583436	
20	Saturday Ukpowan	Youth		
21	Amogha osagie	"	—	

OKOMU OIL PALM COMPANY PLC

SOCIAL IMPACT ASSESSMENT ATTENDANCE REGISTER

COMMUNITY EKPAN **CORDINATE**

DATE 24/3/14

S/NO	NAME	DESIGNATION	TELEPHONE	SIGNATURE
1	Edore Felix		07064647350	[illegible]
2.	Akharia Albert	Farmer	.	[illegible]
3	AKHIMIEN VINCENT	Com. Secretary	08109092411	[illegible]
4	Osawe Godwin		08162192972	[illegible]
5	Ajayi Anthoney	farmer	08069506135	
6	Osito felix	"	08060318308	
7	Emmanuel Oniqwu	Farmer	08165872081	[illegible]
8	Ukpeto Money			[illegible]
9	William Sunday	Youth	—	W.S
10	ASIA ROLLAND	Youth	08060339915	
11	ONIAWU SYLVESTER		08062728246	[illegible]
12	Etpomabor Dick	farming		
13	omegho Japhet		—	[illegible]
14	Mathew Omomiyi	Leader		[illegible]

OKOMU OIL PALM COMPANY PLC

SOCIAL IMPACT ASSESSMENT ATTENDANCE REGISTER

COMMUNITY UHIERE **CORDINATE**

DATE 20 MARCH 2014

S/NO	NAME	DESIGNATION	TELEPHONE	SIGNATURE
1	Obanor Francis	Comm. Secretary	08182731748	
2.	MARLEY OFEWMU	Youth	08173628274	
3	MARY OSAZUWA	WOMAN LEADER	08130257950	
4	James Igbinwyose	member	08138820705	
5	Imoancle Paul	—	—	
6	Ukeneye oliver	Member		
7	Christopher Udegbe	member		
8	Osifor Mercy	Member		
9	Ken ofeimun	CDA.	08023375632	
10	Enaglele john.			
11	Goodluck gbadibon	member		
12	Mr. Edosa	Elder		
13	Collins Goodwin	member		
14	Abel omoregbe	student		
15	Igbinoba osasebin	✓		
16	Ogayande Maverick			
17	Ofuoje Williams	student		
18	Lucky Ugiagbe	Youth		
19	Osa Patrick	Member		
20	Nsira Monday	"	08107344784	
21	Daniel Edos	✓	08132460808	
23	Ediisson Ewese	student		

OKOMU OIL PALM COMPANY PLC

SOCIAL IMPACT ASSESSMENT ATTENDANCE REGISTER

COMMUNITY AGBANIKAKA **CORDINATE**_____

DATE 18 MARCH 2014

S/NO	NAME	DESIGNATION	TELEPHONE	SIGNATURE
1.	Ekpenga Obba	Odionwere		
2.	Igbi Adeh			
3.	IKPEHURAN SUNDAY	Comm. Secretary.		
4.	David Aigbokhae			
5.	Okoro paul.			
6.	Imonide Peter			
7	Uwabor Andrew	Member		
8	Uwabor Mary	"		
9	Agboye Pius	"		
10	Odamusi Tony	"		
11	Edeth Celestine	Member		
12	Yaya Bello	member		
13	odigwe Rabor	"		
14	Ajala Moses	"		
15	Afels Samuel.			
16	OTEKHILE OSADEBE	MEMBER		
17	STANLEY OMOAREBU	"		
18	Imonicle Johnbull	"		
19	Ufoyoku friday	member		
20	Ofomado Paul	Member		
21	Akubu Stanley			

OKOMU OIL PALM COMPANY PLC

SOCIAL IMPACT ASSESSMENT ATTENDANCE REGISTER

COMMUNITY IRHUE **CORDINATE**

DATE 24 March 2014

S/NO	NAME	DESIGNATION	TELEPHONE	SIGNATURE
1.	Mr. Samuel Afoham	Leader		
2.	FELIX AGABA		08143510368	
3.	AIGBOGUN SAMUEL	ELDER	08064495411	
4.	Pa Edenene Igbinosun	Odionwere	07062946826	
5	Ojemen Wilson	Asst. Youth Secretary	08031803694	
6	Idemudia samuel	member		
7	Otabor Anthony	member		
8	Osemwota Daniel	Treasurer	08170743638	
9	UHUNGHO GODWIN	Member		
10	Ogbebor Joy	member		
11	Imade Timothy	member	09032131753	
12	Otabor Dorcas	〃		
13	Ojemen Emily	〃	08030813694	
14	Aigbogun Grace			
15	Igbinosun Eduke	〃		
16				

OKOMU OIL PALM COMPANY PLC

SOCIAL IMPACT ASSESSMENT ATTENDANCE REGISTER

COMMUNITY OWAN **CORDINATE**_____

DATE 19 MARCH 2014

S/NO	NAME	DESIGNATION	TELEPHONE	SIGNATURE
1	IFIABOR MICHEAL	ODIONWERE	080 37351123	
2.	Ileren Micheal.			
3.	Omuta John		08136865004	
4	Ugwuoke Elias.	Elder		
5	Omoregbe paul	Elder		
6	Friday Eguaoje	Secretary	08104479786	
7	Charlie Inowa	CDA.	08035058865	
8	Egunma Samuel.	Secretary CDA	08033704401	
9	Mark Macaulay	Speaker		
10	David Adide.	Member	07061164402	
11	Ilesha Mogaji	Member	08062425949	
12	Desmond Okuokpi	Member.	08069400146	
13.	Ajagboye Godspower	11		
14	Okhena Ighigbe	11		
15	Omabe Lucky			
16	Imouai Charles.S			
17				
18				

OKOMU OIL PALM COMPANY PLC

SOCIAL IMPACT ASSESSMENT ATTENDANCE REGISTER

COMMUNITY Odighi **CORDINATE**_____

DATE 24 March 2014

S/NO	NAME	DESIGNATION	TELEPHONE	SIGNATURE
1.	Osasuyi Isaac	CDA-Secretary	08059519800	
2	Uwaghiren John	Elder	08039140355	
3	Joseph Osakwe nmwen	odighi	07052622502	
4	Pastor Ijatto	Elder	07036242406	
5	Uwaghiren Catherine	Woman leader	07036845337	
6	Esere peter	Dep. Odionwere	07033667578	
7	Omosusi peter	CDA	08039094466	
8	Osayande Okuonghae	CDA	07031330733	
9	John Idahomeme	member		
10	Sam Eptan	member		
11	Obasuyi mabel	member		
12	Idobor william	Member		
13	Emuamba Andy	Member.		
14	VINCENT OGBEDE		08072644182	
15	Emma Orpokun	//		
16	Henry Iyagbe	odighi	—	
17				
18	Omorede David	Odighi	08066252157	
19	Anna Omagbe	odighi		
20	Mr. Kelly Osarchere		07031249151	
21	Mr. Flamingo Dayide	odighi		

OKOMU OIL PALM COMPANY PLC

SOCIAL IMPACT ASSESSMENT ATTENDANCE REGISTER

COMMUNITY OKE-IRHUE **CORDINATE**______

DATE 20/3/14

S/NO	NAME	DESIGNATION	TELEPHONE	SIGNATURE
1.	Ehigie Johnbull	CDA Chairman	08030679009	[signature]
2.	Ozasie Johshon	Irhue	09091317113	[signature]
3	Sonny Irabor	Irhue		[signature]
4	Omoretikhon Godwin	Irhue		[signature]
5	Alegbe Sunday	Youth		
7	Tony Jimoh	CSO	08068008449	
8	Isiaka Irabor		0807112528	—
9	Ofabor Salami	Youth		
10	Omodosun Collins			[signature]
11	Papa Ola			[signature]
12	Imonkhede Lucky			[signature]
13	Osawadili Iroha	Youth leader	07030845968	[signature]
14	Okogun Lucy	woman leader		[signature]
15	Mr. Frank	Sec. CDA	08038453336	[signature]
16	Iyenbor, Peter			
17	Omorefikhan friday	Youth		
18	Amorifikhan Sunday	Youth		
19	Afemota Gabriel			
20	Osazie benard	Youth		
21	Rose Ojo	Trader	08024112936	[signature]
22	Marylin Akpana	Trader	08037441426	
23	Osiomo Jase	Trader	—	

SIA IN PICTURES

Agbanikaka

Odiguetue

Owan

Uhiere

Consultation at Irhue Community

Umuokpe

Oke-Irhue

Ekpan

Odighi

APPENDIX II

BIODIVERSITY SURVEY (2014)

OKOMU

THE OKOMU OIL PALM COMPANY PLC

(RC 30894)

PROPOSED EXTENSION TWO OIL PALM DEVELOPMENT PROJECT

BIODIVERSITY ASSESSMENT REPORT

Prepared by

FOREMOST DEVELOPMENT SERVICES LIMITED
21 Mercy Eneli Street, Surulere, Lagos. Tel: +2348033314800, +2348022236228
Email:foremost.development@gmail.com, Website: www.foremostdevelopmentservices.com

DECEMBER, 2014

Biodiversity Assessment Report on the Proposed Extension

Two Oil Palm Development Project
In
Ovia North-East and Uhunmwonde Local Government Areas, Edo State, Nigeria

Prepared by

FOREMOST DEVELOPMENT SERVICES LIMITED
21 Mercy Eneli Street, Surulere, Lagos. Tel: +2348033314800, +2348022236228
Email:foremost.development@gmail.com, Website: www.foremostdevelopmentservices.com

DECEMBER 2014

1.0 INTRODUCTION AND BACKGROUND

The Okomu Oil Palm Company Plc proposes to develop its newly acquired site of about 11, 400 hectares into oil palm estate. The site is located in Ovia North-East and Uhunmwonde Local Government Areas of Edo State, Nigeria. It is required to conduct a detailed study to determine the biodiversity status and importance of the proposed site before the commencement of the development.

The biodiversity survey is part of the requirements of the general environmental impact assessment of the proposed development. The survey is meant to gather information on the status and trends of biodiversity with specific information required on the status of flora and fauna in relation to rare, threatened or endangered species and high conservation value habitats, if any, that exist on the land or that could be affected by the development, operation and management of the oil palm estate.

Pre-assessment of biodiversity status as a pre-requisite for establishment of oil palm plantation is also a requirement of the Roundtable on Sustainable Palm Oil (RSPO), to promote best management practices in the production of oil palm, emphasizing high standard in environmental and biodiversity conservation, among other economic and social considerations.

The Biodiversity survey is therefore in line with the RSPO Principles and criteria 5 for sustainable oil palm production – Environmental responsibility and conservation of natural resources and biodiversity. Specific outline of the criteria touched on aspects of natural resource management, waste, energy and biodiversity. Criterion 5.2 is specifically focused on Biodiversity and stated thus:

"The status of rare, threatened or endangered species and high conservation value habitats, if any, that exist in the plantation or that could be affected by plantation or mill management, shall be identified and their conservation taken into account in management plans and operations."

The survey is also in compliance with relevant National policy, legislation and principles on sustainable environmental resource management as contained in the following regulations which are also connected and relevant to international Treaties such as the Convention on Biological Diversity (CBD) and the Convention on Trade in Endangered Species (CITES).

Globally respected biodiversity assessment tools such as the Forests of High Conservation Value (HCV), Important Bird Area (IBA) and species of global and national biodiversity threat within the context of IUCN Red List and the Endangered Species Law of 1985 are considered as part of the analysis of the study.

In line with the terms of reference of the study, surveys were carried out during dry and rainy season periods of the year 2014. Dry season observation took place in March while the rainy season observation took place in July 2014.

2.1 BIODIVERSITY ASSESSMENT

Site Description

The proposed oil palm plantation is between Ovia Northeast and Uhunmwode Local Government Area, Edo State Nigeria. It lies within Latitudes 6° 38' - 6° 48' N and Longitudes 5° 48' and 5° 55' E. The area is about 11,416 hectares along the Akure-Benin road. The Communities around the proposed project area are ten, including Uhiere, Owan, and Agbanikaka (Fig 1 & 2). The area is within the Benin Formation (coastal plain sandstone), which is of Plieocene-Pleistocene age and consists of yellow and white sands with pebble horizons. The formation has clays and sandy-clays in lenses and is partly marine, partly deltaic, and partly fluvio-lacustrine in origin. The beds vary from deltaic sands to fully marine clays and shales. The terrain is characterized by highly undulating ridges and nearly flat topography. Some section of the concession serves as the catchment basin of some rivers such as *Jemide* and *Owan Rivers* which drain into the Osse River, via the Benin River into the Atlantic Ocean.

The climate is tropical with a low annual range in temperature, usually less than 5 ˚C. Rainfall is seasonal with a dry season extending from November to February and the rainy season from March to October.

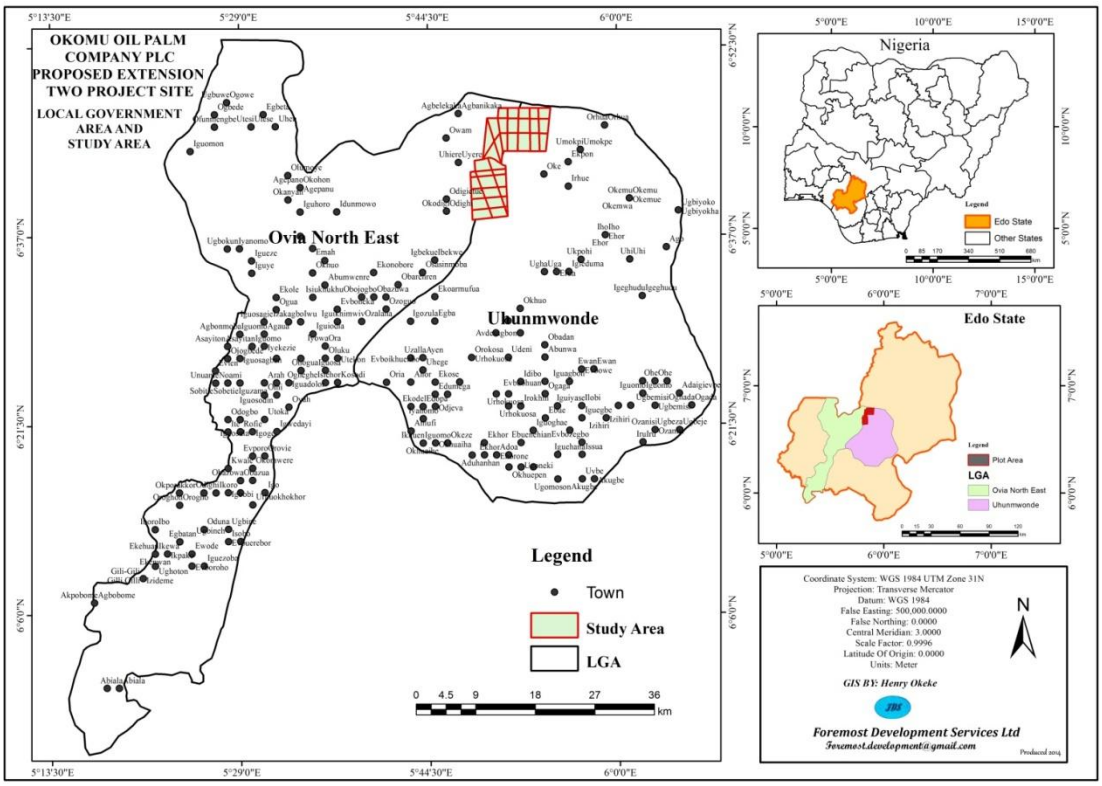


Figure 1: Map of Edo State showing location of the proposed project Area

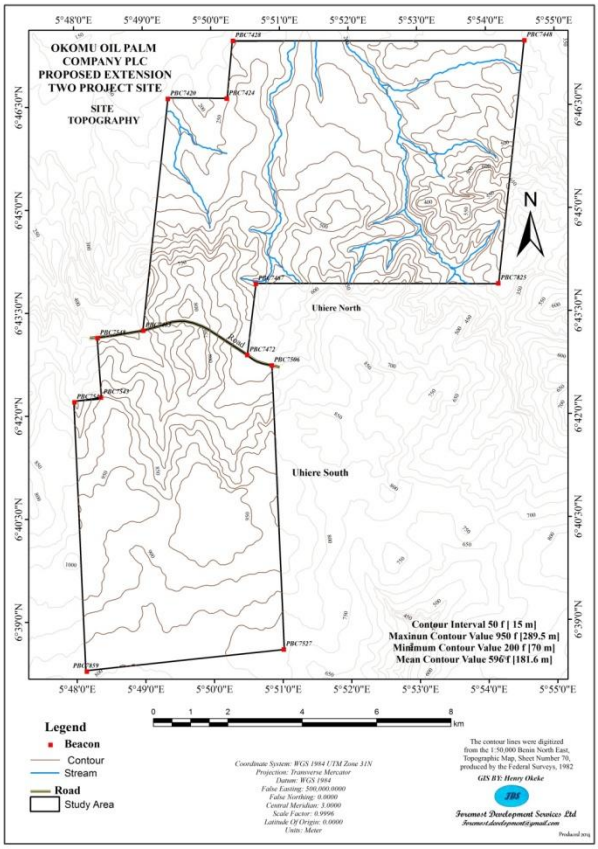


Fig 2: Map of proposed project area showing contour and drainage pattern

2.2 Assessment Method

The biodiversity studies were conducted during the two seasons of the year (2014) and centred on a number of intensive study locations sited to sample the variations in soils, topography, major vegetation communities and climatic conditions represented throughout the project areas. At each location, a series of bird observation transects were established, either in the quadrat or line transect configuration, together with a vertebrate fauna observation grid, an invertebrate sampling transect and a vegetation plot. These locations formed the basic study units for all systematic fauna investigations. Other areas were sampled by opportunistic collections or observations. Data thus gathered served either to corroborate the finding from the systematic surveys or to confirm the information provided by the local hunters or trappers. Some of the sites visited are shown in Appendix II with photographic records.

The project area was divided into twenty equal-sized grids for effective sampling coverage of the areas within the grid. The grid units, consisted of nine (9) in the southern part and eleven (11) in the northern part and the sampling points within the project area were labeled SP 1-20 (Table 1, Fig. 3). Within each grid, systematic data collection was made while traversing from one location to another. The roads within each grid formed the transect line used and served as the basic study unit for all systematic collections and observations. Direct and indirect observation enabled the gathering of information on the current status of the biodiversity resources as well information on the hydrobiology, topography, and land use in the area.

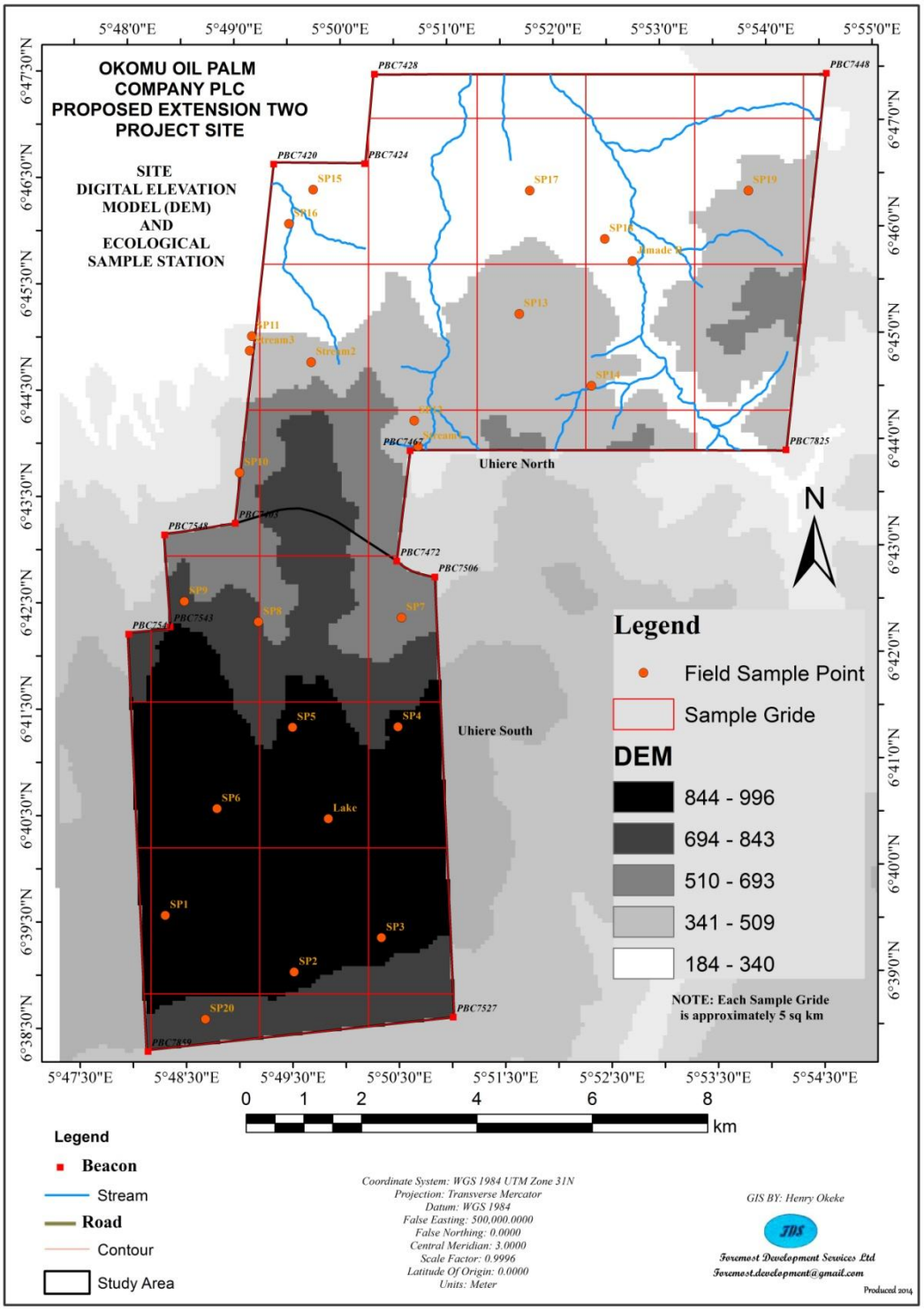


Figure 3: Map of Study Area showing sampling grid and sampling locations

Table 1: Coordinates of sampling location in the proposed project area

	Longitude E (X)				Latitude N (Y)		
	DEGREE	**MINUTES**	**SECONDS**		**DEGREE**	**MINUTES**	**SECONDS**
SP1	5	48	18.3		6	39	33.4
SP2	5	49	30.8		6	39	01.0
SP3	5	50	20.1		6	39	20.1
SP4	5	50	30.1		6	41	19.0
SP5	5	49	30.6		6	41	19.0
SP6	5	48	47.8		6	40	33.4
SP7	5	50	32.5		6	42	20.5
SP8	5	49	11.7		6	42	18.6
SP9	5	48	30.0		6	42	30.4
SP10	5	49	01.6		6	43	42.8
SP11	5	49	09.0		6	44	59.8
SP12	5	50	40.3		6	44	11.6
SP13	5	51	39.9		6	45	11.5
SP14	5	52	20.4		6	44	30.7
SP15	5	49	NA		6	46	NA
SP16	5	49	30.3		6	46	03.0
SP17	5	51	NA		6	46	NA
SP18	5	52	28.4		6	45	53.5
SP19	5	53	NA		6	46	NA
SP20	5	48	NA		6	38	NA
Stream1	5	50	42.4		6	43	57.1
Stream2	5	49	42.4		6	44	44.9
Stream3	5	49	07.7		6	44	51.6
Lake	5	49	50.5		6	40	27.4
Jimade R	5	52	43.9		6	45	40.9

2.2.1 Vegetation Assessment

A direct observation of the vegetation was done using the existing road network as the major transect. A field study was carried out in order to obtain information on plant species composition, density and diversity in the proposed project site. The various plant species were assessed and listed at each study site using transects. The cover of the creeping plants was determined using 1m x 1m quadrats while the plant population density of economic trees within the study area was assessed using 10m x 10m quadrats. Photographs of the vegetation in the study area were recorded. The precise location of the study sites was ascertained with the use of a global positioning system. Unidentified plants were collected, pressed as herbarium specimens for correct identification.The proposed project site lies within the lowland rain forest zone of Nigeria. Plant species identification was done with Flora of West Tropical Africa and Nigerian Trees (Keay, 1989).

2.2.2 Wildlife Assessment

Assessment of the wildlife fauna of proposed project area was carried out through field observation, interviews with local hunters/trappers, and reference to specialist institutions and experts both local and international. Information on animals not sighted in the field was obtained from local hunters or trappers by showing them voucher specimen or photographs. This was corroborated by information obtained from the University of Benin Museum collection from the area.

Systematic effort: Systematic field data collection for birds, amphibians, and mammals centered on a series of grid points and observation transects located around the proposed project area. The area was divided into twenty (20) grid units, consisting of nine (9) in the southern part and eleven (11) in the northern part (Table 1, Fig. 2). Within each grid, systematic data collection was made while traversing from one location to another. The roads within each grid formed the transect line used and served as the basic study unit for all systematic collections and observations. Direct sightings and animal indices such as calls, foot prints, nests, burrow and food remains were used to confirm presence of animals. Birds and mammals were recorded up to 50 m either side of the transect lines, with the aid of a binoculars, depending on the extent and density of vegetation. Birds and mammals not sighted but heard were also recorded. Identification and nomenclature were based on the field guide of birds of Nigeria and West Africa (Elgood, *et al*., 1994; Serle *et al*., 1977, Happold 1987). Invertebrates were collected by litter sieving techniques (land molluscs), sweep netting and light trap (arthropods).

2.3 FLORA AND FAUNAL COMPOSITION

2.4 FLORA (Vegetation)

The vegetation in the northern part of the proposed site consists of a mosaic of fallow lands, farms, and riparian wetlands along the streams located within the site. The commonest crops under cultivation in the farms include *Manihot esculenta* (cassava), *Musa sapientum* (Plantain), *Zea mays* (corn), and *Dioscorea alata* (yams) (Plates 1-4). The fallow lands are covered by a variety of weeds including *Commelina nodiflora, Panicum repens, Indigofera suffruticosa, Chromoleana odorata, Tridax procumbens, Panicum maximum, Axonopus compressus, Ageratum conyzoides, Ipomoea involucrata, Sida acuta, Abuliton* sp., *Costus afer, Smilax anceps, Manniophyton fulvum, Solanumtorvum Ipomoea hirta* and *Cyperus* spp. (Plate 5) Trees within the fallow area of the northern region of the proposed project area include *Baphia nitida, Trema orientalis, Pycnanthus angolensis, Musanga cecropioides, Alchornea cordifolia, Alstoni aboonei, Milicia excelsia,Nauclea spp., Voacanga spp, Terminalia ivorensis,Ricinodendron africanum ,Irvingia gabonensis* and *Bombax* spp. (Plate 6).The riparian wetland areas along the streams and *Jemide* River are dominated by swamp loving plants such as *Hallea ciliata, Ancistrophyllum seccundiflorum, Uapaca spp., Musanga cropioides, Anthostema aubryanum, Danielia ogea, Pandanus togoensis,* and *Alchornea cordifolia* (Plates 7-8). Riparian wetlands area areas of high conservation value as they contain sensitive biota. Aquatic macrophytes encountered include *Cyrtosperma senegalense, Ipomoea aquatica, Leersia hexandra, Crinum sp.* and *Jussiea repens.* The vegetation is generally healthy. The cassava mosaic disease is however prevalent in the study area.

The vegetation in the Southern part of the study area is also similar to that of the northern part but a portion of the study area is presently covered with weed species typical of the lowland rain forest zone in Nigeria. The dominant plants include Guinea grass (*Panicum maximum), Trema orietalis, Alchornea cordifolia,* Siam weed (*Chromoleana odorata*) and *Sida* spp. (Plate 9). However, there is a lake (06° 40' 27.4" N and 005° 49' 50.5" E) within the southern part of the proposed project area, with some aquatic plant species such as *Nymphaea lotus* and *Pistia stratiotes, Cyrtosperma* .

Plate1: Luxuriant growth of cassava in the study area

Plate 2: Part of a plantain farm in the study area

Plate 3: A new plantain farm at the edge of one of the streams

Plate 4. Part of a yam farm within the proposed site

Plate 5: Part of the fallow land colonised by various weeds, shrubs and trees

Plate 6: A riparian forest is well developed along one of the streams in the proposed site.

Plate 7: Part of the proposed site showing some preserved economic trees

Plate 8: River Jemide fringed by emergent aquatic Macrophytic plants and riparian species

Plate 9. The Southern part of the proposed site is covered mainly by weed species.

Forest stratification was observed in large patches. There were three tree strata, consisting of emergents, canopy and under-storey layers. Other life forms associated with trees were epiphytes and climbers.

Emergent

These are the tallest trees (>35m) scattered within the forest. Their crowns do not touch as they are far apart and tower above the canopy trees. Emergent species encountered during the survey included *Triplochiton scleroxylon, Ceiba pentandra, Khaya ivorensis, Terminalia superba, Piptadeniastrum africanum* and *Milicia excelsa*. A *Terminalia sp* tree was above 50m in height and 5m in girth. As these are timber species of value, these forest fragments are susceptible to assault by timber merchants and their collaborators.

Plate 10: Emergent vegetation

Canopy Layer

The trees in this layer have their crown touching one another so they form a complete cover (canopy) over the forest, thus casting shade upon the species below. Species found in this layer included *Trema guineensis, Antiaris toxicaria, Trilepisium madagascariense, Malacantha alnifolia, Hallea ciliata, Alstonia boonei* and *Dacryodes edulis.*

Plate 11: Canopy trees

Under-Storey Layer

The trees in this layer are adapted to the little amount of light that filters through the canopy layer. They are smaller in size and some notable characteristics include buttresses at the bases of the stems, relatively thin barks, and drip tips of leaves. Species found included *Olax subscorpioidea*, *Celtis phillipensis*, *Cola millenii*, *Campylospermum flavum*, and *Pycnanthus angolensis*.

The canopies of trees in this layer were infested with epiphytes such as lichens, mosses and ferns, and some vascular plants including *Culcasia scandens* and a variety of orchids. The shrub layer had species like *Abrus precatorius*, *Cnestis ferruginea*, and *Connarus staudtii*. *Paullinia pinnata* occurred at the edge of the forests where there is illumination.

Plate 12: Understorey trees with epiphytes

Active Farmlands

The presence of farmland within the proposed project area was observed. Arable crops include maize, cassava, yam, pawpaw, plantain, banana and various species of vegetables such as *Telfaria occidentalis* and *Vernonia amygdalina*, which were being harvested on a large scale for sale in markets.

2.5 Wildlife Fauna

Composition of the fauna

The terrestrial wildlife fauna of the region consist of mammals, birds, reptiles, amphibians and invertebrates.

2.5.1 Mammals

Table 2 gives a summary of the mammalian fauna recorded from the study area. A total of 27 species of mammals (excluding bats) were recorded from the area during the period of study. These species belong to 6 mammalian Orders, 16 Families, and 24 Genera. They include the rodents (Rodentia), primates (Primates), pangolins (Pholidota), carnivores (Carnivora), insectivores (Insectivora), and ungulates (Artiodactyla). The rodents were the most dominant mammalian group, excluding bats, constituting about 40% of the total number of mammalian species recorded. Except for the Giant rats, the rodents are small mammals and are very varied in pelage coloration and patterning (Happold, 1987). They are mostly terrestrial and live in burrows, being mostly nocturnal. Because of their large numbers they are neither

threatened nor endangered by the proposed project but rather considered a pest to field crops and stored products. They are listed as Least Concert (LC) by the 2014 IUCN Redlist.

The primates include the monkeys, galagos and pottos. Monkeys were sighted along the watershed forest in Grid 11, 17 and 18. Mona monkeys (*Cercopithecus mona*) and the White-throated monkeys were seen recently but their population is declining as a result of habitat loss through deforestation for timber and conversion of forest to agricultural land. These monkeys are now restricted to the watershed forest of the Jemide River. The White Throated Monkey is listed in the IUCN Red list (2014) as Vulnerable and will need special attention for protection when clearing and farm operations commence. Pottos and galagos have been reported by trappers and hunters. Although their population is declining, they were considered as Least Concern by the IUCN Redlist.

The carnivores are represented by small to medium-sized species of civet, genet and mongoose. They are all rare and may be threatened by habitat loss and over-exploitation by humans for food. They were considered as Least Concern by the IUCN Redlist.

Amongst the Artiodactyla (even-toed ungulates) only the antelopes (family Bovidae) and bush pigs (family Suidae) were reported to occur in the area. They are commonly found in the area and may not be threatened immediately by the project. However, as the forest becomes more accessible to hunters/trappers due to the project, these wildlife species will be seriously threatened. The buffalo was reported to be present in the past but this species has not been recorded in the area in the last 5 years and may be locally extinct. All the Artiodactyla are considered as Least Concern by the IUCN Redlist.

The pangolins (Order Pholidota) were represented by a single species of tree pangolin, or White-bellied Pangolin *Manis tricuspis = Phataginus tricuspis*. This species is considered as Vulnerable by the IUCN Redlist. Table 3 gives a checklist of all the mammalian fauna found in the area of study.

Estimates of population densities based on counts of trapping animals or interviews by hunters were low. The population density of most species of primates, carnivores, artiodactyls may vary between 2-10/km^2 while rodents may vary between 10-20/km^2 depending on the species. Plate 13 shows some of the mammals species recorded within the project area.

Table 2: Number of species, genera and families of mammals (excluding bats)

Order	**Family**	**Genera**	**Species**
Rodentia	6	6	11
Primates	3	4	4
Artiodactyla	2	3	4
Carnivora	2	5	5
Insectivora	2	2	2
Pholidota	1	1	1
Total	**16**	**21**	**27**

Table 3: Checklist of mammals recorded in the proposed project area

S/N	Order	Family	Common names	Scientific names	Abundance status	Conservation status
1	Primates	Lorisidae (potto)	Potto	*Perodicticus potto*	Rare	Least Concern
2		Galagidae (bushbabies)	Dwarf Galago	*Galagoides demidovii*	Rare	LC
3		Cercopithecidae (monkeys)	White-throated monkey	*Cercopithecus erythrogaster*	Rare	Vulnerable
4			Mona monkey	*Cercopithecus mona*	Rare	LC
5	Pholidota (Pangolins)	Manidae	Tree Pangolin	*Manis tricuspis*	Rare	Vulnerable
6	Insectivora	Erinaceidae	Hedgehog	*Erinaceus albiventris*	Common	LC
7		Soricidae (Shrews)	Forest Shrew	*Crocidura odorata*	Common	LC
8	Rodentia	Anomaluridae	Beecrof's Flying-squirrel	*Anomalurus beecrofti*	Rare	LC
9	(rodents)	Hystricidae	Brushtailed Porcupine	*Atherurus africanus*	Abundant	LC
10		Cricetidae	Emin's Giant-rat	*Cricetomys emini*	Abundant	LC
11			Gambian Giant Rat	*Cricetomys gambianus*	Abundant	LC
12		Thryonomidae	Greater Cane Rat	*Thryonomys swinderianus*	Abundant	LC
13		Sciuridae	Giant Forest Tree-squirrel	*Protexerus strangeri*	Rare	LC
14			Red-legged Sun-squirrel	*Heliosciurus rufobrachium*	Rare	LC
15		Muridae	Black Rat	*Rattus rattus*	Abundant	LC
16			Multimammate Mouse	*Mastomys natalensis*	Common	LC
17			Pygmy Mouse	*Mus minutoides*	Common	LC
18			Three-striped Mouse	*Hbyomys trivirgatus*	Common	LC
19	Carnivora (Carnivores)	Viverridae (civet, genets &	African Civet	*Viverra civetta*	Rare	LC

		mongoose)				
20			Two-spot Palm Civet	*Nandinia binotata*		
21			Forest Genet	*Genetta poensis*	Rare	LC
22		Herpestidae	Marsh Mongoose	*Atilax palidinosus*	Rare	LC
23			Egyptian Mongoose	*Herpestes ichneumon*	Rare	LC
24	Artiodactyla	Suidae (pigs)	Red River-hog	*Potamochoerus porcus*	Rare	LC
25		Bovidae (Antelopes)	Bushbuck	*Tragelaphus scirptus*	Common	LC
26			Sitatunga	*Tragelaphus spekii*	Rare	LC
27			Maxwell's Duiker	*Cephalophus maxwelli*	common	LC

(a) White throated monkey

(b) African Civet, *Civettictis civetta*

(c.) Bushbuck, *Tragelaphus scriptus*

(d) Maxwell's Duiker, *Cephalopus maxwelli*

(e) Tree Pangolin, *Manis tricuspis*

(f) Grasscutter, Thryonomys swinderianus (g) Brushtailed porcupine, Atherurus africanus

Plate 13: Mammals recorded from the proposed project area

2.5.2 Birds (Avifauna)

The avifauna of the region represents the diverse habitat types in the region. The habitats include secondary forest at various successional stages, farmlands (including cassava, yam) and freshwater swamp forest in the northern part of the concession and oil palm plantation in the south. A total of 49 species were recorded. Birds' characteristic of primary forest or old growth secondary forest such as hornbills, turacos, various bulbuls, flycatchers, and eagles were found in the primary forest fragment near the *Jemide River*.

Seed and insect eating birds dominated the farmlands and oil palm plantation in the southern part of the concession within the proposed project area. They include bulbuls, barn swallows, swift, wagtails, waxbills, pin-tailed whydahs, common thrush, kingfishers and sunbirds. These species gives a clear indication of habitat change.

Common raptors in the proposed project area include hawks, hawk-sparrow, kites, buzzards, palmnut vultures and martial eagles.

Moreover, only a few species restricted to the Guinea-Congo Forest Biome, were identified during the assessment. These include the White-Thighed Hornbill (*Bycanistes albotibialis*), African Emerald Cuckoo (*Chrysococcyx cupreus*), Yellow-Crested Woodpecker (*Thripias xantholophus*) and White-Breasted Negro finch (*Nigrita fusconotus*). Plate 14-15 shows some of the bird species recorded from the proposed project area.

The proposed project area is not located within any Important Bird Area (IBA) as defined by Birdlife International. The nearest being the Okomu National Park, approximately 60 km, in Ovia Southwest Local Government Area, Edo State, Nigeria.

Table 4: A checklist of Bird fauna of the proposed project area

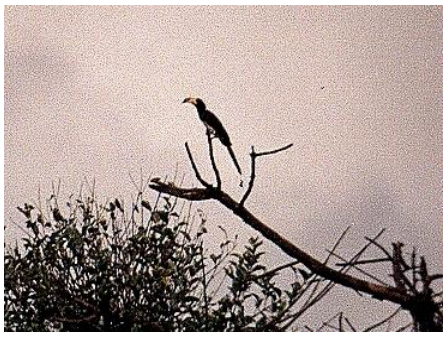
Family	Scientific Name	Common Name	IUCN Status
Accipitridae	*Gypohierax angolensis*	Palm-Nut Vulture	Least concern
Accipitridae	*Polyboroides radiatus*	Harrier Hawk	LC
Accipitridae	*Polemaetus bellicosus*	Martial Eagle	LC
Accipitridae	*Milvus migrans*	Black Kite	LC
Accipitridae	*Kaupifalco monogrammicus*	Lizard Buzzard	LC
Alcedinidae	*Halcyon malimbica*	Blue-Breasted kingfisher	LC
Alcedinidae	*Halcyon senegalensis*	Woodland Kingfisher	LC
Alcedinidae	*Alcedo cristata*	Malachite kingfisher	LC
Apodidae	*Cypsiurus parvus*	African Palm-swift	LC
Ardeidae	*Bubulcus ibis*	Cattle Egret	LC
Bucerotidae	*Bycanistes subcylindricus*	Black-and-White Casqued Hornbill	LC
Bucerotidae	*Tockus fasciatus*	African Pied hornbill	LC
Capitonidae	*Pogoniulus bilineatus*	Yellow-Rumped Tinkerbird	LC
Capitonidae	*Pogoniulus subsulphureus*	Yellow-Throated Tinkerbird	LC
Cisticolidae	*Cisticola erythrops*	Chattering Cisticola	LC
Columbidae	*Turtur tympanistria*	Tambourine Dove	LC
Columbidae	*Streptopelia senegalensis*	Laughing Dove	LC
Columbidae	*Streptopelia semitorquata*	Red eyed Dove	LC
Coraciidae	*Eurystomus glaucurus*	Broad-Billed Roller	LC
Columbidae	*Turtur afer*	Blue-spotted Wood dove	LC
Corviidae	*Corvus albus*	Pied Crow	LC
Cuculidae	*Centropus senegalensis*	Senegal Coucal	LC

Cuculidae	*Centropus grilli*	Black Coucal	LC
Cuculidae	*Chrysococcyx caprius*	Didric cuckoo	LC
Estrildidae	*Nigrita fusconotus*	White Breasted Negrofinch	LC
Estrildidae	*Lonchura cucullata*	Bronze Mannikin	LC
Estrildidae	*Nigrita canicapillus*	Grey-Headed Negrofinch	LC
Estrildidae	*Lonchura bicolor*	Black and White Mannikin	LC
Hirundinidae	*Hirundo nigrita*	White-Throated Blue Swallow	LC
Hirundinidae	*Hirundo aethiopica*	Ethiopian Swallow	LC
Meropidae	*Merops pusilus*	Little Bee-Eater	LC
Meropidae	*Merops albicollis*	White-throated bee-eater	LC
Motacillidae	*Motacilla flava*	Yellow Wagtail	LC
Motacillidae	*Macronyx croceus*	Yellow-Throated Longclaw	LC
Nectariniidae	*Hedydipna collaris*	Collared Sun-bird	LC
Nectariniidae	*Cinnyris cupreus*	Copper Sun-bird	LC
Nectariniidae	*Cinnyris superbus*	Superb Sunbird	LC
Numididae	*Numida meleagris*	Helmented Guinea Fowl	LC
Passeridae	*Passer griseus*	Northern Grey-Headed Sparrow	LC
Picidae	*Dendropicos goertae*	Grey Woodpecker	LC
Picidae	*Dendropicos gabonensis*	Gabon Woodpecker	LC
Ploceidae	*Ploceus cucullatus*	Village Weaver	LC
Pycnonotidae	*Pycnonotus barbatus*	Common Bulbul	LC
Pycnonotidae	*Andropadus virens*	Little Greenbul	LC
Pycnonotidae	*Thescelocichla leucopleura*	Swamp Palm Bulbul	LC
Sylviidae	*Hylia prasina*	Green Hylia	LC
Turdidae	*Turdus pelios*	African Thrush	LC
Viduidae	*Vidua macroura*	Pin-Tailed whydah	LC

Senegal Kingfisher, *Halcyon senegalensis*

Bush Sparrow, *Petronia dentata*

West African Thrush, *Turdus pelios*



Black and White Hornbill, *Tockus fasciatus*

Pin tailed Whydah, *Vidua macroura*

Village Weaver, *Ploceus cucullatus*

White-throated Bee-eater, *Merops albicollis*

Little Bee-eater, *Merops pusillus*

Plate 14: Birds seen within the proposed project area

Red-eyed Dove, *Streptopelia vinacea*

Pied Crow

Sunbird

swift

Finches

Yellow wagtail

Harrier hawk, Polyboroides radiatus

Martial Eagle, Polemaetus bellicosus

Plate 15: Birds recorded within the proposed project area continued

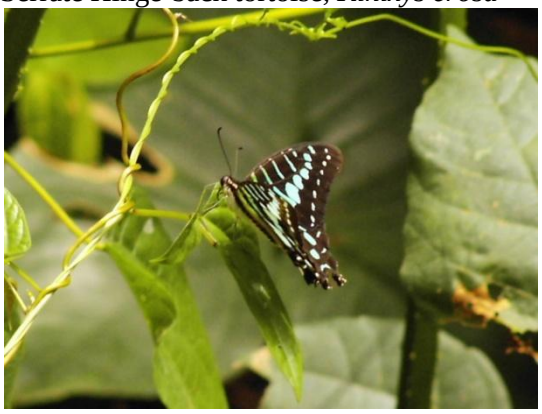
Bird nest

Weaver Bird nest

Plate 16 (a): Bird nest

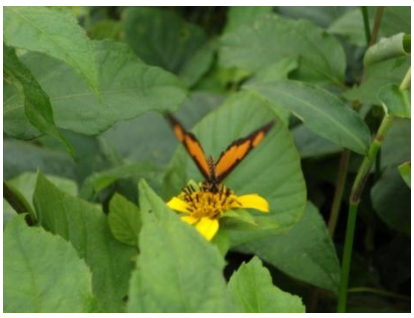
Serrate Hinge-back tortoise, *Kinixys erosa*

Frog



Butterflies

Plate 16(b): Bird nest, tortoise, frog and butterflies recorded from the proposed project area



Butterfly

Prey mantis

Dragonfly

Butterflies

Plate 17: Arthropods from the proposed project area.

2.5.3 Amphibians and Reptiles

The reptiles were represented by chameleons, geckos, monitor lizards, agama lizards, snakes, skinks, and tortoises. There are reports of the presence of the long snouted crocodiles in the lake within the southern part of the project area. However, none was sighted during the investigation. A total of 14 species of reptiles and ten (10) amphibian species were recorded in the proposed project area. Apart from the crocodiles and the royal python most reptilian and amphibian species are neither endangered nor threatened. The amphibians were represented mainly by different types of frogs and toads including the African Tree frogs and the Tongueless frogs. A checklist of the amphibian and reptilian species found or reported is listed in table 3.

Table 5: Checklist of reptiles and amphibians reported from the proposed project area

Order	Family	Common name	Scientific name	Abundance	IUCN status
Chelonia	Testudinidae	Tortoise			
		Serrate Hinge-back tortoise	*Kinixys erosa*	rare	LC
Crocodilia	Crocodylidae				
		Dwarf Crocodile	*Osteolaemus tetraspis*	rare/extinct locally	V
Squamata	Agamidae	Agama lizard	*Agama agama*	Abundant	LC
	Gekkonidae	Wall Gecko	*Hemidactylus brooki*	Abundant	LC
	Scincidae	Skinks	*Mabuya sp*	Abundant	LC
			Lygosoma sp	Abundant	LC
			Melanoceps sp.	Abundant	LC
	Varanidae	Nile Monitor	*Varanus niloticus*	Rare	LC
	Boidae	Royal Python	*Python regius*	Rare	LC
	Colubridae	Common Snakes			
		Common Nigerian File Snake	*Mehelya crossi*	Abundant	LC
		The Lined House Snake	*Boaedon lineatus*	Abundant	LC

		the Common Hedge Snake	*Philothamnus irregularis*	Abundant	LC
	Elapidae	Black Cobra	*Naja melanoleuca*	Abundant	LC
	Viperidae	common vipers	*Vipera sp.*	Abundant	LC
Amphibia	Bufonidae	Toads	*Amietophrynus maculates*	Abundant	LC
	Dicroglossidae	True frogs	*Hoplobrachus occipitalis*	Abundant	LC
	Arthroleptidae		*Leptopelis hyloides*	Rare	LC
	Phrynobatrachidae		*Phrynobatracus sp*	Abundant	LC
	Hyperoliidae	Treefrogs	*Afrixalus dorsalis*	Rare	LC
			Hyperiolius fusciventris	Rare	LC
	Ptychadenidae		*Ptychadena longirostris*	Abundant	LC
			Ptychadena oxyrynchus	Abundant	LC
			Ptychadena pumlio	Abundant	LC
			Chiromantis rufescens	Rare	LC

2.5.4 Invertebrates: Arthropods and molluscs

Arthropods collected were represented mainly by the Lepidoptera (butterflies), Coleoptera (beetles), Isoptera (termites), Orthoptera (grasshoppers), Hemiptera (bugs) and Diptera (flies). Land molluscs were represented by over thirty species of snails belonging to the families Achatinidae, Streptaxidae, Subulinidae, urocyclidae, and Veronicellidae.

Habitat Utilization

The forests in the northern section of the proposed project area although severely degraded, may serve as potential habitat for many bird species, such as, hornbills, hawks, and many Palaearctic migrants. Also the watershed forest may serve as suitable refugia for many migratory mammalian and reptilian and amphibian species. The various component of the environment observed during the survey are shown in the figure 5.

Presence of Globally Significant Species

No national or globally significant species were observed during the survey. However, there is a possibility that the Endangered Ibadan Malimbe *Malimbus ibadanensis* (IUCN 2013) may be harboured within the area. This may be as a result of the presence of extensive oil palm plantations and degraded secondary forest vegetation within the area. The species had previously been recorded in the nearby Ifon Forest Reserve. However, failure to detect the presence of some of the Endangered species within the proposed project area does not preclude their presence because Volant and non-volant animals do not recognize man-made boundaries.

2.6 Hydrobiology

The area is drained by two perennial water bodies, Jemide and Owan Rivers, which are tributaries of the *Osse* River that originates from the Idanre hills and drains into the Benin River into the Atlantic Ocean. Other water bodies sampled within the area were as follow: Stream 1 (06° 44' 30.4" N, 005° 49' 05.7" E), stream 2 (06° 44' 44.9" N, 005° 49' 07.6" E). The major water body was the Jemide River (N 6° 45' 42.1" N, 005° 52' 43.9" E) that flows into the Owan River. The only water body in the southern part is the "Odigi" pool (06° 40' 27.4" N, 005° 49' 50.5" E).

Water quality varied from one location to another within the proposed project area. Appendix III list the result of physico-chemical analysis of the water sample from the project area. The pH varied from 5.6 – 6.7, Conductivity 20 – 50(uscm-2), Turbidity 6-303, Suspended solids 3-208 mg/l, Dissolved oxygen 1.2-3.2, Biological oxygen demand 0.5-2.6 mg/l, Alkalinity 2-6, Hardness 4-14, Chloride 10.6-14.12, Phosphate 0.15-2.17, nitrate 4.5-9.5 mg/l, Sulphate 6-43 mg/l, calcium 1.6-3.21mg/l, Magnesium 0.49-1.95mg/l. All the values determined for heavy metals in the water bodies occurred in low concentration much below the recommended limits by FMENV and WHO. Water temperature was 27ºC± 0.4. Water movement could only be determined for Jemide River because other streams were seasonal. The speed of the water ranged from 0.5 to 0.7m/sec; with a mean of 0.603±0.054 m/sec. Secchi disc turbidity for Jemide River was 80cm.

The planktonic community was represented by 29 species of phytoplanktons and 2 species of zooplankton. The phytoplankton consist of Bacillariohyta (7 species), Chlorophyta (10 species) Euglenophyta (4 species) Cyanophyta (1 species), and Dinophyta (7 species) while the zooplankton was up of 2 species of Cladocera and Copepoda. There was no evidence of eutrophication (alga bloom). Table 6 list the species of plankton recorded in the proposed project area.

The benthic fauna of the Jemide and Owan rivers is made up of eleven (11) species decapods crustacean and larval forms of Coleoptera, Diptera, Tricoptera and Odonata (Table 7). These species are indicative of the absence of organic pollution.

Ichthyofauna (fishes) information revealed that the fish comprised mainly members of the family Cichlidae (*Oreochromis niloticus, Sarotherodon galilaeus*), Clariidae (*Clarias gariepinus* and *Heterobranchus longifilis*), Hepstidae (*Hepsetus odoe*) and Gymnarchidae (*Gymnarchus niloticus*).

The river system is a major resource for the proposed plantation especially for the processing of the palm oil. The location of major river systems which bordered the proposed site on the North West and South West will aid the underground water recharge. The various component of the environment observed during the survey are shown in the figure 5.

Table 6: A checklist of plankton species recorded from the water bodies within the project area during the rainy and dry seasons

S/No.	TAXA	Stream 1	Jamide Downstream	Jamide Upstream
	BACILLARIOPHYTA		19	
1	*Baccillaria paradoxa*		15	16
2	*Flagillaria sp*	32		15
3	*Bidulphia sinensis*			1
4	*Bidulphia regia*	1	5	1
5	*Melosira granulata*		1	
6	*Synedra acus*	17	11	10
7	*Synedra ulna*	16	4	14
	CHLOROPHYTA			
8	*Melosira granulata*	1		1
9	*Volvox africana*	1		
10	*Spirogyra sp*	18	8	22
11	*Spirogyra majuscula*	10	4	
12	*Pandorina morum*	21		11
13	*Pandorina sp*	60	17	
14	*Closterium gracile*		1	
15	*Closterium pseudonulula*			1
16	*Sirogonium melanosporum*	8	7	3
17	*Scenedesmus sp.*			1
	EUGLENOPHYTA			
18	*Euglena spirogyra*		1	
19	*Phacus Curvicauda*	1		
20	*Phacus acuminatus*		1	
21	*Euglena sp*	7	15	32

	CYANOPHYTA			
22	*Coelosphaerium pallidum*		2	
	DINOPHYTA			
23	*Gymnodinium fusum*	11	2	4
24	*Merisbmospeida elegans*			3
25	*Microcystis aeruginosa*		14	4
26	*Oscillatoria priceps*		1	
27	*Protoperidinium depressum*		1	
28	*Peridinium cincium*		2	
29	unidentified		2	
	ZOOPLANKTON			
	ARTHROPODA			
	CRUSTACEA			
	CLADOCERA			
	SIDIDAE			
30	*Diaphanosoma excisum*		1	
	COPEPODA			
	ORDER CYCLOPOIDA			
31	Mesocyclops bodanicola	6	2	3

Table 7: List of benthic fauna recorded from the aquatic habitats in the project area during the rainy and dry seasons

	TAXA	STREAM 1	JAMIDE UPSTREAM	JAMIDE DOWNSTREAM
	DECAPODA			
1	*Desmocaris trispinosa*	5		2
2	*Caridina gabonesis*	2	2	6
	DIPTERA			
	Chironomidae			
3	*Chironomus sp*	5		1
4	*Chironomus fractilobus*	2		
5	*Tarnypus sp*		5	3
6	*Culex sp*		1	
	COLEOPTERA			
7	*Hydrophilus sp*		1	1
	EPHEMEROPTERA			
8	*Elassoneura candida*		2	
9	*Cloeon sp*		12	4
10	*Baetis sp*		3	
	TRICHOPTERA			
11	*Trichoptera* larvae		2	
	ODONATA			
12	Anisoptera			
13	*Aphyla sp*	2		
14	*Libellula sp*		3	

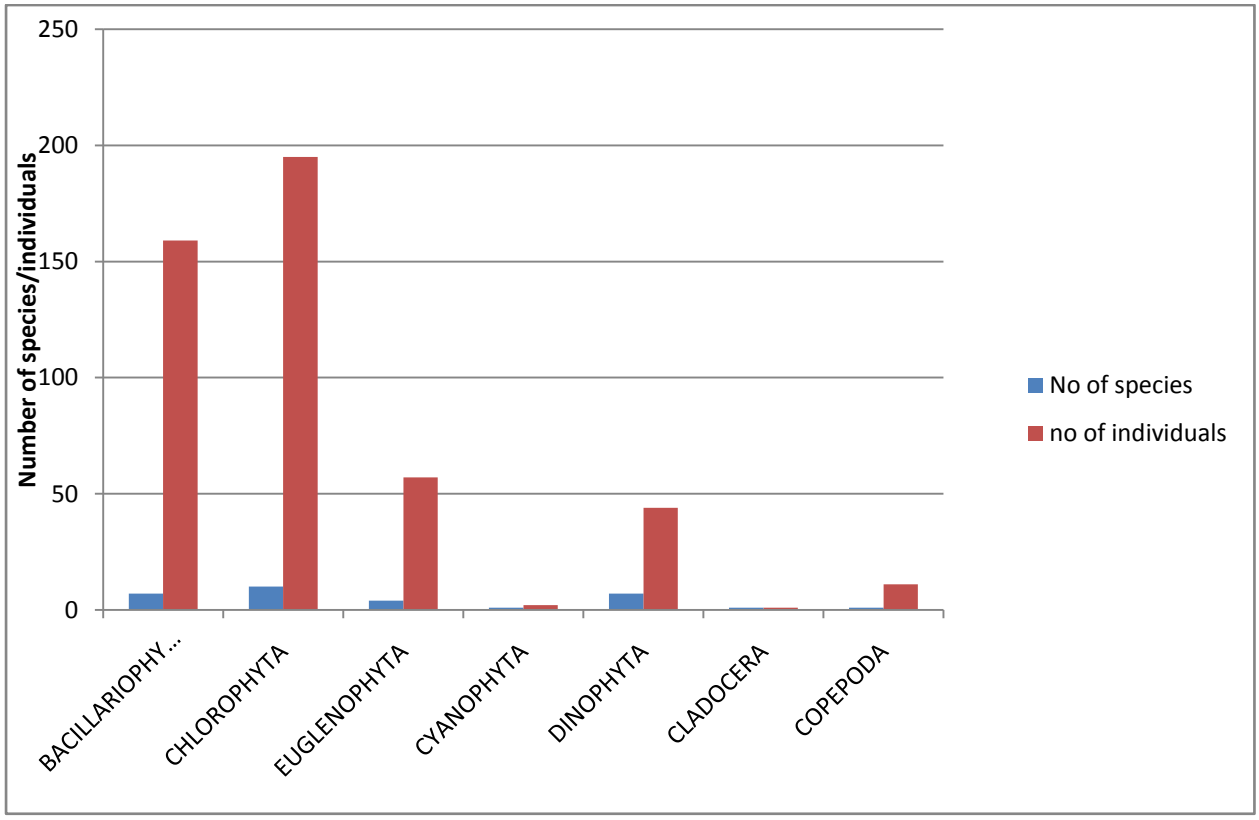


Figure 4: Family composition of plankton recorded in water bodies

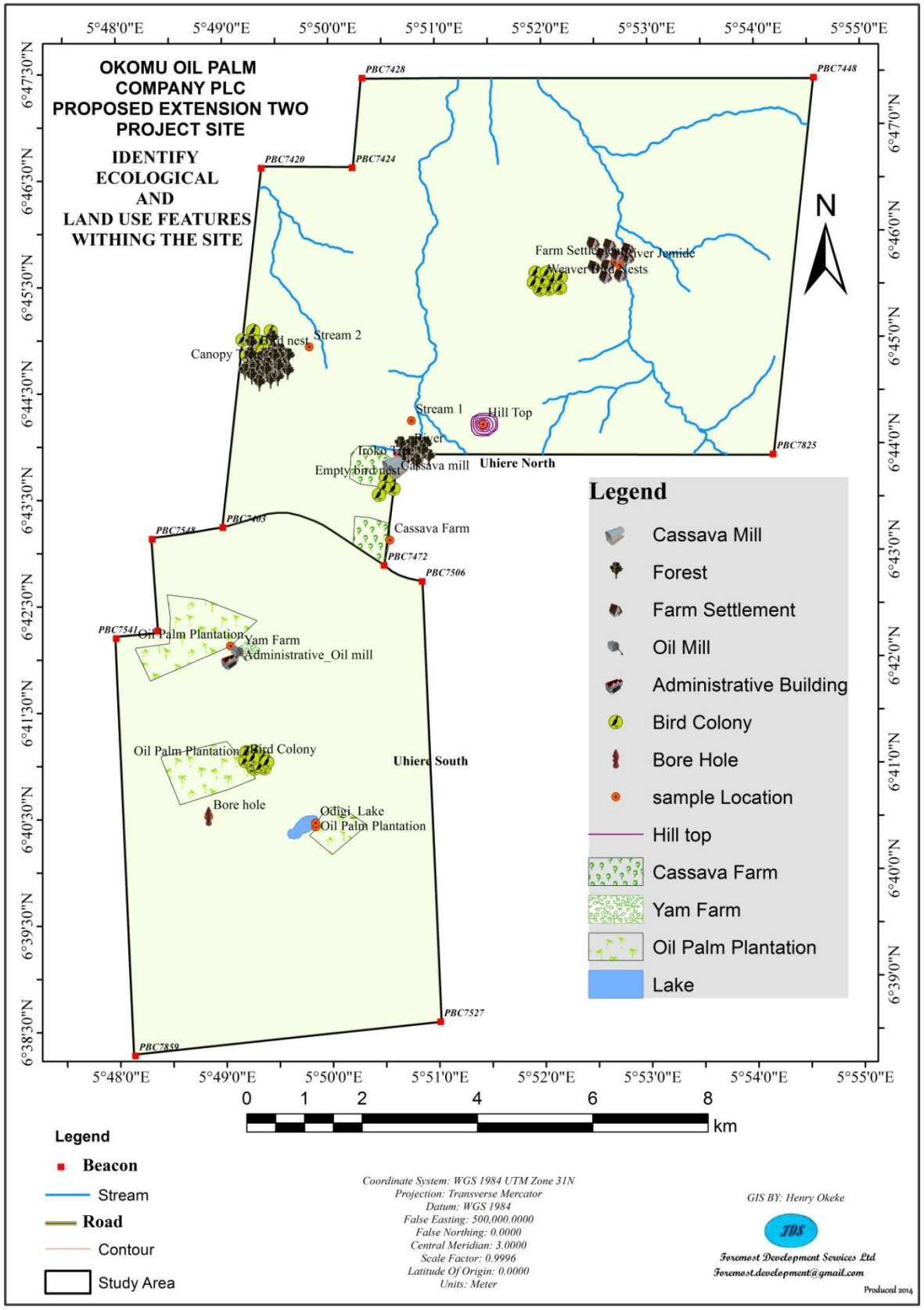


Fig 5: Map of proposed project area with various components of the Environment

3.0 IMPACT ASSESSMENT

The objectives of the impact assessment are:

- To establish the biodiversity issues that are associated with the proposed oil palm development in relation to the existing state of the project environment
- To predict the impact magnitude, suggest and evaluate alternatives and identify the best possible option with a high degree of cost effectiveness and least biodiversity impact;
- To proffer mitigation measures for the identified impacts;
- To incorporate the contributions of the study into the decision making process of the project
- To identify areas of High Conservation Value and biodiversity importance within the project area.

In order to achieve the above objectives, it is important to identify the components of the biodiversity that may be impacted by the proposed oil palm development and the associated impact indicators. The various developmental phases and the associated activities are shown in the Table 8, while the sources of probable impacts from the various stages of project development are identified in Table 9.

Table 8: Phases of the project development activities

	Development phase	**Activities**
1	Site investigation/preparation	land clearing, logging, waste disposal
2	Nursery phase	irrigation, fertilizer, pesticide
3	Plantation phase	irrigation, fertilizer, pesticide
4	Abandonment	population, income, settlement,

Table 9: Environmental impact and mitigation measures

	Development	**Issues**	**Mitigation**
1	Site Clearance	Habitat loss for Mammals Birds, Reptiles and Amphibians Terrestrial Invertebrates	Create corridor for wildlife migration Protect riparian forest Provide appropriate buffer on the river banks
2	Nursery/Plantation	Invasive or generalist species	
		Irrigation	
		Fertilizer application	
		Pesticide application	Use biodegradable pesticides

Basis for screening

In assessing the impacts of the different phases of the proposed oil palm development project on the receiving environment, the major areas of concern are the various components of the biodiversity, hydrology, aesthetics and socio-economic modification of the area. The basis of screening the likely impacts of the proposed project derives from the following:

1. Project type
2. Project location and sensitivity of the environmental components to project activities
3. Knowledge of the construction procedures, equipment types and layout of the project facilities

The criteria applied to the screening of the various activities are:

i. Severity
ii. Prevalence – likely extent of the impact
iii. Duration and frequency – (long-term, short-term or intermittent)
iv. Risk – probability of serious and permanent adverse impacts
v. Importance – economic, social and cultural values attached to the environment

The interaction matrix (Table 10) is derived by displaying the environmental parameters with the proposed activity so that a quantitative estimate of the potential magnitude of the environmental impacts can be derived. The total impact derived from the table showed that site clearance and preparation will have the highest effect on the biodiversity loss and more lasting effect on the ecosystem as a result of habitat loss.

However, this can be mitigated by creating corridors for wildlife migration during clearance and protecting riparian forest along the river courses as well as other wetlands. These areas form the forest of high conservation value (HCVF).

Table 10: screening matrix for environmental impact assessment

	Land clearance	Generator	Refuse disposal	Sanitary waste	Noise	Fertilizer application	Pesticide	Water extraction
Biodiversity								
Mammals	3/3	2/3	1/3	1/3	1/2	0/0	1/3	1/3
Birds	3/3	2/3					3/3	0/0
Reptiles	3/3	0/0	0/0	0/0	0/0	0/0	2/3	1/3
Amphibians	3/3	0/0	0/0	0/0	0/0	0/0	2/3	1/3
Terrestrial Invertebrates	3/3	0/0	0/0	0/0	0/0	1/3	2/3	1/3
Trees	3/3	0/0	0/0	0/0	0/0	1/3	2/3	1/3
Shrubs/grasses	3/3	0/0	0/0	0/0	0/0	1/3	2/3	1/3
Water quality	3/3	0/0	0/0	0/0	0/0	3/3	2/3	1/3
Underground Water	3/3	0/0	0/0	0/0	0/0	2/3	2/3	2/3
Total	27/27	4/6	1/3	1/3	1/2	8/15	18/27	9/24

Magnitude/scale

magnitude	1	low
	2	medium
	3	high
Scale	1	short term
	2	medium
	3	long

4.0 High Conservation Value Forest (HCVF)

Within the project area, the High Conservation Value Forest found were located around the riparian or watershed forest of River Jemide, Owan, and streams identified within the northern region of the project and in the lake of the southern part. These riparian forests are of high conservation value and need to be conserved.

Riparian zones are the interface between aquatic and terrestrial environments. They exert important influences on the waterways they adjoin by mediating the bi-directional flow of matter and energy between the water body and the surrounding hinterland. Intact riparian zones are critical to aquatic-terrestrial ecosystem function and ultimately, to waterway health.

Disturbance and modifications to catchments through clearing of vegetation for agriculture will result in extensive degradation of riparian zones and their adjacent water bodies. This is predominantly through increased transfer of nutrients, sediment and pollutants into streams, exacerbated by bed and bank erosion, and loss of in-stream and terrestrial biodiversity via degradation of riparian and aquatic vegetation and loss of important habitat structure such as large wood.

The best opportunity for mitigation of catchment-scale disturbances is by the protection or rehabilitation of headwater systems due to their demonstrated capacity for greatest regulation of water quality and highest contribution to regional biodiversity. Thus, disturbance impacts on streams may be partially or totally alleviated by establishing riparian buffer zones that are laterally and longitudinally continuous, beginning in the headwaters and progressing downstream.

Recommendations for riparian minimum widths to protect flowing waters and conserve biodiversity varies between 60- 200 metres depending on the topography, intensity of land use and the management objectives

Specific Recommendations

Two main locations; one each in the main blocks of north (Jemide River Forest: (06° 45' 42.1" N, 005° 52' 43.9" E) and south (Odighi Lake: 06° 40' 27.4" N, 005° 49' 50.5" E) were observed to be suitable for development as Conservation areas in the concession. The Odighi forest can be designated a Biodiversity plot (up to 40 hectares) while forest-line along Stream 1 and Jemide River be designated as a watershed and forest conservation zone.

5.0 ENVIRONMENTAL MANAGEMENT PLAN (EMP)

Management objectives will be to address the following during the life span of the plantation:

- Improve the quality of the ecosystem
- Improve terrestrial biodiversity
- Improving water quality (combining nutrient and sediment interception)
- Increase shading and moderate stream temperatures
- Provide food and other resources to the aquatic environment (includes facilitating reciprocal subsidies)
- Improve in-stream biodiversity
- Prevent man and company conflict on wildlife

APPENDIX I

Checklist of Plant and Tree Species

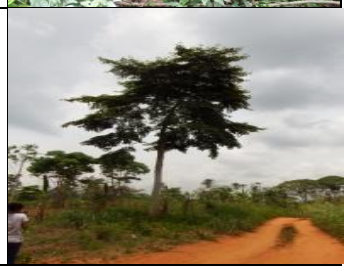
Common/Local Name	Scientific Name	Family
Cat's eye	*Abrus precatorius*	PAPILIONACEAE
Alligator pepper	*Aframomum melegueta*	ZINGIBERACEAE
Mahogany bean	*Afzelia africana*	CAESLALPINIACEAE
West African Albizzia	*Albizia zygia*	MIMOSACEAE
Christmas bush	*Alchornea cordifolia*	EUPHORBIACEAE
	Alchornea laxiflora	EUPHORBIACEAE
cheese wood	*Alstonia boonei*	APOCYNACEAE
	Amorphophallus sp	ARACEAE
Cabbage tree	*Anthocleista sp*	LOGANIACEAE
	Berlinia grandifolia	CAESALPINIACEAE
Black Jack/beggar's tick	*Bidens pilosa*	ASTERACEAE
Akee apple	*Blighia welwitschii*	SAPINDACEAE
	Brachystegia eurycoma	CAESALPINIACEAE
Trade asas	*Bridelia micrantha*	PHYLLANTHACEAE
	Campylospermum flavum	OCHNACEAE
Pawpaw	*Carica papaya*	CARICACEAE
White silk cotton	*Ceiba pentandra*	BOMBACACEAE
	Celtis phillipensis	ULMACEAE
African Celtis	*Celtis zenkeri*	ULMACEAE
Butterfly pea	*Centrosema pubescens*	PAPILIONACEAE
Siamweed/Akintola weed	*Chromolaena odorata*	ASTERACEAE
Star apple	*Chrysophyllum albidum*	SAPOTACEAE
Fringed spider flower	*Cleome rutidospermum*	CAPPARIDACEAE
Dog's penis	*Cnestis ferruginea*	CONNARACEAE

Bush willow	*Combretum ghasalense*	COMBRETACEAE
	Commelina sp.	COMMELINACEAE
Large ouara	*Cola gigantea*	STERCULIACEAE
Small ouara	*Cola millenii*	STERCULIACEAE
Fleabane	*Conyza sumatrensis*	ASTERACEAE
	Connarus staudtii	CONNARACEAE
Common Ginger Lily	*Costus afer*	COSTACEAE
Climbing arum lily	*Culcasia scandens*	ARACEAE
	Dacryodes edulis	BURSERACEAE
	Dichrostacys cinerea	MIMOSACEAE
Yam	*Dioscorea sp*	DIOSCOREACEAE
	Diospyros mespiliformis	EBENACEAE
Oil palm	*Elaeis guinensis*	ARECACEAE
	Entandrophragma sp	MELIACEAE
Snakeweed	*Euphorbia hirta*	EUPHORBIACEAE
Sandpaper tree	*Ficus exasperata*	MORACEAE
	Hallea ciliata	RUBIACEAE
	Hanno aklaineana	SIMAROUBACEAE
Spear grass	*Imperata cylindrica*	POACEAE
Monkey's apple	*Irvingia gabonensis*	IRVINGIACEAE
	Khaya ivorensis	MELIACEAE
	Malacantha alnifolia	SAPOTACEAE
Cassava	*Manihot esculentum*	EUPHORBIACEAE
	Megaphrynium macrostachyum	MARANTACEAE
Iroko	*Milicia excelsa*	MORACEAE
	Mimusops warneckii	SAPOTACEAE
Bitter morinda	*Morinda lucida*	RUBIACEAE
Plantain	*Musa paradisiaca*	MUSACEAE

Banana	*Musa sapientum*	MUSACEAE
Ashanti blood	*Mussaenda erythrophylla*	RUBIACEAE
Umbrella tree	*Musanga cecropioides*	MORACEAE
	Napoleona vogelli	LECYTHIDACEAE
	Olax subscorpioidea	OLACEAE
	Ouratia flava	OCHNACEAE
Guineagrass	*Panicum maximum*	POACEAE
Locust beans	*Parkia bicolor*	MIMOSACEAE
	Paullinia pinnata	SAPINDACEAE
African oil bean	*Pentaclethra macrophylla*	MIMOSACEAE
Wildcape gooseberry	*Physalis angulata*	SOLANACEAE
	Piptadeniastrum africana	MIMOSACEAE
Pheasant-berry	*Margaritaria discoidea*	PHYLLANTHACEAE
Swizzle stick	*Rauvolfia vomitora*	APOCYNACEAE
Cork wood	*Ricinodendron heudelotii*	EUPHORBIACEAE
Soft cane	*Sarcophrynium brachystachys*	MARANTHACEAE
	Setaria spp	POACEAE
Wireweed	*Sida rhombifolia*	MALVACEAE
Turkey berry	*Solanum torvum*	SOLANACEAE
	Spathodea companulata	BIGNONIACEAE
Pinkweed	*Spigelia anthelmia*	LOGANIACEAE
Idigbo	*Terminalia ivorensis*	COMBRETACEAE
Afara	*Terminalia superba*	COMBRETACEAE
African breadfruit	*Treculia africana*	MORACEAE
Charcoal tree	*Trema guinensis*	CANNABACEAE
	Trichilia preuriana	MELIACEAE
	Trilepisium madagascariense	MORACEAE
Cocoa	*Theobroma cacao*	STERCULIACEAE

Obeche	*Triplochiton scleroxylon*	STERCULIACEAE
Hibiscus bur	*Urena lobata*	MALVACEAE
Bitter leaf	*Vernonia amygdalina*	ASTERACEAE
Bitter leaf	*Vernonia conferta*	ASTERACEAE
	Xylopia aethiopica	ANNONACEAE
	Zanthoxylum zanthoxyloides	RUTACEAE

Appendix II

GPS Coordinates	Description	Photographic Evidence
N 06 ^{0}42′ 04.1″ E 005^{0}49′ 07.9″	Administrative unit / oil mill	
N 06 ^{0}43′ 06.6″ E 005^{0}50′ 33.3″	Cassava Farm	
N 06 ^{0}42′ 04.1″ E 005^{0}49′ 07.9″	Yam farm outside boundary	
N 06 ^{0}43′ 40.6″ E 005^{0}50′ 37.2″	Empty bird nest	
N 06 ^{0}43′ 41.5″ E 005^{0}50′ 37.8″	Cassava mill close to River	
N 06 ^{0}43′ 57.2″ E 005^{0}50′ 42.2″	Location of first River	
N 06 ^{0}43′ 50.3″ E 005^{0}50′ 49.4″	Iroko Tree	

N 06 ^{0}44′ 11.6″ E 005^{0}51′ 26.3″	Hill Top	
N 06 ^{0}45′ 32.2″ E 005^{0}52′ 00.3″	Weaver Bird Nests	
N 06 ^{0}45′ 42.5″ E 005^{0}52′ 41.0″	Farm Settlement close to River Jemide	
N 06 ^{0}45′ 40.9″ E 005^{0}52′ 43.9″	River Jemide	
N 06 ^{0}42′ 07.4″ E 005^{0}49′ 03.0″	Oil Palm plantation behind the office	
N 06 ^{0}41′ 01.5″ E 005^{0}49′ 11.0″	Oil Palm plantation behind the check point	
N 06 ^{0}41′ 02.6″ E 005^{0}49′ 10.9″	African Weaver Bird Colony	
N 06 ^{0}40′ 31.3″ E 005^{0}48′ 35.1″	Bore hole close to nursery	

N 06 ^{0}40′ 25.2″ E 005^{0}49′ 50.1″	Oil Palm Plantation close to Lake	
N 06 ^{0}40′ 27.4″ E 005^{0}49′ 50.5″	Temporal wetland/ lake	
N 06 ^{0}44′ 30.4″ E 005^{0}49′ 05.7″	Stream 1	
N 06 ^{0}44′ 44.9″ E 005^{0}49′ 07.8″	Stream 2 in a Valley	
N 06 ^{0}44′ 49.4″ E 005^{0}49′ 07.8″	Big tree	
N 06 ^{0}44′ 51.6″ E 005^{0}49′ 07.7″	Bird nest near stream 2	

Appendix III

Physico-chemical Analysis of River Jamide, Stream 1, Stream 2 upstream and Stamream 2 downstr

BENIN-OWENA RIVER BASIN/UNIVERSITY OF BENIN
JOINT ANALYTICAL RESEARCH LABORATORY

Office: Ugbowo Campus,
Uniben.
08033914394

Our Ref.:.....

SAMPLE MATRIX: WATER
DATE ANALYZED: 24/04/15

Prof. C. OKE

Parameter	Stream1(T0)	Jamide Downstream	Jamide Upstream	Stream 2 Upstream	Stream 2 Downstream
PH	6.7	6.6	6.7	5.9	5.6
Conductivity(µscm^{-2})	20	20	20	50	50
Turbidity(NTU)	10	7	6	303	240
Suspended solid	5	3	5	208	170
Dissolved oxygen	3.2	2.6	2.4	1.2	1,9
B.O.D	1.5	0.5	1.2	2.6	2.1
Alkalinity	6	4	6	4	2
Hardness	6	4	6	14	14
Chloride	10.6	10.60	10.6	14.12	14.12
Phosphate	0.15	0.12	0.17	2.17	1.74
Nitrate	4.9	5.1	9.2	4.9	9.5
Sulphate	7	6	7	40	43
Calcium	1.60	0.80	1.60	3.21	2.40
Magnesium	0.49	0.49	0.49	1.46	1.95
Nickel	0.183	0.284	0.193	0.223	0.170
manganese	ND	ND	ND	0.023	0.005
Iron	0.200	0.611	0.241	5.518	4.583
Copper	0.021	0.02	0.011	0.007	0.017
Zinc	ND	ND	ND	0.008	ND
Lead	0.048	0.052	0.086	0.050	0.039
Cadmium	ND	ND	ND	ND	ND

All unit are in mg/l except otherwise mentioned. ND: Not detected.

UWAIFO OSARETIN P.
ANALYST

References

Elgood, J.H., Heigham, J.B., Moore, A.M., Nason, A.M., Sharland, R.E. & Skinner, N.J. (1994). The birds of Nigeria. An annotated checklist. British Ornithologists' Union.305pp.

Haltenorth, T. & Diller, H. (1977) A field guide to the mammals of Africa including Madagascar. Collins, London, 400pp.

Hansen, B., Reich, P., Lake, P.S., & Cavagnaro, T. (2010) Minimum width requirements for riparian zones in Victoria. Report to the Office of Water, Department of Sustainability and Environment, Victoria, Australia.

Happold, D.C.D (1987). The mammals of Nigeria. Oxford University Press, Oxford. 402pp

Keay, R.W.J. 1989. *Trees of Nigeria*. Clarendon Press Oxford. 476pp.

Rayment, R.A. (1976). *Stratigraphy of Niger Delta*. Ibadan University Press, Nigeria.

Serle, W., Morel, G.J. & Hartwig (1977) A field guide to the Birds of West Africa. Collins, London, 351pp.