



**ENVIRONMENTAL IMPACT ASSESSMENT (EIA)  
REPORT FOR THE PROPOSED SCRAP TYRE  
RECYCLING PLANT BY FREETOWN WASTE  
MANAGEMENT & RECYCLE LIMITED AT KM  
10, IBADAN-ABEOKUTA ROAD, APATA,  
IBADAN, OYO STATE.**

**SUBMITTED TO:  
FEDERAL MINISTRY OF ENVIRONMENT  
ABUJA, NIGERIA.**

**NOVEMBER 2020.**

<b>TABLE OF CONTENT</b>	<b>Page</b>
<b>Cover Page</b>	<b>i</b>
<b>Table of Contents</b>	<b>ii-iv</b>
<b>List of Tables</b>	<b>v</b>
<b>List of Figures</b>	<b>vi</b>
<b>List of Plates</b>	<b>vii</b>
<b>List of Preparers</b>	<b>viii</b>
<b>Acknowledgment</b>	<b>ix</b>
<b>List of acronyms</b>	<b>x</b>
<b>Executive Summary</b>	<b>xi-xxxviii</b>

## **CHAPTER ONE INTRODUCTION**

<b>1.0 Background Information</b>	<b>1-2</b>
1.1 The Proponent	2
1.2 The Proposed Project Location	3-4
1.3 Terms of Reference (ToR)	5
1.4 EIA Objectives & Approach	6
1.5 Environmental Screening & Scoping	6-8
1.6 Environmental Impact Assessment Premises	8-9
1.7 Legal and Administrative Framework	9-10
1.7.1 World Bank Guidelines on Environmental Assessment (EA) 1991.	10
1.7.2 International Union for Conservation of Nature & Natural Resources (IUCN) Guidelines.	10
1.7.3 Convention on Biological Diversity	10
1.7.4 Basel Convention on the Control of Trans-Boundary Movements of Hazardous Wastes and their Disposal	11
1.7.5 United Nations Framework Convention on Climate Change (1992)	11
1.7.6 Land Use Act 1978	11
1.7.7 Federal Ministry of Environment (FME)	11
1.7.8 Environmental Impact Assessment Act No 86, 1992	12
1.7.9 Regulations Gazette as supplementary to NESREA Act	12
1.7.10 The Mineral Oil (Safety) Act CAP 350 LFN 1990	13
1.7.11 National Inland Waterways Authority Act No 13 of 1997	13
1.7.12 Forestry Law Cap 52, 1994	13
1.7.13 Territorial Waters Act CAP 428 LFN 1990	13
1.7.14 Water Resources Act Cap W2 LFN 2004	13
1.7.15 The Dept. of Pet. Resources (DPR) Environmental Guidelines & Standards for Petroleum Industry in Nigeria 2018	14
1.7.16 Oyo State Ministry of Environment & Natural Resources	14-15
1.8 Scope of work	15-17
1.9 Study Approach and Methodology	18-19
1.10 Equator Principles (EPS) and IFC Performance Standards	19-21
1.11 IFC Performance Standards	22-24

1.12 The Structure of the report	24-25
<b>CHAPTER TWO PROJECT JUSTIFICATION</b>	<b>26</b>
2.0 Introduction	26-27
2.1 Benefits of the project	27
2.1.1 Socio-Economic Benefits	27-28
2.1.2 Environmental Benefits	28
2.2 The need for the project	28
2.3 Values of the Project	28-29
2.4 Envisaged Sustainability	30-31
2.5 Project Alternatives	31-32
<b>CHAPTER THREE PROJECT DESCRIPTION</b>	<b>33</b>
3.0 Introduction	34-35
3.1 Raw Materials	35
3.2 Raw Materials & Sources	35
3.3 Process Description	35-38
<b>CHAPTER FOUR: DESCRIPTION OF THE PROJECT EXISTING ENVIRONMENT</b>	<b>39</b>
4.0 Description of the Project Environment	39
4.0.1 Geographical Location of Study Area	39-41
4.0.2 Geographical Positioning System (GPS) coordinates for the project site	42-43
4.0.3 Meteorology & Climate	43
4.0.4 Rainfall	43-45
4.1 Temperature, Cloud Cover & Precipitation	45-46
4.2 Relative Humidity	47
4.3 Wind Speed and Direction	48-53
4.4 Physiography and Geology	54
4.5 Baseline Data Acquisition Methodology & Approach	54
4.6 Quality Assurance & Quality Control	54
4.7 Sampling Strategy	55
4.8 Air Quality & Noise Studies	55-62
4.9 Soil Studies/Characteristics	62-75
4.10 Aquatic studies/Hydrology	76-81
4.11 Land Use/Cover & Ownership	81-82
4.12 Site's Natural Characteristics	82-83
4.13 Topography, Ecology & Geology of the Area	83-84
4.14 Vegetation Cover and Wildlife	84-90
4.15 Socio- Economics	90-95
4.16 Health Status	95-96
4.17 Waste Management	97-98
<b>CHAPTER FIVE CONSULTATION</b>	<b>99</b>
5.0 Introduction	99-100

5.1	Objectives of the consultation and public participation	100
5.2	Process of Engagement	101
5.3	Notification	101
5.4	Opportunities	101
5.5	Stakeholders, and Interested and Affected Parties	102
5.6	Outcome of Socio- Economic survey	102-106
<b>CHAPTER SIX ASSOCIATED AND POTENTIAL ENVIRONMENTAL IMPACTS</b>		<b>107</b>
6.0	Introduction	107
6.1	Impact Quantification & determination of Significant Impact	107-108
6.2	Project risk Assessment	108-109
6.3	Assessment Criteria	109-113
6.4	Anticipated Environmental and Social Impacts	113-116
6.5	Physical Environment	116-127
6.6	IFC Performance Standards	117-138
<b>CHAPTER SEVEN: MITIGATION MEASURES</b>		<b>139</b>
7.0	Introduction	139
7.1	Mitigation Measures	139-148
7.2	Contingency Plan	149
<b>CHAPTER EIGHT: ENVIRONMENTAL MANAGEMENT PLAN</b>		<b>150</b>
8.0	Introduction	150
8.1	Site Specific Management Plan	150
8.2	Implementation of EMP	150-170
8.3	Environmental Monitoring Program	171-173
8.4	Implementation and Monitoring	174
8.5	Environmental Monitoring/FME/OYSME	174
8.6	Implementation Arrangement	174
8.7	Contractor	174-175
8.8	Reporting System	175
8.9	Environmental Capacity Building	175
8.10	Decommissioning & Remediation Plan	175-179
<b>CHAPTER NINE CONCLUSION &amp; RECOMMENDATION</b>		<b>180-181</b>
<b>REFERENCES</b>		<b>182-184</b>
<b>APPENDIX</b>		<b>185-195</b>

**LIST OF TABLES**

	<b>PAGE</b>	
Table 1.0	GPS Coordinates of the Proposed project location	3
Table 1.2	Distinct Phases of EIA Study	18
Table 1.3	Application of Equator Principles	19-21
Table 1.4	Application of IFC Performance Standards to the Project	22-24
Table 2.0	Project Financial Feasibility	28
Table 3.0	Sources of Raw Materials	37
Table 4.0	GPS Coordinates of the Project Site	42
Table 4.1	Monthly Wind Speed and Direction in Ibadan	49-52
Table 4.3	GPS coordinates of air quality monitoring	56
Table 4.4	Air Pollutants & Effects	58
Table 4.4.1	Noise level monitoring within study area	59
Table 4.4.2	Gaseous Air Pollutants Measurement	60
Table 4.5	Bulk density & permeability of soil sample	64-65
Table 4.6	List of soil animals in the study area	65-66
Table 4.7	Soil Sampling Coordinates	66-67
Table 4.8	Physicochemical Parameters of Soil Samples	68-69
Table 4.9	Soil particle distribution	71-72
Table 4.10	Microbiological properties of soil samples	75
Table 4.11	Public Health Impacts of Water Parameters	77-78
Table 4.12	Ground (Borehole) Water Sample Coordinates	78
Table 4.13	Physicochemical Lab. Analysis Result for Ground Water Samples	79-80
Table 4:14	List of some common economic trees & plants within the study area	87-88
Table 4.15	List of Food Crops Encountered in the Study Areas	88-89
Table 4.16	Some fauna composition encountered in the study area	89
Table 6.0	Definition Consequence Category (Damage to Environment)	110
Table 6.1	Relevant Criteria for Risk Calculation	110-113
Table 6.2	Activity - Impact Identification Matrix	114-115
Table 6.3	Significant Impacts of Production Plant	116-117
Table 6.4	Source Of Noise Pollution	124
Table 6.5	Environmental & social impacts in line with IFC Performance Standards	128-138
Table 7.0	Mitigation plan for potential impacts	140-143
Table 7.1	Summary of Mitigations for Impacts on Air Quality	144
Table 7.2	Mitigative Measures, Monitoring Actions Affecting Environmental Resources & Human Amenity	145-147
Table 7.3	Impacts on Water Resources during the Construction Stage	148
Table 8.0	Environmental Management Plan (EMP)	151-170
Table 8.1	Monitoring Programme for the Freetown Waste Recycle & Mgt Ltd Recycling Plant	172-173
Table 8.2	International Standards Applicable to Decommissioning	179

## LIST OF FIGURES

		<b>PAGE</b>
FIG. 1.0	Satellite Image Showing Project Location	3
FIG. 1.01	Proposed project boundary	4
FIG.1.2	EIA Classification of Various Project Sectors in Nigeria	7
FIG 2.0	Percentage Distribution of operating expenses	29
FIG 3.0	Scrap Tyre recycling/Production Process	35
FIG. 3.1	Installation layout of rubber granule flooring sheet production line	37
FIG 3.2	Flowchart of tyre recycling process	38
FIG. 4.0	Map of Nigeria showing the State where the project is located	39
FIG. 4.0.1	Map of Oyo State showing the project Location	40
FIG. 4.0.2	Map of Ido Local Government Area of Project Location	41
FIG 4.0.3	Map Showing the Proposed Scrap Tyre Recycling Plant	43
FIG 4.1	Mean Annual Rainfall	44
FIG. 4.2	Annual mean temperature distribution in project area	45
FIG. 4.3	Temperature, Cloud Cover & Precipitation of the Project Area	46
FIG 4.4	Cloudiness, sunshine & precipitation of the project location	46
FIG. 4.5	Relative Humidity Distribution in project area	47
FIG 4.6	Wind Rose of the Study Area	53
FIG. 4.8	Noise Level Measurement Within Study Area	59
FIG 4.9	Air Quality & Soil sampling points within study area	67
FIG 4.10	PH Measurements of Soil Samples	70
FIG 4.11	Electrical Conductivities of soil samples	72
FIG 4.12	Total Organic contents the soil samples	73
FIG 4.13	Concentration of total iron contents in the soil samples	74
FIG. 4.14	Population distribution of the project Local govt Area	94
FIG. 4.15	Age distribution within the project LGA	95
FIG 5.0	Socio-economic survey questionnaire	103
FIG 5.1	Income pattern of the population	103
FIG 5.2	Holding of durable commodities	104
FIG 5.3	Migration pattern	104
FIG 5.4	Women Involvement	105
FIG 6.0	Risk Assessment Matrix (RAM) for Environmental Consequences	110

## LIST OF PLATES

		<b>PAGE</b>
Plate 3.0	Rubber Roll	36
Plate 4.0	Air Quality Monitoring Kits	57
Plate 4.1	EIA consultant conducting air quality monitoring at the proposed site	58
Plate 4.2	EIA Consultant Conducting Soil sampling with hand auger	63
Plate 4.3	Consultant Reps Conducting Water Sampling	77
Plate 4.4	Food crops within the Project Location	82
Plate 4.5	Physical structures within project	83
Plate 4.6	Vegetation within the project location	85
Plate 4.7	Food crops within the project area	87
Plate 4.8	Some fauna within the project site	90
Plate 4.9	Sources of water within the project location	91
Plate 4.10	Roads within the project location	92
Plate 4.11	Electricity poles within the project location	92
Plate 4.12	Means of transportation within the project location	93
Plate 5.0	Residents during socio-economic survey	99
Plate 5.1	Socio-economic survey Team & host community in the project area	100

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## **ACKNOWLEDGEMENT**

The project proponent (Freetown Waste Management & Recycle Limited) wishes to thank the Environmental Regulatory Ministries / Agencies and all stakeholders who in no small measures contributed to the success of the conduct of the environmental study. Our special gratitude goes to the EIA Consultant and the Host Community who cooperated throughout the studies.

## LIST OF ACRONYMS

FMENV	-	Federal Ministry of Environment
NESREA	-	National Environmental Standard & Regulation & Enforcement Agency
WHO	-	World Health Organisation
TOR	-	Terms of Reference
ANSI	-	American National Standards Institute
EIA	-	Environmental Impact Assessment
ESIA	-	Environmental & Social Impact Assessment
ELF	-	Extremely Low Frequency
ESMP	-	Environmental & Social Management Plan
IAP	-	Interested and Affected Party
PPP	-	Public Participation Process
THB	-	Total Hydrocarbon utilizing bacteria
THF	-	Total Hydrocarbon Fungi
HUB	-	Hydrocarbon Utilising Bacteria
HUF	-	Hydrocarbon Utilising Fungi
BHW	-	Borehole Water
TNTC	-	Too Numerous to Count
ND	-	Not Detected
COD	-	Chemical Oxygen Demand
BOD	-	Biochemical Oxygen Demand
OD	-	Oxygen Demand
TSS	-	Total Suspended Solid
TDS	-	Total Dissolved Solid
EMP	-	Environment Management Plan
FEPA	-	Federal Environmental Protection Agency
EA	-	Environmental Assessment
EAR	-	Environmental Audit Report
mg/L	-	Milligram per Litre
µS/cm	-	Micro Semen per Centimetre
°C	-	Degree Centigrade
FNU	-	Formazin Nephelometric Units
CS	-	Control Sample
BH	-	Borehole
SW	-	Surface water
LPG	-	Liquidified Petroleum Gas
IFC	-	International Finance Corporation

## **EXECUTIVE SUMMARY**

### **0.1. INTRODUCTION AND BACKGROUND**

Solid waste generation and disposal is a fundamental concern in any developing or industrial society. The volume of waste generated on daily basis is alarming and a source of worry both in developed and developing nations of the world. The generation of the wastes is not the major concern in any nation but rather the inability of such a Government/nation to gear up to the responsibility of its collection and management. Nigeria has lots of Legislations on waste management and this portends the fact that, legal framework is not the only problem of poor waste management in Nigeria but rather there are also other fundamental challenges. Management of waste is capital intensive and required sophisticated technology to ensure efficient waste management. Overpopulation is another factor that impedes the effectively of waste management. As population of a nation increases waste generation increases and the facilities to manage the increment in the generated waste increases.

Political infringement is another challenge in waste management. The Political/'God Fatherism' is a critical factor whereby political officer holders will recommend their persons for the waste collection without sheer knowledge of waste management. So, waste management is left in the hands of novice. The individual nonchalant attitude of the populace is another detrimental factor in waste management. In compliance with the Environmental Impact Assessment Act CAP E12 LFN 2004, and because the proposed project activities will have some interactive influences with the environment, there is need to conduct an Environmental & Social Impact Assessment studies.

### **0.2. THE PROJECT PROPONENT**

The project proponent is Freetown Waste Management & Recycle Limited. The company is a dynamic and integrated manufacturing company whose mission is to provide increased accessibility through its product offerings of household rubber floor products through recycling of scrap tyres that are enhanced with state-of-the-art technology to promote environmental sustainability. Freetown Waste Management Recycle Limited ('Freetown Waste') was incorporated in 2018 with RC number 1465129 to transform waste materials into reusable, economic and environment-friendly products.

### **0.3. THE PROPOSED PROJECT LOCATION**

The proposed project is located on km10, Ibadan-Abeokuta Road, Apata in Ido Local Government Area, Oyo State. The project location coordinates are stated on the report.

### **0.4. TERMS OF REFERENCE (TOR)**

The Terms of Reference (TOR) for this assessment is illustrated as followings:

- Existing vegetation or wildlife
- Other natural physical environment (air, water, soil), as well as principal physical features like topography, geology, drainage.
- Manmade physical environment along the corridor of the proposed project area e.g. buildings, cultural facilities, schools, hospitals, electricity poles/line, communication lines and such other public infrastructure.
- Human health and socio-economic of the communities along the corridors including culture.
- Aesthetic value of the environment.
- The study shall cover all aspects of preparatory and operational phases of the project; focusing on evolution and interpretation of environmental impacts of the project by carrying out the following.
- Generate baseline data of the existing ecology and socio economy of the proposed project areas.
- Identify, evaluate, prediction all impacts of the project on the environment including, health, security and safety.
- Development of a workable control and monitoring programmes and strategies to enhance the quality, beauty and aesthetics of the proposed project.
- Mitigation and amelioration of significant adverse impacts that the project shall have on the environment including traffic and human control.
- Development of environmental management systems including plans and procedures for effective management of the project at completion in terms of waste management (solid, liquid and air).
- Identify adverse action or inaction of project designers, engineers, monitors and the impacts of such actions on the project and the environment.
- Predicting potential impacts of all activities
- Recommendations on mitigating measures
- Monitoring, EMS and plan of action
- Submission of written report to the proponents and the authorities.
- Approval of the EIA study report from the environmental authorities.

#### **0.5. EIA OBJECTIVES AND APPROACH**

The basic objective of the EIA study is to:

- collect baseline environmental samples for the proposed factory;
- assess, evaluate and predict the potential impacts of the field development project activities and their significance on the identified environmental sensitivities;
- review and update the baseline information of the area in line with the project scope;
- assess analysis of alternatives towards minimizing the environmental and social impacts and costs;

- assess and evaluate the requirements of environmental enhancement through ensuring proper consultation with the communities; and
- prepare Environment Management Plan (EMP) considering the input of public consultation, analysis of alternatives and impact assessment of the project.

#### **0.6. ENVIRONMENTAL SCREENING AND SCOPING**

Project screening of EIA is the first step in the initial assessment of the possible environmental impacts of the proposed project. The purpose of the project screening is to ascertain if the proposed project requires an EIA through the elimination of irrelevant environmental issues and focusing on potentially significant issues at the planning and design stages. The representatives of the Federal Ministry of Environment (FMENV) attended the site verification and scoping workshop. The scope of screening study included:

- consideration of bio-physical, socio-economic and health issues, environmental sensitive area and the relevant legislative framework; and,
- consultation with key decision-makers and experts to identify key issues.

#### **0.7. ENVIRONMENTAL IMPACT ASSESSMENT (EIA) PREMISES**

- The key Environmental Impact Assessment (EIA) principles were established to provide general guidance, framework, and a commitment to standards, which are acceptable nationally and internationally. In line with this, the principles will be retained in this study and where necessary variations are allowed with evidence. Additional procedures, commitments and understanding necessary to resolve environmental impact, were developed and adopted through the Environmental Impact Assessment (EIA) process. The premises are as follows:
- Freetown Waste Management & Recycle Limited recognizes the Federal Ministry of Environment, and other State Environmental Regulatory Agencies and laws operating both nationally and internationally. Furthermore, the project will adopt the best option relevant to the local circumstances and situations.
- The project has been designed to comply with these local and national laws, in conjunction with all the international protocols, agreements and conventions.
- During this Environmental & Social Impact Assessment Study all the understandings arrived at during consultations with the Federal Ministry of Environment and the issues raised by the indigene during the stakeholder's process were without prejudiced considered.
- Consultations have and will continue to be held with all stakeholders at various levels (State and Local Governments) together with Apata community in Ibadan, Oyo State. Consultation meetings shall be maintained on a mutually agreed basis during the entire project phases.

- During this EIA an Environmental Management Plan (EMP) has been developed as part of the EIA process. The implementation of the plan will be the responsibility of Freetown Waste Management & Recycle Limited.

#### **0.8. LEGAL AND ADMINISTRATIVE FRAMEWORK**

The generation of waste in any form is not a crime but its unwholesome disposal methods. It is the responsibility of the originator of the waste to ensure it is managed in an environment- friendly manner. Due to the tragic disposals of solid wastes globally, waste management regulations were enacted with stiff penalties. In 1988, Nigeria as a nation experienced the first disposal of toxic waste by a foreign Italian vessel in Koko, Warri North Local Government Area of Bendel State (Now Delta State) which led to the promulgation of environmental protection laws. The Federal Government of Nigeria enacted Decree number 58 for the establishment of a Federal Environmental Protection Agency (FEPA) on 30<sup>th</sup> December 1988 to achieve a set of goals. In Nigeria waste management is among the very core management of the local government, state government and federal government. Moreover, at the state levels – the state environmental protection agencies (SEPA) and state waste management agencies oversee municipal waste management. Presently wastes are managed by each state environmental protection agency (SEPA) and state waste management agencies in urban cities and big towns in Nigeria. Environmental Impact Assessment (EIA) Decree 86 of 1992 now EIA Act Cap E12 2004: The objective is to ensure that environmental factors are considered in the decision-making process while likely adverse/hazardous environmental impacts are identified and minimized before the commencement of any proposed developmental projects. The creation of the State Environmental Protection Agencies led to the enactment of environmental protection regulations; such as the Harmful Waste (Special Criminal Provisions) Act Cap HI, 1988; The National Environmental (Sanitation and Waste Control) Regulation 2009; Guide for Importers of Used Electrical & Electronic Equipment (UEEE); The National Environmental (Electrical/Electronic Sector) Regulations 2011.

There are existing Federal /State statutory regulations requiring Development Permit for any new project and those that require the proponent of a major/mandatory project to submit an Environmental Impact study report prior to the execution. The Project area is subject to many other specific laws, guidelines and standards that ensure compliance with environmental pollution abatement in facilities that generate wastes, groundwater protection and surface impoundment, health and safety, and hazardous substances. Freetown Waste Management & Recycle Limited believes and adheres to the principle of sustainable development. The following are some of the international and national/local environmental regulations.

### **WORLD BANK GUIDELINES ON ENVIRONMENTAL ASSESSMENT (EA) 1991.**

The World Bank has set up environmental assessment standards that must be fulfilled by any project proponent before they can access financial assistance in form of loan. In line with the foregoing, the World Bank requires an EIA report as a prerequisite for the borrower to be granted approval for such loans. The EIA report normally forms part of the feasibility study of the project. Projects are categorized based on their EIA requirements and is very much like that of FEPA. The details of World Bank's EIA procedures and guidelines are published in the Bank's EA Source Book vols. I - III of 1991. The potential issues considered are biodiversity, coastal and marine resources management, cultural properties, hazardous & toxic materials, and international waterways.

### **INTERNATIONAL UNION FOR CONSERVATION OF NATURE & NATURAL RESOURCES (IUCN) GUIDELINES.**

The World Conservation Union of Nature & natural Resources (IUCN) in conjunction with the oil Industry International Exploration and Production forum (E & P Forum) have guidelines, which contain internationally acceptable practices and standards for oil and gas exploration and production. These guidelines present practical measures to conserve wetlands and enhance protection of aquatic ecosystem during oil and gas E & P activities.

This regulation and its standards were also considered in preparing the environmental studies to ensure that the natural resources are conserved during construction and operations phases.

### **CONVENTION ON BIOLOGICAL DIVERSITY**

The objectives of this Convention encompass the conservation of biological diversity, through the sustainable use of environmental components, and the fair and equitable sharing of benefits arising out of the utilization of genetic resources.

### **BASEL CONVENTION ON THE CONTROL OF TRANS-BOUNDARY MOVEMENTS OF HAZARDOUS WASTES AND THEIR DISPOSAL**

The convention focuses attention on the hazards of the generation and disposal of hazardous wastes. The convention defines the wastes to be regulated and control their trans-boundary movement to protect human and environmental health against their adverse effects.

### **UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE (1992)**

Climate change is a global environmental issue and it therefore requires concerted efforts of all the nations. To achieve sustainable social and economic development, energy consumption in the developing nations needs to grow considering the possibilities for achieving greater energy efficiency and for controlling greenhouse gas emissions in general. This also includes the application of new technologies on terms which make such an application economically and socially beneficial, determined to protect the climate system for present and future generations. The proposed project has incorporated

strategies into its manufacturing technology and processes to improve energy consumption and to ensure efficiency.

### **LAND USE ACT CAP 202 LFN 1990**

The Land Use Act was promulgated in 1978 with commencement date of March 29, 1978 now Land Use Act Cap 202 LFN 1990. It vests all land in each State of the Federation (except land already vested in the Federal Government of Nigeria 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 governments in such cases. The governor of a State can revoke a right of occupancy for overriding public interest (e.g. new project development purposes). The following surface rights are permitted under Section 51 of the Land Use Act fishing rights, buildings and other structures, juju shrines, objects of worship, farms, cultivated crops, economic trees, projects, and Loss of use of the land.

### **FEDERAL MINISTRY OF ENVIRONMENT (FMENV)**

The Federal Ministry of Environment is now the apex institution in Nigeria charged with the overall responsibility for the protection and development of the environment, biodiversity conservation and sustainable development of Nigeria's natural resources. The Ministry grants permits for environmental and laboratory consultancies and must approve an Environmental Impact Assessment (EIA) study of a major development activity before the proponent can implement execution.

### **ENVIRONMENTAL IMPACT ASSESSMENT (EIA) ACT. CAP E12, LFN 2004.**

An Environmental Impact Assessment (EIA) is an assessment of the potential impacts whether positive or negative, of a proposed project on the natural environment. It deals with the considerations of environmental impact in respect of public and private projects. Sections relevant to environmental emergency prevention under the EIA include:

- Section 2 (1) requires an assessment of public or private projects likely to have a significant (negative) impact on the environment;
- Section 2 (4) requires an application in writing to the Agency before embarking on projects for their environmental assessment to determine approval;
- Section 13 establishes cases where an EIA is required; and
- Section 60 creates a legal liability for contravention of any provision.

This process involves the undertaking of mandatory study by a review panel and the preparation of a mandatory Environmental Impact Assessment (EIA) report.

### **REGULATIONS GAZETTED AS SUPPLEMENTARY TO NESREA ACT**

- National Environmental (Soil Erosion and Flood Control) Regulations, S. I. No. 12 of 2011
- National Environmental (Surface and Groundwater Quality Control) Regulations, S. I. No. 22 of 2011



- National Environmental (Protection of Wetlands, Riverbanks and Lake Shores) Regulations, S. I. No. 26 of 2009:
- National Environmental (Watershed, Mountainous, Hilly and Catchments Areas protection) Regulations, S. I. No. 27 of 2009
- National Environmental (Sanitation and Wastes Control) Regulations, S. I. No. 28 of 2009
- National Environmental (Noise Standards and Control) Regulations, S. I. No. 35 of 2009
- National Environmental (Control of Bush/Forest Fire and Open Burning) Regulations, S. I. No. 15 of 2011
- National Environmental (Protection of Endangered Species in International Trade) Regulations, S. I. No. 16 of 2011
- National Environmental (Construction Sector) Regulations, S. I. No. 19 of 2011

#### **NATIONAL INLAND WATERWAYS AUTHORITY ACT NO 13 OF 1997**

This Act established the National Inland Waterways Authority with a view to improving and developing inland waterways for navigation, providing an alternative mode of transportation for the evacuation of economic goods and persons, executing the objectives of the national transport policy as they concern inland waterways. The Act also prescribes regulations and sanctions on the use and exploitation of resources of inland waterways such as dredging, sand or gravel, mining, and erection of permanent structures within the right-of-way or diversion of water from a declared waterway.

#### **FORESTRY LAW CAP 52, 1994**

Conservation of the natural resources is key to sustainable development and to avoid extinction of some species of plants and animals; and it was pursuant to this that this law was promulgated. The Forestry law prohibits any act that may lead to the destruction of or cause injuries to any forest produce, forest growth or forest property. The law clearly states the administrative framework for the management, utilization, and protection of forestry resources in Nigeria.

#### **TERRITORIAL WATERS ACT CAP 428 LFN 1990**

The territorial waters of Nigeria shall for all purpose include every part of the open sea within twelve nautical miles of the coast of Nigeria (measured from low water mark) or of the seaward limits of inland waters. Any act or omission which:

- is committed within the territorial waters in Nigeria, whether by a citizen of Nigeria or a foreigner; and
- would, if committed in any part of Nigeria, constitute an offence under the law in force in that part, shall be an offence under that law and the person who committed it may, subject to section 3 of this Act, be arrested, tried and punished for it as if he had committed it in that part of Nigeria

## **WATER RESOURCES ACT CAP W2 LFN 2004**

The Water Resources Act vests the right to the use and control of all surface and groundwater and of all water together with the bed and banks in any watercourse affecting more than one state in the Government of the Federation. However, the Act essentially preserves existing rights, including customary rights, provided they are for domestic use, watering of livestock and personal irrigation schemes. A proviso to section 1(1) states that the subsection shall not be deemed to infringe or to constitute a compulsory right over or interest in property. Apparently, the idea is to separate rights over water resources from other rights in property.

## **THE DEPARTMENT OF PETROLEUM RESOURCES (DPR) ENVIRONMENTAL GUIDELINES & STANDARDS FOR PETROLEUM INDUSTRY IN NIGERIA 2018.**

The Department of Petroleum Resources (DPR) Environmental Guidelines and Standards for the Petroleum Industry in Nigeria (EGASPIN) 2018 was enacted to regulate the Nigerian Petroleum Industry. It was made mandatory in Part viii (A) sections 1.4.3(ii) and 1.6 for project proponents to prepare Environmental Impact Assessment (EIA) reports for all developmental projects within the petroleum industry.

## **OYO STATE MINISTRY OF ENVIRONMENT**

The Edict setting up the Oyo State Ministry of Environment outlines the primary responsibilities of the ministry, which is to develop policies to protect and develop the general environment of Oyo State. The Environmental Impact Assessment (EIA) Act CAP E12 LFN 2004 is the substantive law that regulates the establishment of projects that infringe on environmental elements in Nigeria, the State in which each project is located has a major role to play in the overall Environmental Impact Assessment (EIA) process as a matter of law. The projects which are outside the mandatory study under the EIA Act is captured in EIA and monitored by FME.

### **0.9. SCOPE OF WORK**

The scope of work for this EIA involve an extensive literature survey and a comprehensive field data gathering exercise to effectively characterize the study area. Specifically, the work scope shall entail:

- Review of national and international environmental regulations guiding the scrap tyre recycling activities to be carried out as well as consultation with relevant stakeholders.
- Description of the Project, baseline/data gathering and report writing.

### **0.10. STUDY APPROACH AND METHODOLOGY**

The EIA study has been undertaken in accordance with FMENV, World Bank and other Nigerian regulatory standards. The distinct phases of the study include: Literature review, project understanding and institutional consultation, site verification/scoping, collection

of secondary information and monitoring, laboratory analysis of samples ably monitored by Representatives of FMENV and report writing.

### **0.11. EQUATOR PRINCIPLES (EPS) AND IFC PERFORMANCE STANDARDS**

The Equator Principles (EPs) is a risk management framework, adopted by financial institutions, for determining, assessing and managing environmental and social risk in projects and is primarily intended to provide a minimum standard for due diligence to support responsible risk decision-making. The EPs, based on the IFC Performance Standards on social and environmental sustainability and on the World Bank Group Environmental, Health, and Safety Guidelines (EHS Guidelines), are intended to serve as a common baseline and framework for the implementation by each Equator Principles Financial Institutions (EPFI). These principles were applied in this study.

### **0.12. IFC PERFORMANCE STANDARDS**

International Finance Corporation (IFC) Performance Standards defines clients' roles and responsibilities for managing projects and the requirements for receiving and retaining financing from EPFI's. The proposed project was benchmarked against the IFC performance standards and the project location and underlining principles comply.

### **0.13. STRUCTURE OF THE EIA REPORT**

The structure of the EIA report is as shown below:

- Chapter One – The chapter one contains the introduction; and it contains the background information, EIA objectives, Legal/administrative framework, structure of the EIA report.
- Chapter Two – This contains the Project Justification, and it emphasizes the proposed project background, project objectives, basis of the project, envisaged sustainability, and development options to be considered in the proposed project;
- Chapter Three- This chapter contains the project description, it describes the type of project, scope, location, material input/output and by-products, waste generation, technical layout and process, operation and maintenance, proposed project schedules;
- Chapter Four - Description of Existing Environment is contained in this chapter and it further provides every information on the precinct/baseline environmental conditions of the project area describing the physical, chemical, biological social, and health environment
- Chapter Five - Associated and Potential Environmental Impacts – emphasis is placed on the Associated and Potential Environmental Impacts of the proposed project;
- Chapter Six – Mitigation Measures/Alternatives – illustrates the mitigation options for the proposed project impacts;
- Chapter Seven - Environmental & Social Management Plan - presents the proposed plans for the social & environmental management;

- Chapter Eight - Decommissioning and Abandonment Plan defines the strategies to be adopted during decommissioning of the plant and provides remediation plans after decommissioning/abandonment.; and
- Chapter Nine - Conclusion and Recommendations

#### **0.14 PROJECT JUSTIFICATION**

The dumping of toxic waste by a foreign company at Koko town near Warri in Delta State, Nigeria in 1987 led to the establishment of Federal Environmental Protection Agency (FEPA) by Decree No. 58 of 1988. As a follow up to the establishment of FEPA, in June 1999 the Federal Government of Nigeria created the Federal Ministry of Environment (FMENV) and, as a result, FEPA's function was absorbed by the new Ministry. The establishment of the FMENV birthed State Ministries of Environment and replacing their existing State Environmental Protection Agencies (SEPA's). All these efforts should have enhanced and boosted solid waste management strategy in Nigeria, but it has no effect. The Federal Ministry of Environment (FMENV) organizes regular meetings of the National Council on Environment which is attended by all Chief Executives of State Environmental Ministries. The meeting provides the forum for policy direction and dialogue on topical environmental issues.

According to the Lagos State Waste Management Authority's 2016 report on waste management, over 13 billion tons of waste is generated annually in major cities globally. Nigeria generates more than 32 million tons of solid wastes annually (over 13 000 metric tons daily) Common waste components include tyres, plastics, glass, paper and building and construction wastes. Multiple companies are currently developing recycling plant to reduce the bane caused by non-biodegradable waste in the global waste management process. Scrap tyres consume large spaces in landfills and can be breathing grounds for disease carrying insects like mosquitoes. The main issue with regards to scrap tyres is they are highly durable, large and non-biodegradable and hence can cause health and environmental problems trying to dispose-off them. Burning off scrap tyres releases toxic fumes and uncontrollable fire outburst that poses health damage to humans and damage to soil fertility. In Nigeria, annual tyre consumption is estimated at 3 million annually, the estimated number of scrap tyres produced annually is 15 million units and over 100 million tyres have been disposed-off in the last ten years without a structured detailed and efficient recycling plan. Tyre recycling in Nigeria is dominated by small and medium enterprises repurposing tyres for beautification purposes like making footwears repurposing into chairs or stools or processing the tyres into tyre derived fuel Another major form of tyre recycling in Nigeria is retreading the tyres until they have used up their life span and then the tyres are disposed-off. It is therefore a welcome development for waste recycling plant such as this.

### **0.14.1 BENEFITS OF THE PROJECT**

Freetown Waste Management Recycle Limited intends to promote the Nigerian economy by introducing a proactive technology aimed at recycling the scrapped tyres causing menace to the environment and converting them to a usable household product. The proposed project will eliminate the environmental challenges posed by the scrapped tyres and making the economy of Nigeria adorable. The followings are benefits to be derived from the technology:

- reduction of environmental nuisance arising from littering of scrapped tyres.
- reduced health risks arising from tyre burning on the street.
- it will ensure clean environment.
- the project will avail the masses access to the products.

#### **0.14.1.1 SOCIO- ECONOMIC BENEFITS**

The project will serve as an important employment creation and will provide employment opportunity throughout the life span of the project. After construction, period the industrial and infrastructure development will provide enormous employment opportunities. The proposed scrap tyre recycling plant will provide the following socio-economic benefits:

- enhance the accessibility to the products;
- employment opportunities for the indigene;
- reduction in environmental pollution arising from scrap tyres;
- increase in social activities as personnel will be moving towards the area;
- more business opportunities will spring up within the host community; thereby increasing the employment opportunities and income of the indigene; and
- overall improvement in the quality of life for the lesser development areas in the neighborhood.

#### **0.14.1.2 ENVIRONMENTAL BENEFITS**

- Reduction in air pollution, due to the recycling of scrap tyres littering the street; and
- Reduction in the blockage of water course by scrap tyres.

#### **0.14.1.3 NEED FOR THE PROJECT**

The initiative of the Federal Government of Nigeria (FGN) to ensure clean- environment and reduction of climate change is foster through this project.

#### **0.14.1.4 THE VALUE OF THE PROJECT**

The value of the project is about ₦980million and Freetown Waste Management & Recycle Limited aims at generating a positive return to its investors within its first five years of operations.

#### **0.14.1.5 ENVISAGED SUSTAINABILITY**

The environment is like an orphan and it has been plagued by the nonchalant anthropogenic activities and hence the need to protect the environment. Man has always had need to create products for its existence by relying on the natural resources and as such several of the environmental components have invariably been jeopardized. Ecologically sensitive areas have also been impoverished leading to the extinction of ecologically sensitive species. Wastes are generated in any human and industrial activities in the quest to satisfy a curiosity or need.

However, in recent times there has been a dramatic development and technological advancement leading to the production of less environment-friendly products with adverse negative effects on the environment. The release of toxic substances arising from the production of items into the atmosphere has hitherto negatively destabilized the equilibrium existing within the natural ecosystem and hence the untold environmental consequences that have reared their devastating effects on the climate. All over Nigeria, scrap tyres are serious menace leading to environmental degradation and eventual flooding and blocking of water course. The Federal Government of Nigeria is joining hands with other nations globally to prevent the environmental degradation via scrap tyres and solid wastes. The rate of generation of scrap tyres in Nigeria couple with importation of tons of scrap tyres is a serious concern. From the forgoing, it is therefore a matter of urgency to ensure that the environment is protected. Man must watch what he does and evaluate the negative impact of his activities on the environment.

#### **0.14.1.6 PROJECT ALTERNATIVES**

The assessment of impacts of the proposed project considered these main options; No project option, Project Relocation & the Project execution as proposed. During the Environmental Impact Study, the above project alternatives were reviewed in line with the project objectives in mind. The conclusion is that the location of the project is within an existing industrial facility which was abandoned by the previous user located within 2Ha of land, hence project execution as planned option is applicable.

#### **“NO PROJECT OPTION”**

It is essential that the “no project option” be considered as a first step in mitigation. The “no project” option implies that the proposed project will not be carried out and the area allowed to remain in its present conditions. During the study, the locations of the proposed scrap tyre recycling Plant needs this project because it is within an existing production

facility with perimeter fence which was used for manufacturing facilities. to boost the economy of the State and the nation in general.

### **PROJECT EXECUTION AS PLANNED**

This project option was considered. During the study, it was clear that there will be employment of the indigene if the project is carried out as proposed. For instance, there will be setting up of other small-scale business enterprises. Emigration will be checked; expansion of other infrastructure development will be enhanced if the project is developed as planned and as such this option was considered favourable. The end products of the recycling plant such as the yoga mats, foot mats, floor rubber tiles, gym mats, equipment mats, doormats, anti-slip pads, bathroom mats etc. These products are household items needed in homes and through this project the products will be readily available.

In line with the site verification conducted by the Representatives of Oyo State Ministry of Environment it was agreed that the existing project location is okay since it was formally used as manufacturing plant and the building structures will be used as they are.

### **PROJECT RELOCATION**

The option of project relocation to another location was also considered and it will not be the best option as the area has been used for production which is the same as proposed recycling plant to be used for production of rubber products. If the project is relocated, it will also lead to a continued exposure of the indigene to unemployment and underutilization of the parcel of land and hoodlums can harbour within the existing structures to perpetrate their nefarious acts. There will not be economic and infrastructural development in the area if the existing structure is left as it is. The location of the proposed project is free from any infringement from the inhabitants and does not pose any significant threat to the indigene.

## **0.15 PROJECT PROCESS DESCRIPTION**

### **0.15.1 PROJECT DESCRIPTION**

The project proponent is proposing to operate a modern rubber roll and mat moulding plant with an annual capacity of 3,000 tonnes of rubber powder into rubber rolls. The proposed products are rubber floors, yoga mats, gym mats, equipment mats, door mats, anti-slip pads, bathroom mat. The proposed recycling plant is to be established on an existing structure, which will undergo some renovation works. Freetown Waste Management Recycle Limited, is a manufacturing company aimed at reducing the amount of scrap tyres and recycling them into reusable, eco-friendly rubber moulded products

The proposed Freetown Waste Projects are broken down into three broad Phases

- i. Phase 1 Development of a rubber rolls and mat moulding facility

- ii. Phase 2 Development of a tyre recycling facility
- iii. Phase 3 Development of a rubber tile and accessories moulding facility

The project proponent is looking to commence Phase 1 operations by operating a modern rubber roll and mat moulding plant in Nigeria, recycling 3 000tons of rubber powder per annum into rubber rolls Rubber powder are made from recycling of waste scrap tyres. Rubber rolls and mats can be utilized in offices, gyms, homes, manufacturing plants amongst other uses Freetown Waste products are eco-friendly, durable, versatile, and flexible to meet our clients' needs.

### **0.15.2 RAW MATERIALS AND SOURCES**

The raw materials will be crumb rubber and scrap tyres locally sourced from Oyo state and neighbouring states like Lagos, Ogun states.

### **0.15.3 MANUFACTURING PROCESS**

Used tyres are obtained from suppliers and stored in the specified area of the plant. Tyre recycling process commences with the following steps:

#### **Step 1: Mixing of Raw Materials**

Mixing of rubber granules obtained from disused tyres, PU binder and EPDM granules  
Staff required: production supervisor, forklift driver, machine operator and casual support staff. Time required: 30 - 40 mins

#### **Step 2: Loading Cylinder Moulds into Vulcanizing Pot**

The second stage in production is automatic feeding of mixed granules into cylinder and compressing granules in the cylinder. Loading the cylinder moulds into the vulcanizing pot for heating. Vulcanizing pot takes 4 cylinders at a time. Moulded cylinders are removed to cool before being stripped into rolls. Time required: 3-4 hours

#### **Step 3: Cutting of Rolls and Mats**

Cutting machine cuts the moulds into long strip with different thickness. Mats can also be punched if making interlocking mats and other bespoke designs on the mat.  
Time required: 20 mins depending on output required

#### **Step 4: Packaging of Rubber Products**

Packaging of mats into rolls dependent on proposed used of the product and placed on pallets. Stock inventory is taken, and product is ready for shipment.



**Step 5: Delivery**

Finished mats are transferred to the warehouse and delivered to clients from the warehouse.

**0.16 DESCRIPTION OF PROJECT EXISTING ENVIRONMENT**

The project is located within Apata in Ido Local Government Area, Ibadan, Oyo State. The project location just as Ibadan city is a tropical wet and dry climate with a lengthy wet season and relatively constant temperatures throughout the course of the year. Ibadan's wet season runs from March through October. The month of November to February forms the city's dry season, during which Ibadan experiences the typical West African harmattan. The mean maximum temperature is 26.46°C, minimum 21.42°C and the relative humidity is 74.55%.

**0.16.1 GEOGRAPHICAL LOCATION OF STUDY AREA**

The proposed project site (2Ha of land) is located within the existing parcel of land with perimeter fence and located within the GPS(UTM) coordinates as stated below.

<b>E (31N)</b>	<b>N</b>	<b>ELEVATIONS</b>
588093.282m	817888.138m	217.45m
588087.818m	817916.083m	214.46m
588087.022m	817930.430m	213.51m
588091.407m	817963.971m	212.45m
588108.614m	817995.614m	211.57m
588136.420m	817966.599m	211.83m

**0.16.2 METEOROLOGY AND CLIMATE**

The climate of the project site in Ibadan, Oyo State is tropical with distinct wet and dry seasons. The mean daytime temperature varies between 25oC in the north to 34oC in the south. The wet and dry seasons are associated respectively, with the prevalence of the moist maritime south-westerly monsoon from the Atlantic Ocean and the dry continental north-easterly harmattan from the Saharan Desert. From the coast to the inland hinterland there is a steady decrease in the duration and intensity of the wet season. It falls within the Basement complex of Southwestern Nigeria which are characterized by rocks of mainly Precambrian age.

**RAINFALL**

Ibadan is situated in the transitional region between the rain forest vegetation and the Guinea Savannah vegetation belts in Nigeria. The range of monthly mean of rainfall here in Ibadan is 13.8inches (in June) - 15.0inches (in September).

## **TEMPERATURE, CLOUD COVER AND PRECIPITATION**

The mean monthly temperature of Ibadan is in the range of 21°C to 31°C. Mean maximum monthly temperatures range from 27°C to 35°C. The hottest months are December to February. Relative humidity is high in the state throughout the year and decreases slightly in the dry season.

## **RELATIVE HUMIDITY**

Relative humidity (RH) is the ratio of the partial pressure of water vapour to the equilibrium vapour pressure of water at a given temperature. Relative humidity depends on temperature and the pressure of the system of interest. It requires less water vapour to attain high relative humidity at low temperatures; more water vapour is required to attain high relative humidity in warm or hot air.

Generally, in Nigeria, July is the middle of the wet season and the relative humidity is high because of the warm wet air that prevails. The monthly means of relative humidity in Ibadan, Oyo State ranged 58-78% with the aggregate monthly mean of 68.8%. Relative humidity greater than 68.8% occurs from March to October while RH below 68.8% occurs from January to February and November to December. The ambient temperature and relative humidity of the project location were measured using the Smart Sensor (Model: AR830) which can measure Relative Humidity, Temperature and Particulate Matter.

## **WIND SPEED AND DIRECTION**

The mean annual wind speed varies between a narrow range of 4.0 and 6.2m/s. Speeds are higher between July and August; the period of break is August. Conversely, at the peak of the rainy season in September and October, wind speeds are lowest, measuring between 4.1 and 4.2m/s. From December, wind speeds begin to rise steadily till March, just before the rains begin and later rise during the August break. There are slightly lower speeds in October/February while high wind speeds are obtained from March to September. The wind pattern follows the migratory ITD. According to the statistics available for the last fifteen years, the prevalent wind directions is Southly-westerly, often, the South-westerlies dominate the wetter period of the year in the area while North-easterlies dominate the drier season. Depending on the shifts in the pressure belts in the neighbouring Gulf of Guinea, they are interspersed respectively by South- easterlies and North-westerlies at different times during the year.

### **0.16.3 PHYSIOGRAPHY AND GEOLOGY**

The proposed scrap tyre recycling plant is located at km 10, Ibadan-Abeokuta Road, Apata within Ido Local Government area, Ibadan, Oyo State. The project is located within Apata in Ido Local Government Area, Ibadan, Oyo State. The project location just as Ibadan city is a tropical wet and dry climate with a lengthy wet season and relatively constant temperatures throughout the course of the year. Ibadan's wet season runs from March through October. The month of November to February forms the city's dry season, during

which Ibadan experiences the typical West African harmattan. The mean maximum temperature is 26.46 C, minimum 21.42 C and the relative humidity is 74.55%.

#### **0.16.4 BASELINE DATA ACQUISITION METHODOLOGY AND STUDY APPROACH**

The purpose of the baseline data acquisition is to establish the status of the various environmental components before the execution of the project. To achieve this, the environmental parameters were acquired from data gathering. The components of the environment covered are biophysical, social, and health.

#### **0.16.5 QUALITY ASSURANCE/QUALITY CONTROL**

The quality control & quality assurance (QA/QC) of all samples and the whole process is a vital aspect of this project and the conduct of the Environmental Implication study. This starts from field works, collection of samples, analysis and documentations. Standard methods and procedures have been strictly adhered to during this study. QA/QC procedures were implemented during sample collection, labelling, analyses and data verification. Chain of custody procedures including sample handling, transportation, logging and cross-checking in the laboratory have also been implemented. All analyses were carried out in DPR/FMENV/NESREA accredited laboratories (International Energy Services Limited). The methods of analyses used in this study were in compliance with nationally and other internationally accepted analytical procedures, to ensure the reliability and integrity of the data obtained.

#### **0.16.6 SAMPLING STRATEGY**

The sampling strategy is an essential component of quality assurance and quality control. The sampling and data collection for the environmental components and parameters were in accordance with recommended procedures and practices for environmental data collection in Nigeria (FMENV 1992 and DPR, 2002 Part vii D – sampling and handling of samples). This is done to ensure that the nature, characteristics of the samples is not altered in any way. Samples were collected and stored in coolers to maintain their characteristics and compositions.

#### **0.16.7 AIR QUALITY AND NOISE STUDIES**

The rate of air pollution is becoming worrisome and therefore needs an urgent redress. It is becoming a major factor in the quality of life of urban and rural dwellers, and it poses risk to both human health and the environment. Therefore, it is necessary to study the background quality of the air prior to any project and to predict the impact(s) such a project would have on the air quality. Thus, the following air quality parameters were sampled during the field work viz: Suspended Particulate Matter (SPM), Sulphur Oxides (SO<sub>x</sub>), Nitrogen Oxides (NO<sub>x</sub>), Carbon Monoxide (CO), Hydrogen Sulphide (H<sub>2</sub>S), and

Hydrocarbon gases using highly sensitive digital in-situ Gas Monitors. The background noise levels were measured using a portable digital sound level meter.

#### **0.16.8 SOIL CHARACTERISTICS/ LAND USE & OWNERSHIP**

The land use pattern and land cover are driven by a variety of socio-economic, political, cultural, technological, and bio-physical factors. Land cover change is one of the most important variables of environmental change and represents the largest threat to ecological systems. Ido as the Local Government Area playing host to the proposed project is characterized by remarkable growth in population, expansion and developmental activities which have resulted in increased land consumption and alteration of the land. The increasing concern for the management of natural resources in recent times has been necessitated by the increase in demographic pressure and its associated anthropogenic activities which have led to serious environmental stress and ecological instability.

The foremost land-use and cover of the proposed project area and the host community is forestry, agriculture, and built-up areas (the built-up areas are mainly settlements and low & medium scale businesses). The land use within Apata Local Government Area is predominantly for farming, small scale businesses and housing development. Land ownership is freehold system within the Ibadan, Oyo State. Twenty-four (24) soil samples at nine locations at depth 0-15cm and 15-30cm were collected within the project area with the aid of a Dutch Hand Auger, hand gloves, a spool and hammer. The pH values of the surface subsurface (0 – 30cm) soils of the study area showed that the soils are slightly acidic with values that range from 4.93- 8.10 for the sub-surface.

**Nutrients:** Nitrate concentrations in soil samples ranged in the subsurface layer nitrate ranged from 45.3– 110mg/kg. Sulphate concentrations in soil samples in the subsurface layer ranged from 29.0-75.0mg/kg; phosphate ranged from 12.3– 20.2 mg/kg.

The importance of these nutrients in plants cannot be over-emphasized. Chlorophyll, plant proteins and nucleic acids are nitrogen compounds, which play major roles in plant growth. In addition, Phosphorous compounds are also key plant nutrients. They form an essential part of nucleo-proteins in plant cells and these control cell division and growth. Phosphorous is also a major constituents of deoxyribonucleic acid (DNA) molecules, which are the signature for genetic pools and inheritance characteristics of living organisms (Donahue *et al.*, 1990). It is also part of energy storage and transfer of chemicals (Adenosine triphosphate, ATP) in plants. Sulphur occurs in proteins and is required for plant vitamins. It could be derived from rainfall and agricultural chemicals. Rainfall dissolves the sulphur oxides evolved during the burning of plant-derived fuels such as

wood, coal, and oil. In acidic soils sulphur comes from mineralization of organic matter, particularly weathered soil (Donahue et al., 1990).

### Heavy Metals

The concentrations range of heavy metals for surface and subsurface soil samples (Cr, Fe, Hg, Mn, Ni, Pb, Cu, Zn, and V) in the study area are presented below:

**Total Iron:** The surface soil of the iron level ranged from 30.7-1620mg/kg. The soil samples are rich in iron which accounts for the good agricultural yield within the community.

**Mercury:** The concentration of Mercury was below equipment detectable limit of <0.001mg/kg subsurface soil.

**Nickel:** The recorded values for nickel in the soil samples ranged from 0.12-1.9mg/kg

**Lead:** The concentrations of lead in the soil samples ranged from 0.1-1.2 mg/kg.

**Copper:** The surface soil of the subsurface soil has values that ranged between 0.13-0.98mg/kg.

**Zinc:** The concentration of zinc in the soil samples ranged from 0.32-68.7mg/kg.

### MICROBIOLOGICAL STATUS OF SOILS

Results of microbial analyses of the soil samples are presented below. Results of Total Heterotrophic Bacteria Count (THB) for soil samples collected from 0 – 30cm depth have values that ranged from 3.16 – 5.6 x 10<sup>8</sup>cfu/g. The values of HUB for the soil samples ranged from 0.01X10<sup>2</sup>- 1.1X10<sup>2</sup>cfu/g and the values of HBF the soil samples collected ranged from 24X10<sup>3</sup>-93X10<sup>3</sup>.

S/N	Sample ID	THB Cfu/sg	HUB Cfu/g	HBC Cfu/g
1	SS1(0-15cm)	4.22x10 <sup>8</sup>	0.1X10 <sup>2</sup>	28X10 <sup>3</sup>
2	SS1(15-30cm)	4.20x10 <sup>8</sup>	0.1X10 <sup>2</sup>	24X10 <sup>3</sup>
3	SS2 (0-15cm)	4.21X10 <sup>8</sup>	0.1X10 <sup>2</sup>	90X10 <sup>3</sup>
4	SS2 (15-30cm)	3.16X10 <sup>8</sup>	0.1X10 <sup>2</sup>	93X10 <sup>3</sup>
5	SS3 (0-15cm)	5.33X10 <sup>8</sup>	0.1X10 <sup>2</sup>	42X10 <sup>3</sup>
6	SS3 (15-30cm)	4.29X10 <sup>8</sup>	0.1X10 <sup>2</sup>	38X10 <sup>3</sup>
7	SS4 (0-15cm)	4.62X10 <sup>8</sup>	0.1X10 <sup>2</sup>	48X10 <sup>3</sup>
8	SS4 (15-30cm)	3.61X10 <sup>8</sup>	0.1X10 <sup>2</sup>	52X10 <sup>3</sup>
9	SS5 (0-15cm)	4.25X10 <sup>8</sup>	0.1X10 <sup>2</sup>	30X10 <sup>3</sup>
10	SS5 (15-30cm)	4.25X10 <sup>8</sup>	0.1X10 <sup>2</sup>	24X10 <sup>3</sup>
11	SS6 (0-15cm)	4.30X10 <sup>8</sup>	0.1X10 <sup>2</sup>	24X10 <sup>3</sup>
12	SS6 (15-30cm)	4.22X10 <sup>8</sup>	0.1X10 <sup>2</sup>	24X10 <sup>3</sup>
13	SS7 (0-15cm)	5.12X10 <sup>8</sup>	0.1X10 <sup>2</sup>	32X10 <sup>3</sup>
14	SS7 (15-30cm)	5.16X10 <sup>8</sup>	0.1X10 <sup>2</sup>	31X10 <sup>3</sup>

S/N	Sample ID	THB Cfu/sg	HUB Cfu/g	HBC Cfu/g
15	SS8 (0-15cm)	5.33X10 <sup>8</sup>	0.12X10 <sup>2</sup>	43X10 <sup>3</sup>
16	SS8 (15-30cm)	5.10X10 <sup>8</sup>	0.1X10 <sup>2</sup>	40X10 <sup>3</sup>
17	SS9 (0-15cm)	5.22X10 <sup>8</sup>	0.5X10 <sup>1</sup>	51X10 <sup>3</sup>
18	SS9(15-30cm)	5.60X10 <sup>8</sup>	0.1X10 <sup>2</sup>	52X10 <sup>3</sup>
19	SS10 (0-15cm)	4.22X10 <sup>8</sup>	0.01X10 <sup>1</sup>	28X10 <sup>3</sup>
20	SS10(15-30cm)	4.40X10 <sup>8</sup>	0.01X10 <sup>1</sup>	25X10 <sup>3</sup>
21	SS11 (0-15cm)	3.60X10 <sup>8</sup>	1.1X10 <sup>2</sup>	45X10 <sup>3</sup>
22	SS11(15-30cm)	3.85X10 <sup>8</sup>	1.0X10 <sup>3</sup>	50X10 <sup>3</sup>
23	SS12(0-15cm)	4.21X10 <sup>8</sup>	1.5X10 <sup>3</sup>	28X10 <sup>3</sup>
24	SS12(15-30cm)	4.21X10 <sup>8</sup>	0.5X10 <sup>2</sup>	24X10 <sup>3</sup>

### 0.16.9 HYDROLOGY

Apata just like Ibadan city sits on a rolling topography with the basement rock types characterized by low porosity and permeability. The main rivers draining Ibadan are Ogunpa, Ogbera and Ona rivers with their tributaries, amongst which are the River Maje, Elere, Alaro, Alapata, Omi, Kudeti, etc. The city area sits on the basement complex rocksuit comprising older granite, quartz schists/quartzite and gneiss. There are ridges of quartzite/quartz schists, inselbergs of gneiss and older granite. These rocks are quite old predating the Pan African orogeny. Each rock type possesses its own typical failure plane. Gneiss foliations are marked by alternating white and black bands. In quartzite, micaceous bands constitute possible failure planes. The granite and granite gneiss complex have high residual stress, sub aerial weathering which enhances anisotropy. They also have deformability modules which vary non-linearly with micro-petrographic quality index.

### GROUND WATER SAMPLES LABORATORY RESULTS

Three ground water samples were taken for analysis. The ground water sampling was conducted at three points from one (1) borehole and two (2) well water source within the project site. The insitu parameter values for ground water a like pH, Electrical conductivity, temperature, TDS & dissolved oxygen were measured with the results as shown below.

#### PHYSICAL PARAMETERS

The physical parameters are turbidity, temperature, colour, taste and odour.

**Temperature:** Fish and other aquatic organisms require certain levels of temperature to live and reproduce. The optimum temperature depends on the species of fish or organism and then on the chemical/physical nature of the water.

**Colour, Taste, and Odour:** These are physical characteristics that are important for the

quality of the water. Although they do not cause direct physical harm, most people would object strongly to water that offends their sense of sight, taste, and smell. Too much colour impairs light penetration in a body of water and could affect the food chain.

### **CHEMICAL PARAMETERS**

The chemical parameters are Dissolved Oxygen (DO), Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Total Suspended Solids (TSS), Total Dissolved Solids (TDS), Hardness, asbestos or any dust system containing fibers of the correct size, namely 0.1  $\mu$  m diameter and 2-20 $\mu$ m long, the heavy Metals, Aluminum (Al), Iron (Fe), Manganese (Mn), Lead (Pb)), the eight trace elements, (As, Cd, Cu, Cr, Pb, Hg, Ni, and Zn). Trace elements are elements that are generally present only in small quantities in natural systems. The other parameters are the anions (Fluorides, Chlorides, Sulphate, Nitrogen, Phosphorus), Acidity, Alkalinity and pH, Toxic and radioactive substances. The values of these parameters are as stated on the above table. The values of sulphate ranged from 110-210mg/L, Nitrate values ranged 10.4 & 15.1mg/L, chlorides values ranged from 10 & 14mg/L.

### **Metals & Heavy metals**

Iron content in the borehole water samples ranged from 0.001 & 0.01mg/L, The lead (Pb) contents ranged from <0.001mg/L, Zinc value was 1.05mg/L, Cadmium was <0.01mg/L, Nickel value was <0.001mg/L, Copper value was not detected, and the value of Chromium ranged from <0.001-0.01mg/L.

### **0.16.10 SITE'S NATURAL CHARACTERISTICS**

The climate in the State favours the cultivation of crops like Maize, Yam, Cassava, Millet, Rice, Plantain, Cocoa tree, Palm tree and Cashew. The proposed site is on a well-drained, dry with gentle slope prone to sheet erosion, which is characterised by Rain Forest Zone with vegetations, trees and food crops like, oranges, pawpaw, cassava and other leguminous plants. The proposed project location is a built-up area with SMEs businesses..

### **0.16.11 TOPOGRAPHY, ECOLOGY AND GEOLOGY OF AREA**

The topography of the proposed project location is flat with gentle slope. The project area is on a low land. Various forms of morphological units and depositional environments have been recognised in the study area, ranging from coastal flats, sand bars, ancient/modern sea, river and lagoon beaches, flood plains, seasonal flooded depressions, swamps, ancient creeks and river channels. The geographical landscape of the area and the entire state comprises extensive fertile soil loamy soil suitable for agriculture, because of the presence of grasses it is suitable for cattle rearing and farming. The adjoining area is predominantly savannah ecosystem. There are also vast forest reserves, rivers, lagoons, rocks, mineral deposits. Geologically, extensive deposits of sandstone, mineral deposits occur within the Local Government and the State. A topographic map is a two-dimensional representation

of the Earth's three-dimensional landscape. It is a two-dimensional representation of a portion of the three-dimensional surface of the earth. Topography is the shape of the land surface, and topographic maps exist to represent the land surface. The presence of basement complex rocks has resulted in the formation of an inselberg landscape. This landscape is undulating and marked by numerous domed-shaped hills and by occasional flat-topped ridges. Summits reach between 300 and 700m. Elevation is generally increased northwards from approximately 150m to nearly 500m.

#### **0.16.12 VEGETATION & WILDLIFE**

The vegetation pattern of Oyo State is that of rain forest in the south and guinea savannah in the north. Thick forest in the south gives way to grassland interspersed with trees in the north. There are coastal barrier highland forests and mangrove forests. Coastal barrier highland forest vegetation is restricted to the narrow ridges along the coast. This vegetation belt is characterized by low salinity-tolerant freshwater plants. The assessment of the vegetation was done to identify the types of plants, crops, grasses that are found within the study area. This was done through visual inspection and observation along the project area. Inventory of plants species on the project area was taken at intervals. The characterization, identification and classification of the plant species and communities were undertaken both at the field and with reference materials. The ecological zone is made up of mixtures of trees, shrubs, herbs, grasses, and food crops. The floristic composition is highly diverse in species even over a relatively homogenous area. It consists of typical southern Guinea Savannah general with its herbaceous species and grasses.

#### **0.16.13 AQUATIC STUDIES/HYDROBIOLOGY**

Apata just like Ibadan city sits on a rolling topography with the basement rock types characterized by low porosity and permeability. The main rivers draining Ibadan are Ogunpa, Ogbera and Ona rivers with their tributaries, amongst which are the River Maje, Elere, Alaro, Alapata, Omi, Kudeti, etc. The city area sits on the basement complex rocksuit comprising older granite, quartz schists/quartzite and gneiss. There are ridges of quartzite/quartz schists, inselbergs of gneiss and older granite. These rocks are quite old predating the Pan African orogeny. Each rock type possesses its own typical failure plane. Gneiss foliations are marked by alternating white and black bands. In quartzite, micaceous bands constitute possible failure planes. The granite and granite gneiss complex have high residual stress, sub-aerial weathering which enhances anisotropy. They also have deformability modules which vary non-linearly with micro-petrographic quality index.

#### **0.16.14 WATER RESOURCE STUDIES**

In arid and semi-arid regions, the search for water which are under increasing stress from the growing human population, poses a great challenge due to its scarcity. Groundwater,



as a dynamic system, is located beneath the Earth surface and moves under the control of many factors, which are influenced by forces that are dependent on hydrogeology, hydrology, and climatology. Recharge, as one of the factors controlling the situation and fluctuation of groundwater, is an important parameter that needs to be assessed more fully. Recharge, occurring in small and large scales, spatially and temporally, is influenced by several factors, such as meteorology, soil characteristics, geology, surface cover, slope, and depth of the groundwater level. Groundwater recharge estimation from precipitation is an integral part of hydrology and hydrogeology. Although, precipitation is the most important source of groundwater recharge the accuracy of currently attainable techniques for measuring recharge are not completely acceptable.

#### **0.16.15 SOCIO- ECONOMICS**

The people are predominantly Yoruba. The social organisation revolves around community leaders including the traditional ruler, Community Development Associations (CDA) executives and other opinion leaders. Thus, the issue of the bridge and its attendant impacts on the community are taken up by any or the three groups. This was clearly revealed during the administration of questionnaires and interviews which members of CDAs participated actively

During the Environmental studies, the socio-economic data gathered comprises historical information, cultural norms, land tenure and land use pattern, population and demographic characteristics, health, morbidity, mortality, and fertility, occupations and income distribution, health social and other infrastructure. The Local Government Area in Ido State as the Local Government Area hosting the project has one of the largest crude oil and natural gas deposits in Nigeria. The major Agricultural products are cassava, maize, pepper, sugar cane, vegetables, yam, banana, plantain etc. Most of the farmers are peasants.

#### **0.16.16 HEALTH STATUS**

The prevailing health status of the project area was conducted. There are health facilities within 3km of the project location such as the Government General Hospital and other private hospitals/clinics. Interactions with locals to identify nature of ailment was conducted, the following methods were deployed, and the observations gathered are as stated below, viz:

- Oral interviews
- Physical observations
- Focus Group Discussions (FGD) held separately with adults, women, and youths
- Socio-demographic data, with associated health impact
- Lifestyle/Health behavioural practices

- Common health hazards in the communities
- Immunization status
- General health status.
- Health services/ community health needs
- Environmental/Public health
- Knowledge, attitudes, and practices (KAPs)

## **0.17 PUBLIC CONSULTATION**

### **0.17.1 INTRODUCTION**

The public participation process comprises an important step in identifying issues and expected impacts of the proposed development that may affect the natural and/or socio-economic environment. Consultation as part of the Environmental assessment process is a critical component in achieving transparent decision-making. Public consultations for the proposed scrap tyres recycling plant were conducted as required in the Environmental Impact Assessment Decree. Door to door public consultations were conducted for the residents neighbouring the project site. Questionnaires were also distributed personally to the indigenes to enable us to get the opinion.

### **0.17.2 OBJECTIVES OF THE CONSULTATION AND PUBLIC PARTICIPATION**

The objective of the Consultation and Public Participation (CPP) is to: -

- disseminate and inform the public and other stakeholders about the proposed mixed residential, institutional, and recreational and facility support infrastructure project with special reference to its key components, location and expected impacts.
- awareness among the public on the need for the Environmental & Social Impact Assessment for the proposed project.
- gather comments, concerns and suggestions of the interested and, would be affected/ interested parties.
- ensure that the concerns of the interested and, would be affected/interested parties were known to the decision-making bodies and the proponent at an early phase of project development planning.

### **0.17.3 PROCESS OF ENGAGEMENT**

Public, or stakeholders' and Interested and Affected Parties' (I&AP's) participation formed an integral part of this EIA process. The main purpose of which was to:

- present the intended development as known to the consultants to all stakeholders, and IAP;
- provide stakeholders and IAP with information on the intended development that may bear directly on their health, welfare, and quality of life;
- enable stakeholders to make an informed and objective decision concerning the intended development;

- provide stakeholders and IAP the opportunity to raise their concerns regarding the intended development;
- record the issues and concerns of stakeholders and IAP.

#### **0.17.4 NOTIFICATION**

The following means were used to inform stakeholders and I&AP's of the proposed development:

- the project was registered with the Federal Ministry of Environment;
- focused group discussion; and
- house to house consultation.

#### **0.17.5 OPPORTUNITIES**

The following opportunities were available to contribute/comment:

- Registration of the Environmental Impact Assessment (EIA) with Oyo State Ministry of Environment, preparation of Terms of Reference and communication with the consultant.
- Registering comments/concerns raised by stakeholders.

#### **0.17.6 STAKEHOLDERS AND INTERESTED & AFFECTED PARTIES**

The local communities most likely to be impacted by the project include Apata, Owode, Ologuneru, Abapanu, Oluode, Powerline and Agbojo in Oya State. It was not convenient to have a single meeting of representatives of the neighbours and stakeholders, hence the Socio-economic team, the environmental consultant decided to visit neighbours in turns, to meet and obtain their views on the project. The facility has very few neighbours; a few residential houses in a settlement in the Neighborhood. Commercial buildings were sited around the facility. Questionnaires were distributed to the residents and those that may be affected by the project for their comments within project area.

#### **0.17.7 OUTCOME OF SOCIO-ECONOMIC SURVEY:**

Questionnaires were also distributed to the indigenes to enable us to get the opinion. About twenty six(26) questionnaires were personally distributed due to the nature of the project area while guiding them how to fill the questionnaires. The questionnaires were analyzed and data presented below. 26 responded to the questionnaire of the total number given. From the Histogram, 20 respondents are within the age range of 18years to 30 years, 30 respondents within age 31 years to 50 years, 12 respondents within age 51years to 70years while 2 respondents are within 71 years to 90 years respectively. From the responses, the project is a laudable one and it is a welcome development since the used tyres causing menace in the environment will be utilized for the production of other products and will improve the employment rate and socio-economic development.

## **0.18 ASSOCIATED AND POTENTIAL ENVIRONMENTAL IMPACTS**

### **0.18.1 INTRODUCTION**

This Chapter contains summary of impacts that are inherent with the project because of the interaction between various project components and environmental elements. The method of impact identified and evaluated is also given in this chapter. Several potential impacts associated with the proposed development have been identified through the public participation process, baseline data acquisition process and biophysical specialist assessment. The impacts cover all project phases, i.e. planning and design, preconstruction, construction, and operation.

### **0.18.2 ANTICIPATED ENVIRONMENTAL & SOCIAL IMPACTS**

The general impact assessment methodology used took into consideration the standard and widely accepted impact screening approaches and impact significance criteria which were screened using a modified Leopold matrix. Other relevant and well-known EIA guidelines and tools such as OYSME, DPR, NESREA, NOSDRA and FMENV guidelines, World Bank environmental assessment sourcebook, UNEP EIA training manual, etc. were also consulted for the screening. Some project activities have positive/beneficial impacts, others both positive and negative/ adverse impacts and yet others only adverse impacts. Those with positive impacts only were:

- i. Land acquisition
- ii. Socio-economic /Contracts award
- iii. Security of premises
- iv. Premises fencing
- v. Site remediation after decommissioning
- vi. Staff training
- vii. Taxes and Levies
- viii. Corporate Social Responsibility

The environmental impacts caused due to the development of the project can be categorized as primary (direct) and secondary (indirect) impacts. Primary impacts are those which are induced directly by the project whereas the secondary impacts are those which are indirectly induced and typically include the associated investment and changing patterns of social and economic activities due to the proposed action.

The main negative impacts anticipated on the project environment include possible localized air quality, underground water pollution, communal dichotomy and noise level depreciation, transport impacts, and localized waste management problems especially spills of hydrocarbons around the generator and production house at the sites.

The positive impacts include employment opportunities, improved cash-flow for certain categories of people and general improvement in industrial activities around the area and state. The success of the pilot scheme shall be emulated by other stakeholders and

business community due to abundance of raw material and product needs. The facility shall pay taxes and levies as at when due to various levels of government.

#### **0.19.4 Mitigation Measures**

In this report mitigation measures have been developed for the identified negative environmental impacts. Adequate mitigation measures were developed for each of the negative impacts identified. The mitigation measures provided include pro-active and reactive measures. The proactive measures aim to prevent the occurrence of the impacts through engineering and good housekeeping practices. The reactive measures, on the other hand, will seek to correct impacts resulting from project activities. Upon the re-assessment of the significant impacts assuming that the mitigation measures are applied showed that all impact significance ratings dropped to minor. This implies that proper implementation of the mitigation measures will greatly minimize the impacts of the dining project activities on the environment. The significant adverse impacts producing activities for which mitigation measures were in the report were:

- Vegetation and soil spoils disposal
- Exposure of workers to heat
- Occurrence of workplace accidents
- Excessive noise from generator
- Gaseous emissions of hydrocarbon vapours
- Domestic solid wastes disposal
- Transport Impact
- Groundwater contamination with fuel
- Sanitary wastes disposal
- Liquid waste disposal
- Fuels spillages
- Vehicular traffic disturbance

#### **0.19 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN**

An Environmental Management Plan (EMP) was developed to manage and monitor the environmental, socioeconomic, health and safety impacts of the project in accordance with Nigerian and applicable international standards and regulations. This plan was designed based on the specific project activities, predicted impacts and prescribed mitigation measures as discussed in this EIA Report. The proponent will ensure strict compliance with the provisions of relevant monitoring guidelines and environmental management policies.

The recommended EMP included:

1. The proffered mitigation measures
2. Formulation of an environment policy for the plant by the proponent
3. Monitoring of waste streams and the proffered mitigation measures including timing and responsibility for monitoring
4. Statutory effluent limitations for plant discharges
5. Waste management plan, WMP
6. Social management plan,
7. Staff development and training
8. Contingency planning/Emergency response preparedness
9. Environmental audit after a stipulated period e.g. 2 years after commissioning of project.

## **0.20 DECOMMISSIONING AND REMEDIATION PLAN**

In case the plant will be shut-down, the site will progress through decommissioning, remediation, and redevelopment. Though it is not always possible, it helps to know site reuse options early in the process to inform clean-up decisions and determine the appropriate level of work needed in each stage of the assessment, clean-up and redevelopment process. The Management of Freetown Waste Management & Recycle Limited shall develop a strategy for managing the decommissioning process that serves his or her business needs. Remediation shall start with collection of soil and ground water samples to investigate and document any contamination. Next, a plan for clean-up is developed and once approved by Federal Ministry of Environment.

## **0.21 CONCLUSION AND RECOMMENDATIONS**

The project can impact both positive and negatives impacts on ecosystem, socio- cultural cum economic as well as biophysical environments in the host community and that associated negative environmental impacts are preventable in nature and are possible to mitigate; and it is possible to implement the project, devoid of hazards to human and the general environment, considering the immense financial and Technological needs and proponent's intent to strictly implement the Environmental Management Plan that has been comprehensively outlined in this report.

## CHAPTER ONE

### INTRODUCTION

#### 1.0 BACKGROUND INFORMATION

Solid waste generation and disposal is a fundamental concern in any developing or industrial society. The volume of waste generated on daily basis is alarming and a source of worry both in developed and developing nations of the world. The generation of the wastes is not the major concern in any nation but rather the inability of such a Government/nation to gear up to the responsibility of its collection and management. Nigeria has lots of Legislations on waste management and this portends the fact that, legal framework is not the only problem of poor waste management in Nigeria but rather there are also other fundamental challenges. Management of waste is capital intensive and required sophisticated technology to ensure efficient waste management. Lack of funding is a known factor that affects waste management in Nigeria. If the Government enacts a regulation on waste management and there is no adequate funding; the legislation is just as good as a toothless Bulldog. There is need for adequate funding of the waste management sector of the economy.

Overpopulation is another factor that impedes the effectiveness of waste management. As population of a nation increases waste generation increases and the facilities to manage the increment in the generated waste increases.

Political infringement is another challenge in waste management. The Political/’God Fatherism’ is a critical factor whereby political officer holders will recommend their persons for the waste collection without sheer knowledge of waste management. So, waste management is left in the hands of novice. Well, if those who have gotten the contract for collecting the wastes employ competent waste engineers it would be better but rather, they look for school leavers or people with no waste management experience to manage such waste management outfits due to low salary.

Individual nonchalant attitude of the populace is another detrimental factor in waste management. People have this attitude that the responsibility to manage waste rest with the governments. The Government cannot do everything, the government cannot buy the waste bin in your house nor collect the waste from your room. Charity, they say begins from home; every individual must be concerned with waste generation, collection at designated places closest to your residence or point of generation. People would prefer to drop waste created by them along the highways.

Dearth of required technology to manage the wastes generated unequivocally another challenge of waste management in Nigeria. There is lack of efficient technology and equipment in waste management in Nigeria. Recycling Waste is one of the commonest ways of managing waste in developed countries. It involves the production of a useful material from waste garbage almost always has enough value to justify recycling parts

of it. There are essential features of recycling which some consider as disadvantages. There are also cultural/traditional beliefs that waste materials are worthless and nothing good can be derived from them and as such are disposed in a manner unfriendly to the environment.

Waste collection facilities is another factor that affects the mode of waste handling and collection. This situation has greatly improved in some urban cities like Lagos, Abuja to mention but a few, but this factor affects other areas without these facilities. The proximity to the waste collection point/facilities is another challenge in areas where there is no Public Private partnership arrangement (PSP) that collect the waste from street to street and dispose-off at an approved waste dumpsite. Used tyres are a challenging problem, since tyres have a virtually unlimited life span. These waste tyres are source of environmental concern in developed countries, where landfilling is still a common waste disposal strategy. Tyres decompose very slowly and can take over a century to disintegrate at ambient temperatures. They are also bulky and when disposed-off, they trap air, which may make landfills unstable. Even worse, tyres do not stay buried, but float to the top of a landfill. Piled tyres trap water, and thus can become breeding grounds for mosquitoes and other water-incubating insects and bacteria. All these highlighted environmental challenges spurred up the project proponent to establish the scrap tyre recycling plant.

In compliance with the Environmental Impact Assessment Act CAP E12 LFN 2004, and because the proposed project activities will have some interactive influences with the environment, there is need to conduct an Environmental Impact Assessment studies. Consequent upon the EIA application to FMENV, Freetown Waste Management & Recycle Limited has been requested by Federal Ministry of Environment (FMENV) to conduct a desktop study for the EIA of the scrap tyre recycling plant.

### **1.1 THE PROPONENT**

The project proponent is Freetown Waste Management & Recycle Limited. The company is a dynamic and integrated manufacturing company whose mission is to provide increased accessibility through its product offerings of household rubber floor products through recycling of scrap tyres that are enhanced with state-of-the-art technology to promote environmental sustainability. Freetown Waste Management Recycle Limited ('Freetown Waste') was incorporated in 2018 with RC number 1465129 to transform waste materials into reusable, economic and environment-friendly products.

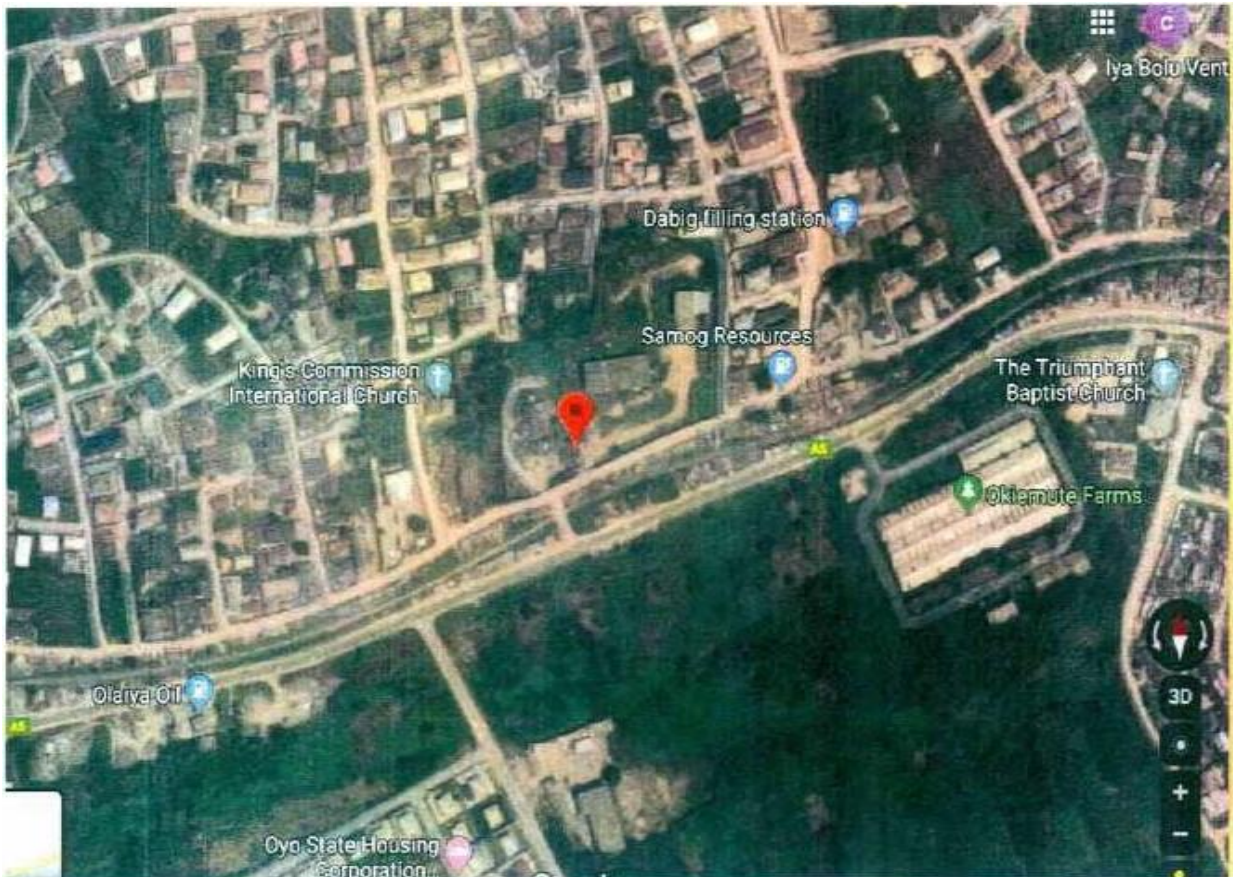


## 1.2 THE PROPOSED PROJECT LOCATION

The proposed project is located within the following GPS coordinates (UTM) represented on the table (1.0) below. The site is accessed through the bitumen tarred Ibadan-Abeokuta Road, Apata, Ibadan. The project is located within Apata community in Ido Local Government Area of Oyo State.

**TABLE: 1.0 GPS COORDINATES OF THE PROPOSED PROJECT LOCATION**

E (31N)	N	ELEVATIONS
588093,282m	817888.138m	217.45m
588087.818m	817916.083m	214.46m
588087.022m	817930.430m	213.51m
588091.407m	817963.971m	212.45m
588108.614m	817995.614m	211.57m
588136.420m	817966.599m	211.83m



**FIG. 1.0: PROPOSED PROJECT LOCATION**

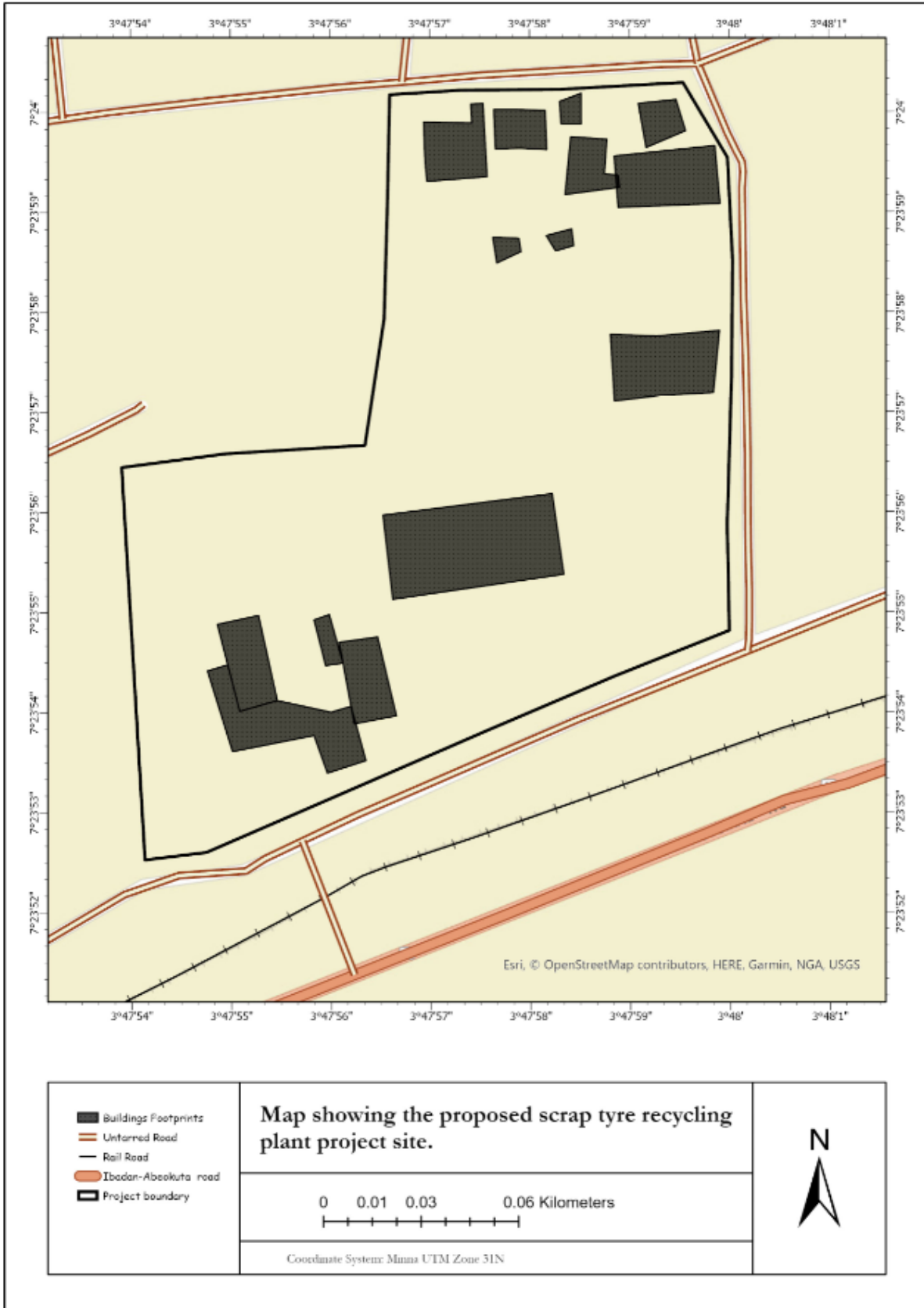


FIG. 1.01: PROPOSED PROJECT BOUNDARY

### 1.3 TERMS OF REFERENCE

The Terms of Reference (TOR) for this assessment is based on the consideration of the existing facilities /environmental elements within the proposed project area. These include:

- Existing vegetation or wildlife
- Other natural physical environment (air, water, soil), as well as principal physical features like topography, geology, drainage.
- Manmade physical environment along the corridor of the proposed project area e.g. buildings, cultural facilities, schools, hospitals, electricity poles/line, communication lines and such other public infrastructure.
- Human health and socio-economic of the communities along the corridors including culture.
- Aesthetic value of the environment.
- The study shall cover all aspects of preparatory and operational phases of the project; focusing on evolution and interpretation of environmental impacts of the project by carrying out the following.
- Generate baseline data of the existing ecology and socio economy of the proposed project areas.
- Identify, evaluate, prediction all impacts of the project on the environment including, health, security and safety.
- Development of a workable control and monitoring programmes and strategies to enhance the quality, beauty and aesthetics of the proposed project.
- Mitigation and amelioration of significant adverse impacts that the project shall have on the environment including traffic and human control.
- Development of environmental management systems including plans and procedures for effective management of the project at completion in terms of waste management (solid, liquid and air).
- Identify adverse action or inaction of project designers, engineers, monitors and the impacts of such actions on the project and the environment.
- Predicting potential impacts of all activities
- Recommendations on mitigating measures
- Monitoring, EMS and plan of action
- Submission of written report to the proponents and the authorities.
- Approval of the EIA study report from the environmental authorities.

#### **1.4 EIA OBJECTIVES AND APPROACH**

The scope of the proposed EIA is described in the Terms of Reference which has been designed to assess the potential impacts (both negative and positive) from the proposed scrap tyre recycling processes as well as to provide necessary mitigation measures and management plan to effectively manage the impacts and monitor the implementation of the management activities.

The basic objective of the EIA study is to:

- collect baseline environmental components for the proposed scrap tyre recycling plant;
- assess, evaluate and predict the potential impacts of the field development project activities and their significance on the identified environmental sensitivities;
- review and update the baseline information of the area in line with the project scope;
- assess analysis of alternatives towards minimizing the environmental and social impacts and costs;
- assess and evaluate the requirements of environmental enhancement through ensuring proper consultation with the communities; and
- prepare Environment Management Plan (EMP) considering the input of public consultation, analysis of alternatives and impact assessment of the project.

#### **1.5 ENVIRONMENTAL SCREENING AND SCOPING**

Project screening of EIA is the first step in the initial assessment of the possible environmental impacts of the proposed project. The purpose of the project screening is to ascertain if the proposed project requires an EIA through the elimination of irrelevant environmental issues and focusing on potentially significant issues at the planning and design stages. The representatives of the Federal Ministry of Environment (FMENV) attended the site verification and scoping workshop. The scope of screening study included:

- consideration of bio-physical, socio-economic and health issues, environmental sensitive area and the relevant legislative framework; and,
- consultation with key decision-makers and experts to identify key issues.

The classification of EIA of Nigeria is given in Figure 1.2.

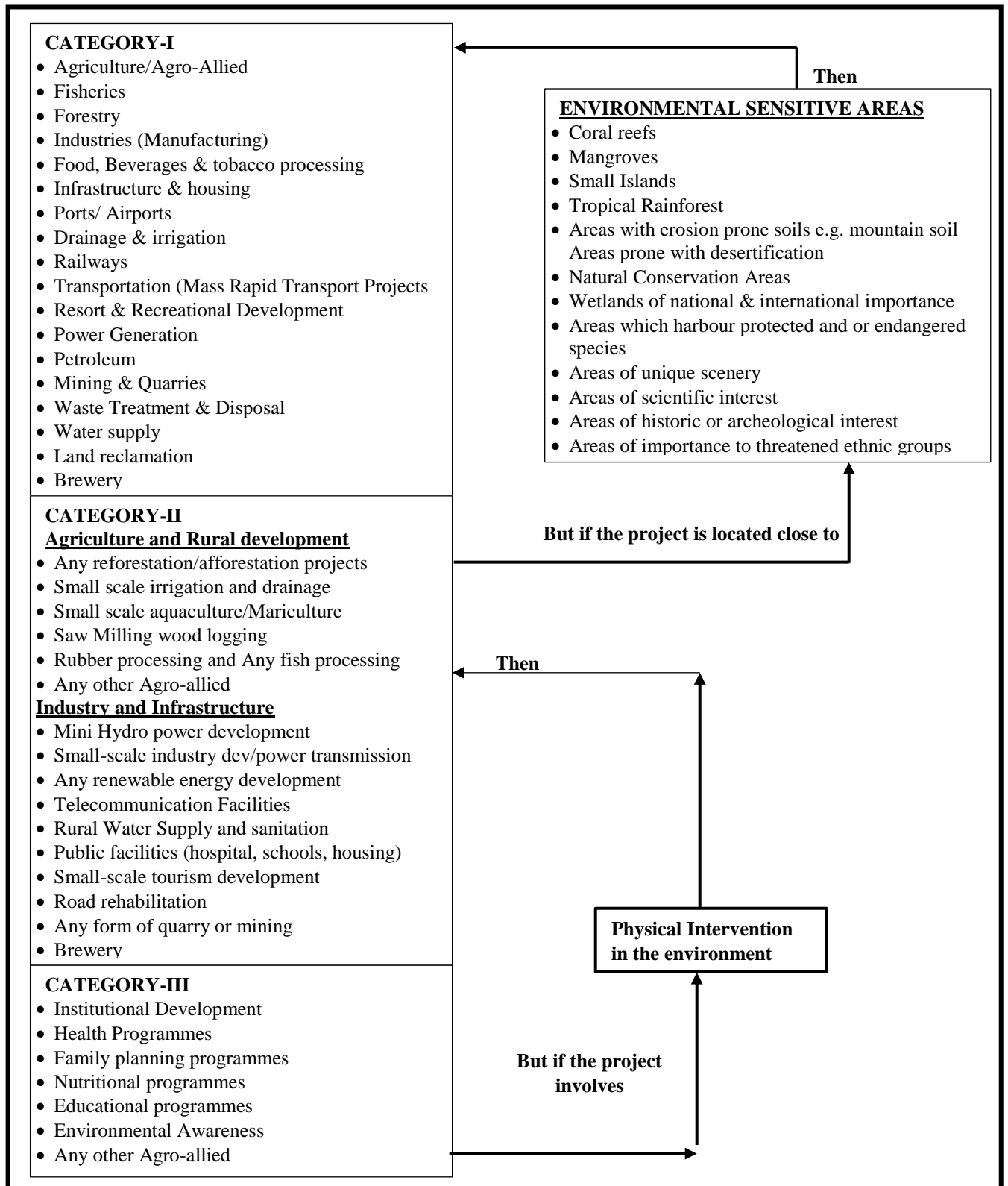


FIGURE 1.2: EIA CLASSIFICATION OF VARIOUS PROJECT SECTORS IN NIGERIA

Environmental issues are of concern to the Nigerian Government since 1988. The Federal Military Government created the Federal Environmental Protection Agency (FEPA) by Decree No 58 of 1988, and then formalized its functions by Decree No 59 in 1992. The two documents became known as the FEPA Act.

According to FEPA, developmental projects in Nigeria are divided into three categories namely Category-I, Category-II and Category-III. The projects falling under such project categories are shown in Figure 1.2.

- Category I projects will require a full Environmental Impact Assessment (EIA).
- Category II projects may require only a partial EIA, which will focus on mitigation and Environmental planning measures, unless the project is located near an environmentally sensitive area--in which case a full EIA is required.
- Category III projects are considered to have “essentially beneficial impacts” on the environment, for which the Federal Ministry of the Environment will prepare an Environmental Impact Statement.

The proposed project falls under industry which is further categorized as **Category-I** and hence a one- season EIA study is required to be undertaken.

## **1.6 ENVIRONMENTAL IMPACT ASSESSMENT (EIA) STUDIES PREMISES**

The key Environmental Impact Assessment (EIA) principles were established to provide general guidance, framework, and a commitment to standards, which are acceptable nationally and internationally. In line with this, the principles will be retained in this study and where necessary variations are allowed with evidence. Additional procedures, commitments and understanding necessary to resolve environmental impact, were developed and adopted through the Environmental Impact Assessment (EIA) process. The premises are as follows:

- **Freetown Waste Management & Recycle Limited** recognizes the Federal Ministry of Environment, State Ministry of Environment, and other States Environmental Regulatory Agencies and laws operating both nationally and internationally. Furthermore, the project will adopt the best option relevant to the local circumstances and situations.
- The project has been designed to comply with these local and national laws, in conjunction with all the international protocols, agreements and conventions.
- During this Environmental Impact Assessment Study all the understandings arrived at during consultations with the Federal Ministry of Environment and the issues raised by the indigene during the stakeholder’s process were without prejudiced considered.

- Consultations have and will continue to be held with all stakeholders at various levels (State and Local Governments) together with Apata community. Consultation meetings shall be maintained on a mutually agreed basis during the entire project phases.
- During this EIA, an Environmental Management Plan (EMP) has been developed as part of the EIA process. The implementation of the plan will be the responsibility of Freetown Waste Management & Recycle Limited.

### **1.7 LEGAL AND ADMINISTRATIVE FRAMEWORK**

The generation of waste in any form is not a crime but its unwholesome disposal methods. It is the responsibility of the originator of the waste to ensure it is managed in an environment- friendly manner. Due to the tragic disposals of solid wastes globally, waste management regulations were enacted with stiff penalties. In 1988, Nigeria as a nation experienced the first disposal of toxic waste by a foreign Italian vessel in Koko, Warri North Local Government Area of Bendel State (Now Delta State) which led to the promulgation of environmental protection laws. The Federal Government of Nigeria enacted Decree number 58 for the establishment of a Federal Environmental Protection Agency (FEPA) on 30th December 1988 to achieve a set of goals. In Nigeria waste management is among the very core management of the local government, state government and federal government. Moreover, at the state levels – the state environmental protection agencies (SEPA) and state waste management agencies oversee municipal waste management. Presently wastes are managed by each state environmental protection agency (SEPA) and state waste management agencies in urban cities and big towns in Nigeria. Environmental Impact Assessment (EIA) Decree 86 of 1992 now EIA Act Cap E12 2004: The objective is to ensure that environmental factors are considered in the decision-making process while likely adverse/hazardous environmental impacts are identified and minimized before the commencement of any proposed developmental projects. The creation of the State Environmental Protection Agencies led to the enactment of environmental protection regulations; such as the Harmful Waste (Special Criminal Provisions) Act Cap HI, 1988; The National Environmental (Sanitation and Waste Control) Regulation 2009; Guide for Importers of Used Electrical & Electronic Equipment (UEEE); The National Environmental (Electrical/Electronic Sector) Regulations 2011.

There are existing international, federal /state statutory regulations requiring Development Permit for any new project and those that require the proponent of a major/mandatory project to submit an Environmental Impact Assessment study report prior to the execution. The Project area is subject to many other specific laws, guidelines and standards that ensure compliance with environmental pollution abatement in facilities that generate wastes, groundwater protection and surface impoundment, health and safety, and hazardous substances. Freetown Waste

Management & Recycle Limited believes and adheres to the principle of sustainable development. Freetown Waste Management & Recycle Limited shall therefore conduct the project in line with stipulated local, national, regional, and international statutes, guidelines, standards and specification for the protection of the environment. There are both international and national/local regulations/legislation summarized below:

#### **1.7.1 WORLD BANK GUIDELINES ON ENVIRONMENTAL ASSESSMENT (EA) 1991.**

The World Bank has set up environmental assessment standards that must be fulfilled by any project proponent before they can access financial assistance in form of loan. In line with the foregoing, the World Bank requires an EIA report as a prerequisite for the borrower to be granted approval for such loans. The EIA report normally forms part of the feasibility study of the project. Projects are categorized based on their EIA requirements and is very much like that of FEPA. The details of World Bank's EIA procedures and guidelines are published in the Bank's EA Source Book vols. I - III of 1991. Potential issues considered for EA in the upstream oil and gas industry include the following:

- Biological Diversity
- Coastal and Marine Resources Management
- Cultural Properties
- Hazardous and Toxic Materials and
- International waterways.

#### **1.7.2 INTERNATIONAL UNION FOR CONSERVATION OF NATURE & NATURAL RESOURCES (IUCN) GUIDELINES.**

The World Conservation Union of Nature & natural Resources (IUCN) in conjunction with the oil Industry International Exploration and Production forum (E & P Forum) have guidelines, which contain internationally acceptable practices and standards for oil and gas exploration and production. These guidelines present practical measures to conserve wetlands and enhance protection of aquatic ecosystem during oil and gas E & P activities.

The general discussions are on Environmental Profile activity, preliminary Environment Impact Assessment, Environmental Impact Assessment (EIA), Environmental Management, Environmental Monitoring, and Environmental Audit. From the guidelines, it is recommended that a Preliminary EIA report be prepared before any activity commences at the project site; and it is to build on the findings of the environmental profile and examine sensitive issue in details.



### **1.7.3 CONVENTION ON BIOLOGICAL DIVERSITY**

The objectives of this Convention encompass the conservation of biological diversity, through the sustainable use of environmental components, and the fair and equitable sharing of benefits arising out of the utilization of genetic resources.

### **1.7.4 BASEL CONVENTION ON THE CONTROL OF TRANS-BOUNDARY MOVEMENTS OF HAZARDOUS WASTES AND THEIR DISPOSAL**

The convention focuses attention on the hazards of the generation and disposal of hazardous wastes. The convention defines the wastes to be regulated and control their trans-boundary movement to protect human and environmental health against their adverse effects.

### **1.7.5 UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE (1992)**

Climate change is a global environmental issue and it therefore requires concerted efforts of all the nations. To achieve sustainable social and economic development, energy consumption in the developing nations needs to grow considering the possibilities for achieving greater energy efficiency and for controlling greenhouse gas emissions in general. This also includes the application of new technologies on terms which make such an application economically and socially beneficial, determined to protect the climate system for present and future generations. The proposed project has incorporated strategies into its manufacturing technology and processes to improve energy consumption and to ensure efficiency.

### **1.7.6 LAND USE ACT CAP 202 LFN 1990**

The Land Use Act was promulgated in 1978 with commencement date of March 29, 1978 now Land Use Act Cap 202 LFN 1990. It vests all land in each State of the Federation (except land already vested in the Federal Government of Nigeria 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 governments in such cases. The governor of a State can revoke a right of occupancy for overriding public interest (e.g. new project development purposes). The following surface rights are permitted under Section 51 of the Land Use Act:

- fishing rights
- buildings and other structures, juju shrines, objects of worship
- farms, cultivated crops, economic trees, projects
- Loss of use of the land.

### **1.7.7 FEDERAL MINISTRY OF ENVIRONMENT (FMENV)**

The Federal Ministry of Environment is now the apex institution in Nigeria charged with the overall responsibility for the protection and development of the environment,

biodiversity conservation and sustainable development of Nigeria's natural resources. The Ministry grants permits for environmental and laboratory consultancies and must approve an Environmental Impact Assessment (EIA) study of a major development activity before the proponent can implement execution.

#### **1.7.8 ENVIRONMENTAL IMPACT ASSESSMENT (EIA) ACT. CAP E12, LFN 2004.**

An Environmental Impact Assessment (EIA) is an assessment of the potential impacts whether positive or negative, of a proposed project on the natural environment. It deals with the considerations of environmental impact in respect of public and private projects. Sections relevant to environmental emergency prevention under the EIA include:

- Section 2 (1) requires an assessment of public or private projects likely to have a significant (negative) impact on the environment;
- Section 2 (4) requires an application in writing to the Agency before embarking on projects for their environmental assessment to determine approval;
- Section 13 establishes cases where an EIA is required; and
- Section 60 creates a legal liability for contravention of any provision.

This process involves the undertaking of mandatory study by a review panel and the preparation of a mandatory Environmental Impact Assessment (EIA) report.

#### **1.7.9 REGULATIONS GAZETTED AS SUPPLEMENTARY TO NESREA ACT**

- National Environmental (Soil Erosion and Flood Control) Regulations, S. I. No. 12 of 2011
- National Environmental (Surface and Groundwater Quality Control) Regulations, S. I. No. 22 of 2011
- National Environmental (Protection of Wetlands, Riverbanks and Lake Shores) Regulations, S. I. No. 26 of 2009:
- National Environmental (Watershed, Mountainous, Hilly and Catchments Areas protection) Regulations, S. I. No. 27 of 2009
- National Environmental (Sanitation and Wastes Control) Regulations, S. I. No. 28 of 2009
- National Environmental (Noise Standards and Control) Regulations, S. I. No. 35 of 2009
- National Environmental (Control of Bush/Forest Fire and Open Burning) Regulations, S. I. No. 15 of 2011
- National Environmental (Protection of Endangered Species in International Trade) Regulations, S. I. No. 16 of 2011
- National Environmental (Construction Sector) Regulations, S. I. No. 19 of 2011

#### **1.7.10 THE MINERAL OIL (SAFETY) ACT CAP 350 LFN 1990**

This Act is promulgated to ensure that project proponents design methods to address the safety of employees in the oil & gas sector. Sections 37 and 40 of the Mineral Oil (Safety) Act CAP 350 LFN 1990 require provision of Personal Protective Equipment (PPE) and the safety measures for workers in drilling and production operation in accordance with international standards.

#### **1.7.11 NATIONAL INLAND WATERWAYS AUTHORITY ACT NO 13 OF 1997**

This Act established the National Inland Waterways Authority with a view to improving and developing inland waterways for navigation, providing an alternative mode of transportation for the evacuation of economic goods and persons, executing the objectives of the national transport policy as they concern inland waterways. The Act also prescribes regulations and sanctions on the use and exploitation of resources of inland waterways such as dredging, sand or gravel, mining and erection of permanent structures within the right-of-way or diversion of water from a declared waterway.

#### **1.7.12 FORESTRY LAW CAP 52, 1994**

Conservation of the natural resources is key to sustainable development and to avoid extinction of some species of plants and animals; and it was pursuant to this that this law was promulgated. The Forestry law prohibits any act that may lead to the destruction of or cause injuries to any forest produce, forest growth or forest property. The law clearly states the administrative framework for the management, utilization and protection of forestry resources in Nigeria.

#### **1.7.13 TERRITORIAL WATERS ACT CAP 428 LFN 1990**

The territorial waters of Nigeria shall for all purpose include every part of the open sea within twelve nautical miles of the coast of Nigeria (measured from low water mark) or of the seaward limits of inland waters. Any act or omission which:

- is committed within the territorial waters in Nigeria, whether by a citizen of Nigeria or a foreigner; and
- would, if committed in any part of Nigeria, constitute an offence under the law in force in that part, shall be an offence under that law and the person who committed it may, subject to section 3 of this Act, be arrested, tried and punished for it as if he had committed it in that part of Nigeria

#### **1.7.14 WATER RESOURCES ACT CAP W2 LFN 2004**

The Water Resources Act vests the right to the use and control of all surface and groundwater and of all water together with the bed and banks in any watercourse affecting more than one state in the Government of the Federation. However, the Act essentially preserves existing rights, including customary rights, provided they are for domestic use, watering of livestock and personal irrigation schemes. A proviso to section 1(1) states that the subsection shall not be deemed to infringe or to constitute a compulsory right over or interest in property. Apparently, the idea is to separate rights over water resources from other rights in property.

#### **1.7.15 THE DEPARTMENT OF PETROLEUM RESOURCES (DPR) ENVIRONMENTAL GUIDELINES & STANDARDS FOR PETROLEUM INDUSTRY IN NIGERIA 2018.**

The Department of Petroleum Resources (DPR) Environmental Guidelines and Standards for the Petroleum Industry in Nigeria (EGASPIN) 2018 was enacted to regulate the Nigerian Petroleum Industry. It was made mandatory in Part viii (A) sections 1.4.3(ii) and 1.6 for project proponents to prepare Environmental Impact Assessment (EIA) reports for all developmental projects within the petroleum industry.

#### **1.7.16 OYO STATE MINISTRY OF ENVIRONMENT AND NATURAL RESOURCES**

The Edict setting up the Oyo State Ministry of Environment and Natural Resources outlines the primary responsibilities of the agency, which is to protect and develop the general environment of Oyo State. This is the specific edict for the protection of the Oyo State environment, which is:

- Oyo State Ministry of Environment and Natural Resources Law of 2003 Other responsibilities include:
- Establishment and implementation of the numerous strategies of the National Policy on Environment towards achieving sustainable development; Implementation of applicable existing edicts on activities related to the environment.
- Monitoring the implementation of EIA/EIA/EER/EAR/EA and Environmental audit guidelines and procedure on all developed policies and project within the State.
- Responsibility for general environmental matters in the State including the negative effects of soil degradation due to oil and mineral exploitation and exploration.

A list of Nigerian laws and regulations enacted at various times since 1963, that are concerned with environmental protection are tabulated hereunder. There are specific Nigerian Government Laws and regulation related to environmental protection, conservation and safety in Nigeria includes but not limited to the following:

1. Federal Environmental Protection Agency Decree No 58 1988
2. Petroleum Regulations 1967
3. Petroleum Act. 1969
4. Employees Compensation Act 2010.
5. Mineral Oils (Safety) Regulations 1963
6. Factories Act 2004
7. Harmful Waste (Special Criminal Provisions, Etc.) Act 1988
8. Electricity Supply Regulations (Including Electrical Supply Act.1929) 1979
9. Gas Industry in Nigeria, Draft Regulations 1989
10. Director of Petroleum and Mineral Resources Environmental Guidelines and Standards for the Petroleum Industry in Nigeria 1991
11. S.1.8: National Environmental Protection (Effluent Limitation) Regulations 1991
12. S.1.9: national Environmental Protection (Pollution Abatement in Industries and Facilities Generating Waste) Regulations 1991
13. Federal Environmental Protection Agency Interim Guidelines and Standards for Environmental Pollution Control in Nigeria 1991
14. Environmental Impact Assessment Decree No. 86 1992
15. S.1.14 Oil and Gas Pipelines Regulations 1995
16. Endangered Species Act No. 11 1985
17. Environmental Sanitation Law 1984 (Law No.6 of 1984)
18. Refuse Collection and Disposal Law 1991 (Law 8 of 1991)

## **1.8 SCOPE OF WORK**

The scope of work for this EIA involved an extensive literature review and a comprehensive field data gathering exercise which characterized the study area. Specifically, the work scope entailed:

- Review of national and international environmental regulations guiding the project construction activities to be carried out as well as consultation with relevant stakeholders.
- Description of the Project

This ESIA documented a clear description of the proposed project in a manner that facilitated the comprehension of all stakeholders. The description included but not limited to the following:

- Construction/installation of facilities and equipment;

- Operations and maintenance of the factory and ancillary facilities;
- Assessment of project and environmental risks and hazards;
- Contingency plans and emergency response philosophies;
- Project risk and hazard prevention philosophy; and
- Definition of the project schedule.

### **Description of Project Environment/ Baseline data collection and Assessment**

This ESIA report is comprehensive and encompassed scientific description of the ecological and socio-economic baseline conditions of the proposed project area; which included the following:

#### **Climate**

- Rainfall
- Humidity
- Wind speed and direction
- Temperature

#### **Air Quality/Noise**

- Localized ambient air pollutants
- Ambient noise levels
- Noise sources
- Proximity of human and ecological habitats to noise sources

#### **Aquatic Systems**

- Surface water system identification and characterization
- Qualitative and quantitative description of plankton and fisheries
- Aquatic ecosystem sensitivity description
- Assessment of the Economic importance of aquatic ecosystems in the study area

#### **Soil /Land-Use and Agriculture**

- Soil physico-chemistry
- Soil microbiology
- Soil morphological characterization
- Land use description
- Agriculture/vegetation

#### **Ecology**

- Species checklist
- Characterization of plant and animal species found in the study area
- Habitat description
- Endangered species identification
- Recommend that existing vegetation be maintained where practicable.

### **Socio-economics**

- Settlements and man-made features around the site
- Resettlement Plan (if any)
- Economic and historical sites (shrines, sacred forest)
- Population distribution around the study area
- Determination of Income distribution in the study area through questionnaire administration
- Existing recreational facilities within the project area
- Social organizations and institutions within the project area
- Occupation and employment structure
- Cultural and religious practices
- Host community's health status and health facilities
- Project health risks
- Community's needs and concerns regarding the project.

### **Waste/ Environmental Management**

- Sources of Waste generation at all stages of the project
- Adequacy of Storage and disposal systems proposed
- Waste management plan
- Pollution control at all stages of the project
- Social and environmental monitoring program that would be put in place for the project.

### **Assessment of Associated and potential Impacts**

The identification and evaluation of associated and potential impacts was carried out based on the following:

- Identification of impact sources;
- Identification of impact indicators;
- Prediction of impact magnitude - empirical worst-case scenario;
- Evaluation of importance of environmental components – consensus of opinions;
- Evaluation of impacts –based on worst case scenario
- Development of an Environmental Management Plan
- Preparation of Draft and Final EIA report following the guidelines and procedure of Ministry of Environment.

These focused items were addressed within the scope of the EIA report and it is consistent with the Federal & State Ministry of Environment guidelines.

## 1.9 STUDY APPROACH AND METHODOLOGY

The EIA study was undertaken in accordance with Federal Ministry of Environment standards and the World Bank standards. The distinct phases of the study included:

**TABLE 1.2: DISTINCT PHASES OF THE EIA STUDY**

Activities	Description of Items
Activity-1	Literature review
Activity-2	Project understanding and Institutional Consultation with Federal & Oyo State Ministry of Environment and Reconnaissance Survey
Activity-3	Site verification by Federal Ministry of Environment
Activity-4	Collection of necessary secondary information and Monitoring

### **Activity-1 Literature review**

Review of Feasibility study report, Existing Laws and Regulation documents, decrees, acts, policies and guidelines for Federal & Oyo State.

### **Activity-2 Project understanding and Institutional Consultation**

The study team conducted series of site visits to understand the site geological, ecological, physical features through reconnaissance survey. The team discussed the following:

- EIA processes;
- Is there any kind of protected area (like National Park/Wildlife sanctuary) in the project areas;
- Project implementation framework

### **Activity-3 Site Verification**

As per the EIA clearance process in Oyo/Federal Ministry of Environment nominated some of its officers for the Site verification to the project site. During the verification exercise; discussion was also held regarding the number of environmental monitoring stations as well as existence of any kind of protected areas within the project area. Further, during the verification it has also been observed that the project location is an existing structure were designed for manufacturing purpose which is suitable for the proposed project.

### **Activity-4 Collection of Necessary Secondary Information and Monitoring**

After the completion of site verification by the necessary primary and secondary data collection initiated. The data collected during this time included:

- Physical chemical and microbial analysis for surface water and ground water;
- Physical and chemical analysis for soil samples including soil microbiology;
- Ambient air qualities;



- Noise qualities;
- Ecology and vegetation study;
- Geology/Geotechnical Study;
- Socio-Economic and Health impacts study

### 1.10 EQUATOR PRINCIPLES (EPS) AND IFC PERFORMANCE STANDARD

The Equator Principles (EPs) is a risk management framework, adopted by financial institutions, for determining, assessing and managing environmental and social risk in projects and is primarily intended to provide a minimum standard for due diligence to support responsible risk decision-making. The EPs, based on the IFC Performance Standards on social and environmental sustainability and on the World Bank Group Environmental, Health, and Safety Guidelines (EHS Guidelines), are intended to serve as a common baseline and framework for the implementation by each Equator Principles Financial Institutions (EPFI). The applicability of EP to the project has been outlined below.

**TABLE 1.3: APPLICATION OF EQUATOR PRINCIPLES**

<b>Equator Principles</b>	<b>Requirements</b>	<b>Project Information/ Application</b>
Principle 1: Review and Categorization	As the project is seeking financing from EPFIs, the project has to be categorized based on the magnitude of its potential impacts and risks in accordance with the environmental and social screening criteria of IFC.	Proposed scrap tyre recycling project is identified as a Category “1” project (A-One- season data gathering).
Principle 2: Social and Environmental Assessment	An Environmental and Social Assessment has to be carried out for the project that addresses relevant social and environmental impacts and risks of the proposed project and also propose mitigation and management measures relevant and appropriate to the nature and scale of the proposed project.	The social and environmental assessment and its management measures are reported in chapters 5 to chapter 8 in the present report including risk assessment.
Principle 3: Applicable Social and Environmental Standards	Nigeria being a non-OECD (Organization for Economic Cooperation Development) country, the IFC performance standards (under exhibit III), General EHS Guidelines and the sector specific	The compliance with IFC standards is reported in chapter-8.

<b>Equator Principles</b>	<b>Requirements</b>	<b>Project Information/ Application</b>
	EHS Guidelines (Exhibit IV – General EHS guidelines and will be applicable	
Principle 4: Action Plan and Management System	The action plan will describe and prioritize the actions needed to implement mitigation measures, corrective actions and monitoring measures necessary to manage the impacts and risks identified in the Assessment	The action plan and management measures are given in chapter-9.
Principle 5: Consultation and Disclosure	The project affected communities are required to be consulted in a structured and culturally appropriate manner.	Public Consultation conducted during the baseline survey work.
Principle 6: Grievance Mechanism	Freetown Waste Management & Recycle Limited is required to establish a grievance mechanism as part of the management system	The HSE team of Freetown Waste Management & Recycle Limited. will take care of grievances raised verbally or in written manner.
Principle 7: Independent Review	An independent social or environmental expert, not directly associated with Freetown Waste Management & Recycle Limited is required to review the Assessment, action plans and consultation process documentation in order to assist EPFI's due diligence, and assess Equator Principles compliance.	As part of the loan approval for the project the respective EPFI may appoint an independent social or environmental expert for review of EIA/EMP report.
Principle 8: Covenants	The covenants would be a part of the contract documents between Freetown Waste Management & Recycle Limited & financing agency as well as contractors and technology suppliers based on the following: a) to comply with all relevant host country social and environmental laws, regulations and permits in all material respects;	E&S Covenants shall be embedded within the contracts drawn between Freetown Waste Management & Recycle Limited and the contractors hired for construction activities and technology providers and waste handlers. Periodic reporting to the project developers will have to be carried out by the contractors.

<b>Equator Principles</b>	<b>Requirements</b>	<b>Project Information/ Application</b>
	<p>b) to comply with the action plans (where applicable) during the construction and operation of the project in all material respects</p> <p>c) to provide periodic reports in a format agreed with EPFIs (with the frequency of these reports proportionate to the severity of impacts, or as required by law, but not less than annually), prepared by in-house staff or third-party experts, that</p> <p>i) document compliance with the action plans (where applicable), and</p> <p>ii) provide representation of compliance with relevant local, State and host country social and environmental laws, regulations and permits (where applicable)</p> <p>d) to decommission the facilities, where applicable and appropriate, in accordance with an agreed decommissioning plan</p>	
<p>Principle 9: Independent Monitoring and Reporting</p>	<p>EPFIs will, for all Category A Projects, and as appropriate, for Category 1 projects, require appointment of an independent environmental and/or social expert, or require that the borrower retain qualified and experienced external experts to verify its monitoring information which would be shared with EPFIs.</p>	<p>The project falls under category-1 and the periodic reporting mechanism will be done as agreed between EPFI and Freetown Waste Management &amp; Recycle Limited. The project proponent shall appoint independent Environmental Consultant to monitor the environmental component throughout the project execution.</p>
<p>Principle 10: EPFI Reporting</p>	<p>This shall be prepared by the EPFI</p>	<p>Based on the assessment and monitoring reports submitted by independent agencies the EPFI will report the findings publicly at least once a year</p>

### 1.11 IFC PERFORMANCE STANDARDS

IFC Performance Standards (revised applicable from January 2012) define clients' roles and responsibilities for managing projects and the requirements for receiving and retaining financing from EPFI's.

**TABLE 1.4: APPLICATION OF IFC PERFORMANCE STANDARDS TO THE PROJECT**

IFC Performance Standards	Requirements	Project Information/ Application
Performance Standard 1: Social & Environmental Assessment & Management System	The project should have a social and environmental management system that incorporates the following: (i) policy; (ii) identification of risks and impacts; (iii) management programs; (iv) organizational capacity and competency; (v) emergency preparedness and response; (vi) stakeholder engagement; and (vii) monitoring and review.	This Performance Standard is applicable to the Project. Details will be given in table 8.1 in chapter-8.
Performance Standard 2: Labor and Working conditions	Freetown Waste Management & Recycle Limited requires to follow requirements on: (i) Working conditions & management of worker relationship (human resource Conditions policy, working conditions, terms of employment, workers organizations, non-discrimination equal opportunity, retrenchment, grievance mechanism); (ii) Protecting work force (not engaging child labour and forced labour); (iii) Occupational health and safety; (iv) Workers engaged by third parties; & (v) Adverse impacts related to supply chain.	This Performance Standard is applicable to the Project addressed in table 8.1 as well as the environment management plan in chapter 9.
Performance Standard 3: Pollution Prevention and Abatement	Freetown Waste Management & Recycle Limited requires to consider: i. Sustainable resource utilization (water consumption);	This Performance Standard is applicable to the Project and is addressed in table 8.1 in chapter 8.

IFC Performance Standards	Requirements	Project Information/ Application
	ii. Pollution prevention (wastes, hazardous materials management, pesticide use and management)	
Performance Standard 4: Community Health, Safety and Security	Freetown Waste Management & Recycle Limited requires to follow requirements on: i. Infrastructure and equipment design and safety; ii. Hazardous materials management and safety; iii. Ecosystem services; iv. Community exposure to disease; v. Emergency preparedness and response; and vi. Security personnel.	This Performance Standard is applicable to the Project and is addressed in the management plan. Details will be given in chapter 9.
Performance Standard 5: Land Acquisition & Involuntary Resettlement	Specifies requirements on: i. Project design to avoid or minimize physical and/or economic displacement; ii. Compensation and benefits for displaced persons; iii. Community engagement; iv. Grievance mechanism; v. Resettlement and livelihood restoration planning and implementation; vi. Physical and economic displacement; vii. Private sector responsibilities under government-managed resettlement	The project does not involve private land acquisition and hence the impact from land acquisition. However involuntary resettlement would be involved.
Performance Standard 6: Biodiversity Conservation and Sustainable Natural Resource Management	Specifies requirements on: i. protection and conservation of biodiversity (modified, natural, critical habitat, legally protected and internationally recognized areas, invasive alien species); ii. management of ecosystem services; iii. sustainable management of natural resources; and iv. supply chain	The site has been selected on an existing facility with insignificant impact on biodiversity. Hence the project meets this performance standard.

IFC Performance Standards	Requirements	Project Information/ Application
Performance Standard 7: Indigenous People	Specifies requirements on i. avoidance of adverse impacts; ii. participation and consent; iii. circumstances requiring free, prior, and informed consent; iv. mitigation and development benefits; and v. private sector responsibilities where government is responsible for managing indigenous people's issues	The project site alignment has been selected in such a fashion that there is no impact on families as it has been used by a manufacturing company.
Performance Standard 8: Cultural Heritage	Specifies requirements on: i. protection of cultural heritage in project design and execution (chance find procedures, consultation, community access, removal of replicable cultural heritage, removal of non-replicable cultural heritage, critical cultural heritage); and ii. project's use of cultural heritage	The project does not impact on any cultural property or structure of archaeological importance.

### 1.12 STRUCTURE OF THE EIA REPORT

The structure of the EIA report is as shown below:

- Chapter One – The chapter one contains the introduction; and it contains the background information, EIA objectives, Legal/administrative framework, structure of the EIA report.
- Chapter Two – This contains the Project Justification, and it emphasizes the proposed project background, project objectives, basis of the project, envisaged sustainability, and development options to be considered in the proposed project;
- Chapter Three- This chapter contains the project description, it describes the type of project, scope, location, material input/output and by-products, waste generation, technical layout and process, operation and maintenance, proposed project schedules;
- Chapter Four - Description of Existing Environment is contained in this chapter and it further provides every information on the precinct/baseline environmental conditions of the project area describing the physical, chemical, biological social, and health environment

- Chapter Five - Associated and Potential Environmental Impacts – emphasis is placed on the Associated and Potential Environmental Impacts of the proposed project;
- Chapter Six – Mitigation Measures/Alternatives – illustrates the mitigation options for the proposed project impacts;
- Chapter Seven - Environmental & Social Management Plan - presents the proposed plans for the social & environmental management;
- Chapter Eight - Decommissioning and Abandonment Plan defines the strategies to be adopted during decommissioning of the plant and provides remediation plans after decommissioning/abandonment.; and
- Chapter Nine - Conclusion and Recommendations: This chapter contains conclusion and recommendations based on data analysis and project implementation strategies.

## **CHAPTER TWO**

### **PROJECT JUSTIFICATION**

#### **2.0 INTRODUCTION**

The dumping of toxic waste by a foreign company at Koko town near Warri in Delta State, Nigeria in 1987 led to the establishment of Federal Environmental Protection Agency (FEPA) by Decree No. 58 of 1988. As a follow up to the establishment of FEPA, in June 1999 the Federal Government of Nigeria created the Federal Ministry of Environment (FMENV) and, as a result, FEPA's function was absorbed by the new Ministry. The establishment of the FMENV birthed State Ministries of Environment and replacing their existing State Environmental Protection Agencies (SEPA's). All these efforts should have enhanced and boosted solid waste management strategy in Nigeria, but it has no effect. The Federal Ministry of Environment (FMENV) organizes regular meetings of the National Council on Environment which is attended by all Chief Executives of State Environmental Ministries. The meeting provides the forum for policy direction and dialogue on topical environmental issues.

The Federal Ministry of Environment has adopted some instruments of intervention in place to tackle the problem of environmental degradation, including waste management: the revised policy on environment, the National Agenda 21 (published in 1999), which touches on the various cross-sectoral areas of environmental concern and maps out strategies on how to address them, and these instruments complement what has existed in the form of guidelines and standards for environmental pollution control in Nigeria and other regulation that deals with effluents, industrial pollution, waste management, and environmental impact assessment, FMENV, 2003. Among FEPA's instructions in combating environmental degradation are the Waste Management Regulation S.I.9 of 1991 and Environmental Impact Assessment (EIA) Decree No. 86 of 1992. FEPA policies regulate the collection, treatment, and disposal of solid and hazardous waste for municipal and industrial sources and makes EIA mandatory for any major development project likely to have adverse impact on the environment. There is also in existence an environmental sanitation edit of 1997 that declared one Saturday in a month to be used for cleaning the environment for 3 hours. This edit is still in force and still being observed all over Nigeria. The post - 1988 environmental laws and regulations continued to prevail without any change.

According to the Lagos State Waste Management Authority's 2016 report on waste management, over 13 billion tons of waste is generated annually in major cities globally. Nigeria generates more than 32 million tons of solid wastes annually (over 13 000 metric tons daily) Common waste components include tyres, plastics, glass, paper and building and construction wastes. Multiple companies are currently developing recycling plant to reduce the bane caused by non-biodegradable waste in the global



waste management process. Scrap tyres consume large spaces in landfills and can be breathing grounds for disease carrying insects like mosquitoes. The main issue with regards to scrap tyres is they are highly durable, large and non-biodegradable and hence can cause health and environmental problems trying to dispose-off them. Burning off scrap tyres releases toxic fumes and uncontrollable fire outburst that poses health damage to humans and damage to soil fertility. In Nigeria, annual tyre consumption is estimated at 3 million annually, the estimated number of scrap tyres produced annually is 15 million units and over 100 million tyres have been disposed-off in the last ten years without a structured detailed and efficient recycling plan. Tyre recycling in Nigeria is dominated by small and medium enterprises repurposing tyres for beautification purposes like making footwears repurposing into chairs or stools or processing the tyres into tyre derived fuel Another major form of tyre recycling in Nigeria is retreading the tyres until they have used up their life span and then the tyres are disposed-off.

It is therefore a welcome development for waste recycling plant such as this.

## **2.1 BENEFITS OF THE PROJECT**

Freetown Waste Management Recycle Limited intends to promote the Nigerian economy by introducing a proactive technology aimed at recycling the scrapped tyres causing menace to the environment and converting them to a usable household product. The proposed project will eliminate the environmental challenges posed by the scrapped tyres and making the economy of Nigeria adorable. The followings are benefits to be derived from the technology:

- reduction of environmental nuisance arising from littering of scrapped tyres.
- reduced health risks arising from tyre burning on the street.
- it will ensure clean environment.
- the project will avail the masses access to the products.

### **2.1.1SOCIO-ECONOMIC BENEFITS**

The proposed scrap tyre recycling project will serve as an employment opportunity to the host community, the State, and the entire nation. Freetown Waste provides quality, durable, safe, versatile, attractive flooring that can and will replace products being imported at expensive prices. Local manufacturing of the rubber flooring would reduce import dependency and aid in the internal growth of the country. The proposed project will provide the following socio-economic benefits:

- enhance the accessibility the products;
- employment opportunities for the indigene;
- a clean- environment strategies and elimination of environmental menace;
- increase in social activities as personnel will be moving towards the area;

- more business opportunities will spring up within the host community; thereby increasing the employment opportunities and income of the indigene; and
- overall improvement in the quality of life for the lesser development areas in the neighbourhood.

### **2.1.2 ENVIRONMENTAL BENEFITS**

The proposed scrap tyre recycling plant will consider environmental best practice and sustainability to reduce the impact of the proposed project on the environment. The following features will be built into the design of the proposed upgrade of the site:

- The scrap tyre waste will be received indoors within the Storage Warehouse to minimise impacts on the outdoor environment (e.g. dust, litter, noise or ponding of water);
- Tyres will be processed within the production hall to avoid impacts on stormwater, dust, noise and litter;
- Advanced processing, shredding, and sorting technology will be used in the Facility to maximise the diversion of waste from landfill, with a target of 100% recovery;
- Minimise the disposal of waste to landfill, and maximise the diversion of quality recycled materials into local markets;
- Reduction in air pollution, due to the recycling and reuse of scrap tyres littering the project area and the nation in general; and
- Ensures environmental sustainability.

## **2.2 NEED FOR THE PROJECT**

The initiative of the Federal Government of Nigeria (FGN) to ensure clean-environment and reduction of climate change is foster through this project.

## **2.3 VALUE OF THE PROJECT**

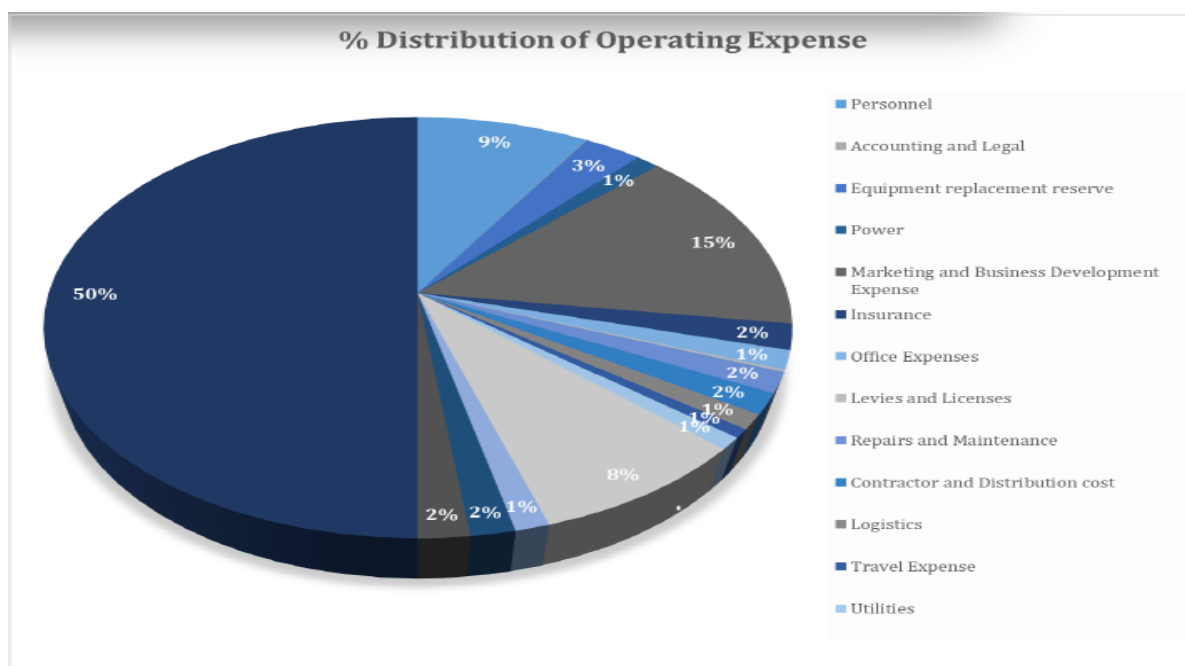
The value of the project is about ₦980million.

### **2.3.1 PROJECT FINANCIAL FEASIBILITY**

The financial feasibility of the proposed project is presented on the table 2.0.

**TABLE 2.0: PROJECT FINANCIAL FEASIBILITY**

Cost Lines	Unit Cost	% of Total Expense	% of Sales
Cost of Production per Ton	₦433,228	76%	48%
Personnel	₦23,903	4%	3%
Accounting and Legal	₦121	0%	0%
Equipment replacement reserve	₦7,895	1%	1%
Power	₦3,192	1%	0%
Marketing and Business Development Expense	₦39,729	7%	4%
Insurance	₦5,398	1%	1%
Office Expenses	₦3,948	1%	0%
Levies and Licenses	₦439	0%	0%
Repairs and Maintenance	₦4,318	1%	0%
Contractor and Distribution cost	₦4,386	1%	0%
Logistics	₦3,158	1%	0%
Travel Expense	₦1,842	0%	0%
Utilities	₦2,500	0%	0%
Provision for Stock Loss/Writeoffs	₦22,744	4%	3%
Director Expense	₦3,509	1%	0%
Bank Charges and Miscellaneous	₦4,549	1%	1%
Community and Stakeholder Integration Expense	₦5,263	1%	1%
<b>Total Expense</b>	<b>₦570,122</b>	<b>100%</b>	<b>63%</b>
			<b>Margin</b>
<b>Average Unit Sales Price per Ton</b>	<b>₦909,779</b>		<b>37%</b>



**FIG 2.0: % DISTRIBUTION OF OPERATING EXPENSES**

**(SOURCE: PROPONENT'S BUSINESS PLAN)**

## **2.4 ENVISAGED SUSTAINABILITY**

The rate at which scrap tyres are generated in Nigeria is alarming and due to the fact that it is the major source of raw material for the recycling plant, the business will be sustained. The scrap tyres are readily available locally and within the project location and adjoining States, which makes its cost of acquisition of raw material cost-effective. The following sustainability strategies are highlighted below:

### **2.4.1 ENVIRONMENTAL SUSTAINABILITY**

The prevalence and littering of scarp tyres along the streets of Nigeria is enough environmental menace and as such any developmental programmes and establishment seeking to reduce the quantities of the scrap tyres produced is a welcome development as it will ensure that the environment is sustained. The proposed project is a welcome development and therefore will ensure environmental sustainability and clean- environment initiative. Freetown Waste Management & Recycle Limited shall without prejudice comply with all statutory regulations and its own corporate guidelines on Environmental Sustainability, continuously striving for performance improvement.

### **2.4.2 TECHNOLOGICAL SUSTAINABILITY**

The Company would commence the collection of scrap tyres to be recycled by its own 2.4 tons per hour tyre recycling plant. The output, crumb rubber would be utilized by the company as a substitute to importing the rubber powder and this would reduce the cost of production of rubber mat. The scrap steel and fibre can be utilized for making new steel and in concrete manufacturing. The technology has the following features and benefits:

- Easy handling
- Easy maintenance
- Allows colour variety in customization
- Utilizes fully recyclable materials
- Minimum waste output
- Spare parts available from OEM Contractor
- Provides safe and secure flooring
- Eco-Friendly
- Easy to install, maintain and keep clean
- Shock, Absorbent, greatly reduces sound and noise levels
- Durable, Excellent protection against damage to floors
- Slip resistant
- Cost-effective

### **2.4.3 ECONOMIC SUSTAINABILITY**

The establishment of the scrap tyre recycling plant will create employment opportunities for the indigene and throughout Nigeria. This business opportunities will ensure extensive economic viability and sustainability of the project. The proposed scrap tyre recycling plant will ensure reduction in pollution which will reduce climate change and as such improvement of the economy. From the financial feasibility studies the proposed recycling plant will sustain itself economically through profit and ploughing back of profits into the business. Freetown Waste Management & Recycle Limited will partner with 100s of retail and wholesale distributors worldwide and new businesses can become installers and distributors of the Freetown Waste products nationwide.

### **2.4.4 SOCIAL SUSTAINABILITY**

Freetown Waste project would result in the employment of over 500 individuals directly and indirectly within the first three years of operations. The proposed project will:

- develop and maintain effective long-term relationships with relevant stakeholders;
- create social development within the project area, social investments like building of hotels and resort centres within the host community which is conspicuously lacking as at the time of the study;
- incorporate regular consultation with all the stakeholder and host communities leading to promotion of social sustainability of the project;
- the development of social centres and resort centres will lead to social sustainability of the host communities.

## **2.5 PROJECT ALTERNATIVES**

The assessment of impacts of the proposed project considered these main options:

- No project Option
- Project Relocation
- Project execution as proposed

During the Environmental Impact Assessment Study, the above project alternatives were reviewed in line with the project objectives in mind.

### **2.5.1 NO PROJECT OPTION**

It is essential that the “no project option” be considered as a first step in mitigation. The “no project” option implies that the proposed project will not be carried out and the area allowed to remain in its present conditions. During the study the locations of the proposed scrap tyre recycling plant needs this project because it is within an

existing structure of a manufacturing plant. It is therefore recommended since manufacturing activities had existed therebefore now.

### **2.5.2 PROJECT EXECUTION AS PLANNED**

The proposed technology of recycling scrap tyre into usable products is a welcome development as it is an eco-friendly development. There will be significant environmental improvements if the project is carried out as proposed due to numerous benefits accruable to the inhabitants of that area. Emigration will be checked; expansion of other infrastructure development will be enhanced if the project is developed as planned. The project is a development with minimal ecological and socio-economic negative impacts. Inhabitants will not move far to have the products.

### **2.5.3 PROJECT RELOCATION**

The option of project relocation to another location is not the best option as the indigene would move far to get the product and more so, that the proposed location is an existing structure used for manufacturing purposes. The employment opportunities that will arise from the project and other business opportunities that will spring up due to the establishment of the scrap tyre recycling plant will be stifled and this will lead to a continued exposure of the indigene to unemployment. There will not be economic and infrastructural development and the environment will remain littered with scrap tyres. The location of the proposed recycling plant is free from any infringement from the inhabitants and does not pose any significant threat to the indigene.

## **CHAPTER THREE**

### **PROJECT DESCRIPTION**

#### **3.0 INTRODUCTION**

Freetown Waste Management and Recycle Limited, in his capacity hereby declares its intention to construct a Plant designed to produce durable, versatile, and flexible crumb rubber moulding products from used tyres at Apata, Ido Local Government Area of Oyo State.

This is a pilot scheme, and its success is expected to be replicated throughout the country as the project represents waste to wealth system, preventing our fragile ecosystem from the menace of indiscriminate disposal of used tyres. According to the Lagos State Waste Management Authority's 2016 report on waste management, over 1.3 billion tonnes of waste is generated annually in major cities globally. Nigeria generates more than 32 million tonnes of solid wastes annually (over 13,000 metric tonnes on a daily basis). Common waste components include tyres, plastics, glass, paper and building and construction wastes.

Multiple companies are currently developing recycling plant to reduce the bane caused by non-biodegradable waste in the global waste management process. Firms like Coca Cola have set up plastic recycling plants to turn PET bottles into reusable eco-friendly plastic materials. Scrap tyres consume large spaces in landfills and can be breeding grounds for disease carrying insects like mosquitoes. The main issue with regards to scrap tyres is they are highly durable, large and non-biodegradable and hence can cause health and environmental problems trying to dispose them off. Burning off scrap tyres releases toxic fumes and uncontrollable fire outburst that poses health damage to humans and damage to soil fertility. According to the US Department of Transportation (2016) about 7% of the 250 million scrap tyres generated annually are exported, 8% are recycled into new products and c. 40% are recycled into tyre-derived fuel to fuel power plants, cement plants, and other industrial boilers. In the EU used tyres were estimated at 3.6 million tonnes per annum and only about 2.7million tonnes were recovered and recycled (c. 80%).

In Nigeria, annual tyre consumption is estimated at 3million annually, the estimated number of scrap tyres produced annually is c. 15 million units and over 100 million tyres have been disposed-off in the last ten years without a structured detailed and efficient recycling plan. Tyre recycling in Nigeria is dominated by small and medium enterprises repurposing tyres for beautification purposes like making footwears, repurposing into chairs or stools; or processing the tyres into tyre derived fuel. Another major form of tyre recycling in Nigeria is retreading the tyres until they have used up their life span and then the tyres are disposed-off.

In pursuance of the need to protect the environment, the management shall be responsible for the protection of the environmental components that are likely to be affected by the project. In executing the projects, the proponent shall satisfy the following:

- protect the immediate and surrounding environment
- Meeting increasing demand of flooring tiles and mat, floor rolls and steel wires.
- Reduces the quantity of solid waste into landfill sites
- Income and jobs generation
- Best business practices, which is in pursuance of a better environment.
- Compliance with government regulations.

### **3.1 RAW MATERIALS AND SOURCES**

The raw material for the recycling is scrap tyres which shall be sourced within the State, Lagos and Ogun State.

### **3.2 PROCESS DESCRIPTION**

#### **3.2.1 FLOORING TILES AND MAT PRODUCTION**

Used tyres are obtained from suppliers and stored in the specified area of the plant. Tyre recycling process commences with the following steps:

##### **Step 1: Mixing of Raw Materials**

Mixing of rubber granules obtained from disused tyres, PU binder and EPDM granules  
Staff required: production supervisor, forklift driver, machine operator and casual support staff. Time required: 30 - 40 mins

##### **Step 2: Loading Cylinder Moulds into Vulcanizing Pot**

The second stage in production is automatic feeding of mixed granules into cylinder and compressing granules in the cylinder. Loading the cylinder moulds into the vulcanizing pot for heating. Vulcanizing pot takes 4 cylinders at a time. Moulded cylinders are removed to cool before being stripped into rolls. Time required: 3-4 hours

##### **Step 3: Cutting of Rolls and Mats**

Cutting machine cuts the moulds into long strip with different thickness. Mats can also be punched if making interlocking mats and other bespoke designs on the mat.  
Time required: 20 mins depending on output required

##### **Step 4: Packaging of Rubber Products**

Packaging of mats into rolls dependent on proposed used of the product and placed on pallets. Stock inventory is taken, and product is ready for shipment.



**Step 5: Delivery**

Finished mats are transferred to the warehouse and delivered to clients from the warehouse.

Rubber Granule Lifter	Lift EPDM Granules, Rubber Granules to inlet of Horizontal Mixer
Horizontal Mixer	Mix EPDM Granules, Rubber Granules and PU binder evenly
Cylinder Moulds and Hydraulic Press	Form material into cylinder moulds under pressure and heat
Vulcanizing Pot	Heat the cylinder moulds
Cylinder to Sheet Cutting Machine	Cut the cylinder into flooring sheets and wind into flooring sheet coils
Big Coil to Small Coil Dividing Machine	Dividing big flooring sheet coils into small flooring sheet coils
Rubber Mat Punching Machine and Knife	Punching rubber flooring sheet into different shape of rubber mats.

**FIG. 3.0: SCRAP TYRE RECYCLING/PRODUCTION PROCESS**

**3.2.2 FLOW CHART OF TYRE RECYCLING PROCESS.**

The various stages of scrap tyre recycling process is shown on Fig 3.5.2 and the process is described below.

- i. Stage 1: Scrap Tyres are transported via mechanical trolley into the Processing Warehouse
- ii. Stage 2: Scrap Tyres are loaded manually into a 'debeader' which removes the steel reinforcing from the tyre.
- iii. Stage 3: The rubber tyre casing is then shredded via rotary shear and screened
- iv. Stage 4: Shredded rubber passes over a magnetic separator for removing remaining steel.
- v. Stage 5: The Granulator size reduces the rubber into a rubber crumb material for recycling
- vi. Stage 6: A Cotton and Fibre Separator removes the cotton from remaining material for recycling.
- vii. Stage 7: Dust collector and cooling system captures dust and removes heat released during the shredding process

viii. Stage 8: Finished crumb rubber and cotton is bagged, steel is baled and transported for storage via trolley in the Storage Warehouse for further recycling

### **3.2.3 PROPOSED PRODUCTS**



**PLATE 3.0: RUBBER ROLL**

### 3.2.4 SCRAP TYRE RECYCLING PROCESS FLOWCHART

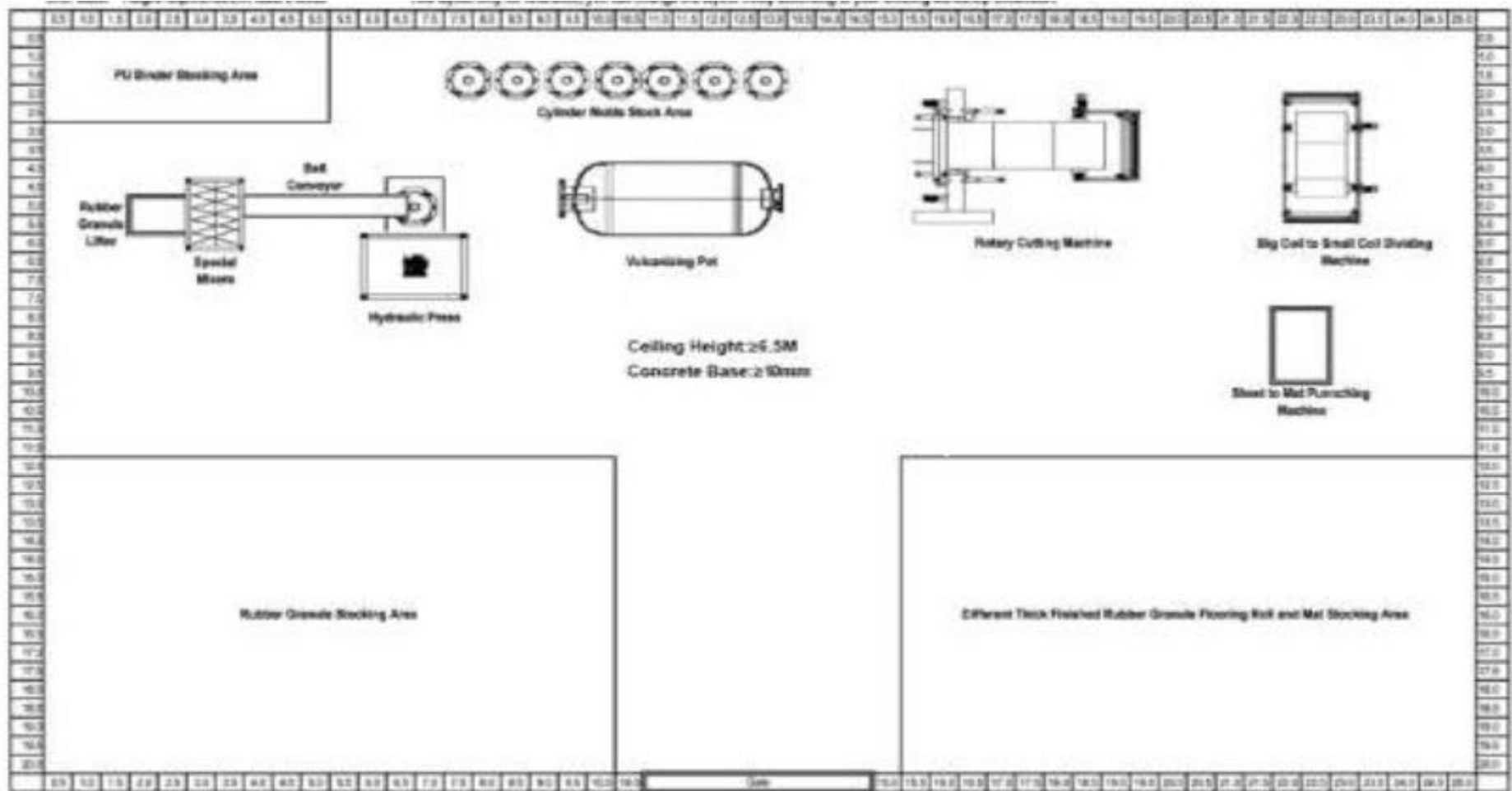
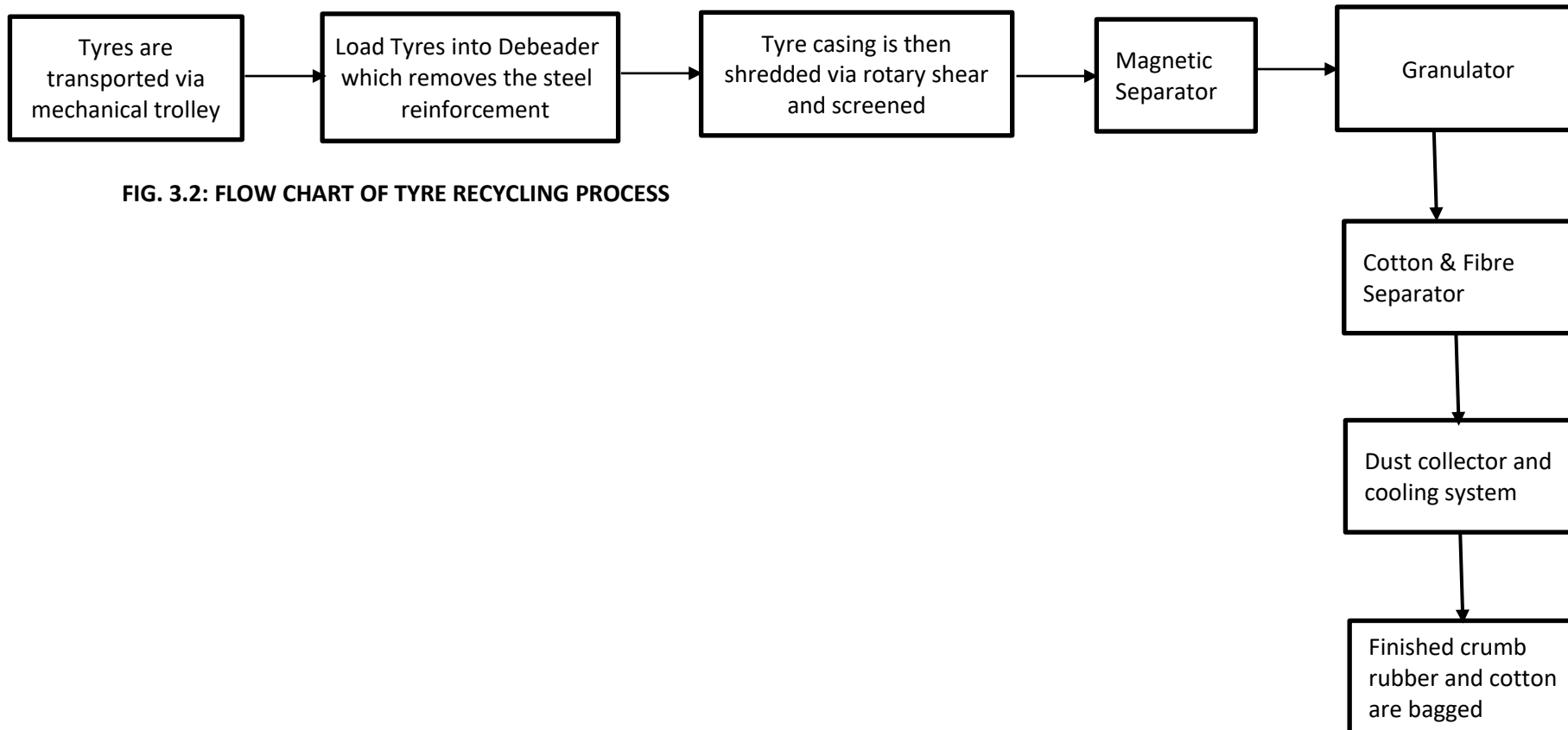


FIG. 3.1: INSTALLATION LAYOUT OF RUBBER GRANULE FLOORING SHEET PRODUCTION LINE



**FIG. 3.2: FLOW CHART OF TYRE RECYCLING PROCESS**

## CHAPTER FOUR

### 4. DESCRIPTION OF PROJECT EXISTING ENVIRONMENT

#### 4.0.1 GEOGRAPHICAL LOCATION OF STUDY AREA

The project is located within Apata in Ido Local Government Area, Ibadan, Oyo State. The project location just as Ibadan city is a tropical wet and dry climate with a lengthy wet season and relatively constant temperatures throughout the course of the year. Ibadan's wet season runs from March through October. The month of November to February forms the city's dry season, during which Ibadan experiences the typical West African harmattan. The mean maximum temperature is 26.46 C, minimum 21.42 C and the relative humidity is 74.55%.

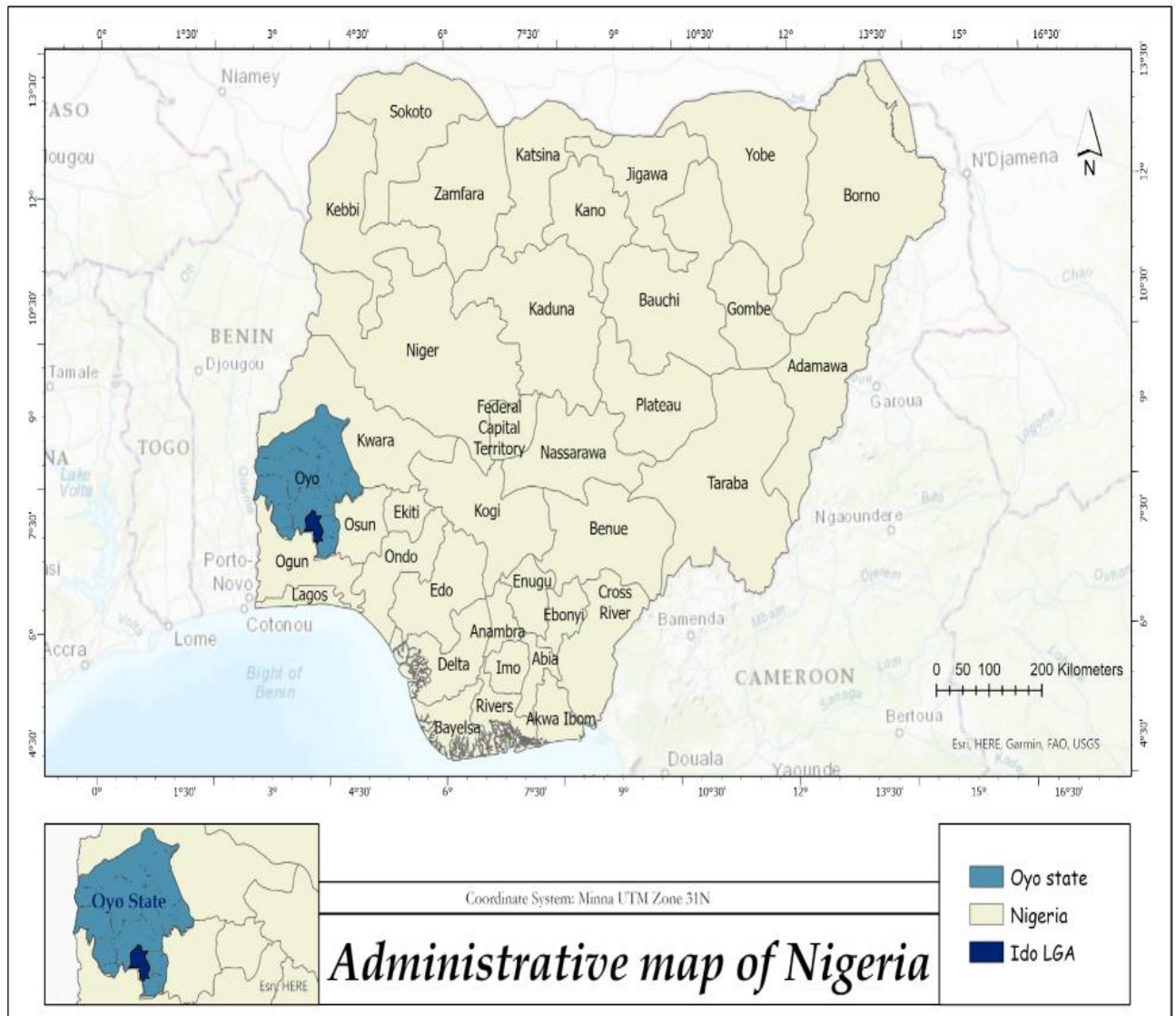
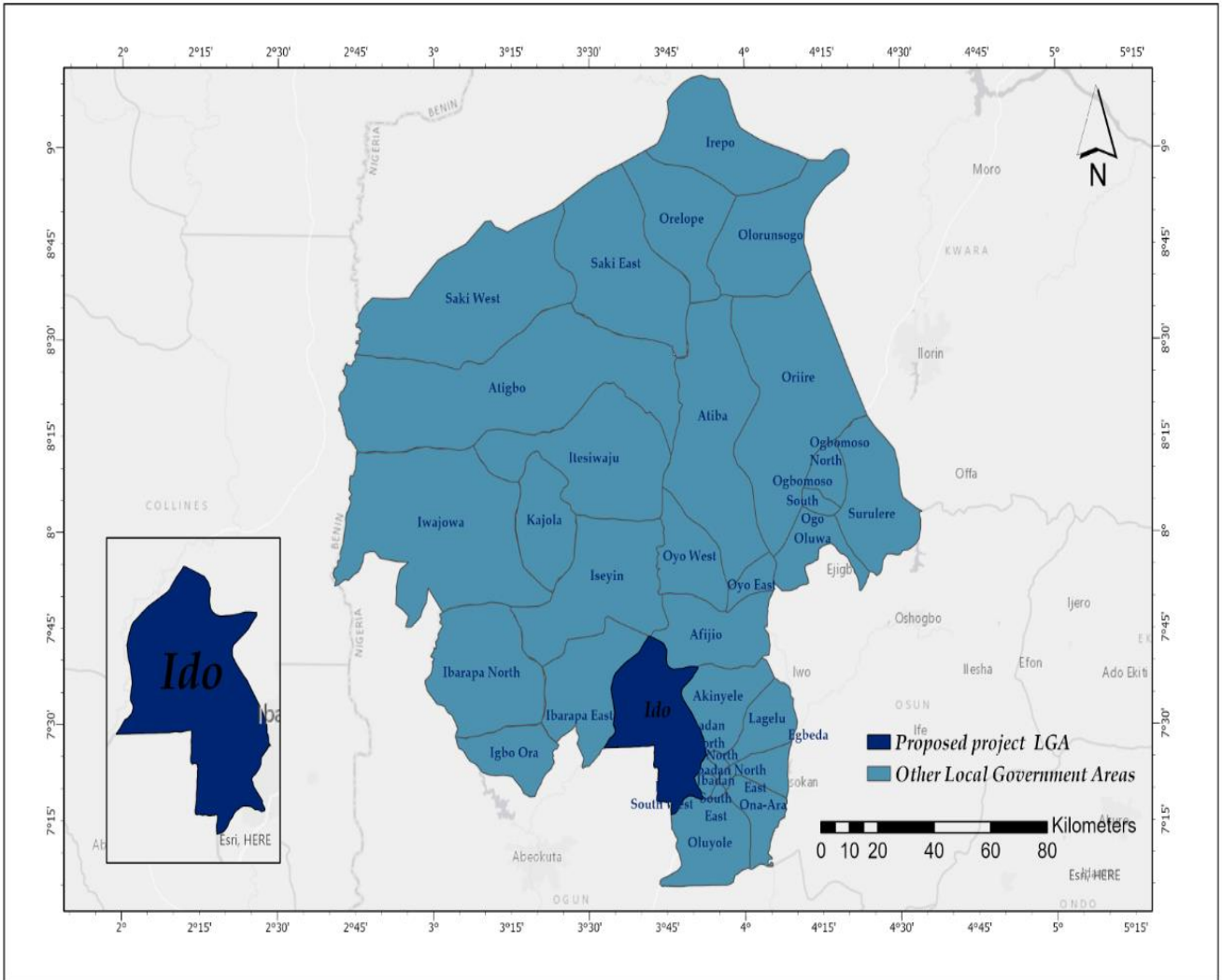


FIG. 4.0: MAP OF NIGERIA SHOWING THE STATE WHERE THE PROJECT IS LOCATED



**Map of Oyo state showing the project local government area.** Spatial Reference Name: Minna UTM Zone 31N

**FIG. 4.0.1: MAP OF OYO STATE SHOWING THE PROJECT LOCATION**

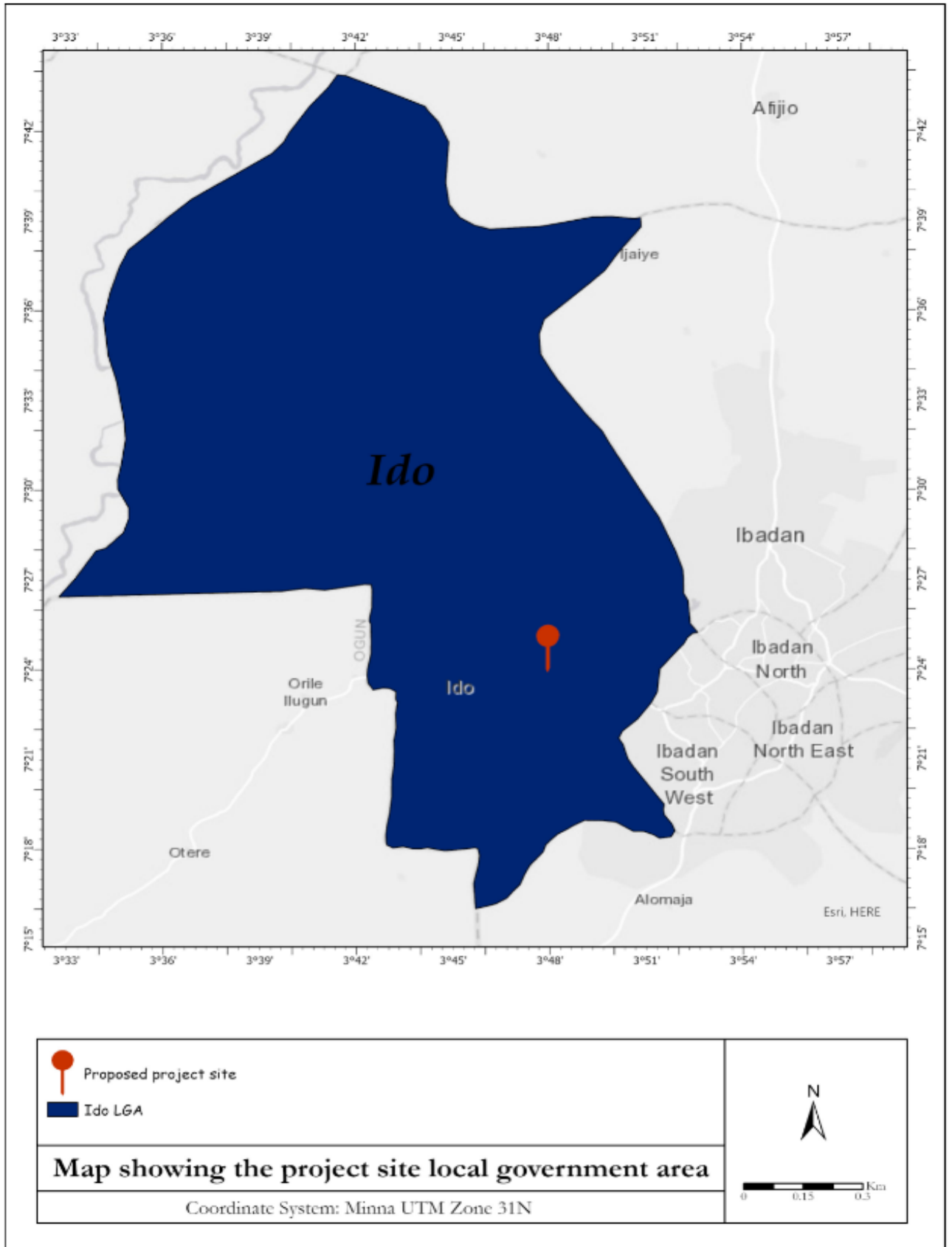


FIG. 4.0.2: MAP OF IDO LOCAL GOVT AREA OF PROJECT LOCATION

#### 4.0.2 GEOGRAPHICAL POSITIONING SYSTEM (GPS) COORDINATES FOR THE PROJECT SITE.

The proposed project site (2Ha of land) is located within the existing parcel of land with perimeter fence and located within the GPS(UTM) coordinates as stated below.

**TABLE 4.0: GPS COORDINATES OF THE PROJECT SITE**

<b>E (31N)</b>	<b>N</b>	<b>ELEVATIONS</b>
588093.282m	817888.138m	217.45m
588087.818m	817916.083m	214.46m
588087.022m	817930.430m	213.51m
588091.407m	817963.971m	212.45m
588108.614m	817995.614m	211.57m
588136.420m	817966.599m	211.83m



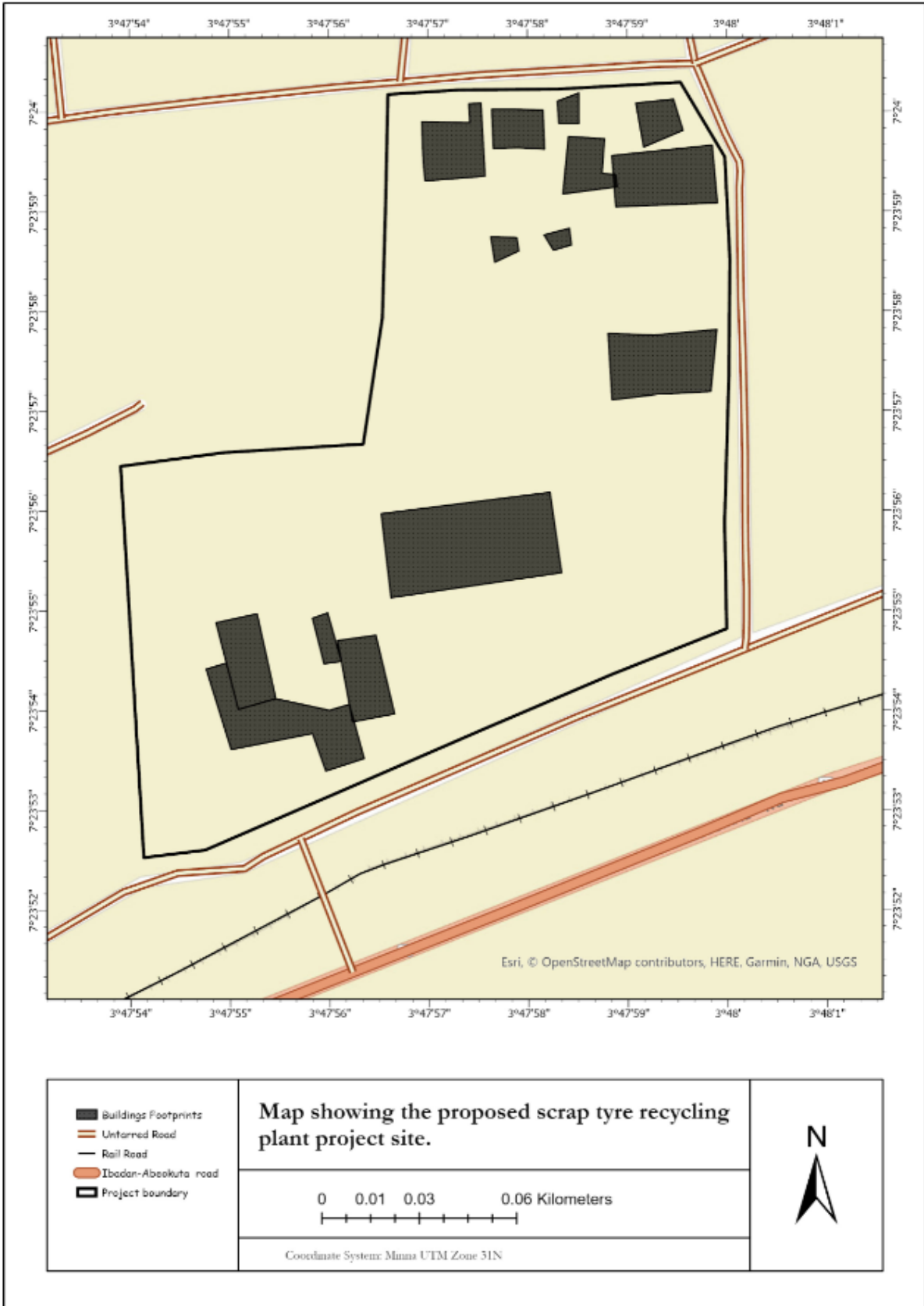


FIG. 4.0.3: MAP SHOWING THE PROPOSED SCRAP TYRE RECYCLING PLANT

**4.0.3 METEOROLOGY AND CLIMATE:**

The climate of the project site in Ibadan, Oyo State is tropical with distinct wet and dry seasons. The mean daytime temperature varies between 25°C in the north to 34°C in the south. The wet and dry seasons are associated respectively, with the prevalence of the moist maritime south-westerly monsoon from the Atlantic Ocean and the dry continental north-easterly harmattan from the Saharan Desert. From the coast to the inland hinterland there is a steady decrease in the duration and intensity of the wet season. It falls within the Basement complex of Southwestern Nigeria which are characterized by rocks of mainly Precambrian age.

**4.0.4 RAINFALL**

Ibadan is situated in the transitional region between the rain forest vegetation and the Guinea Savannah vegetation belts in Nigeria. The range of monthly mean of rainfall here in Ibadan is 13.8inches (in June) - 15.0inches (in September).

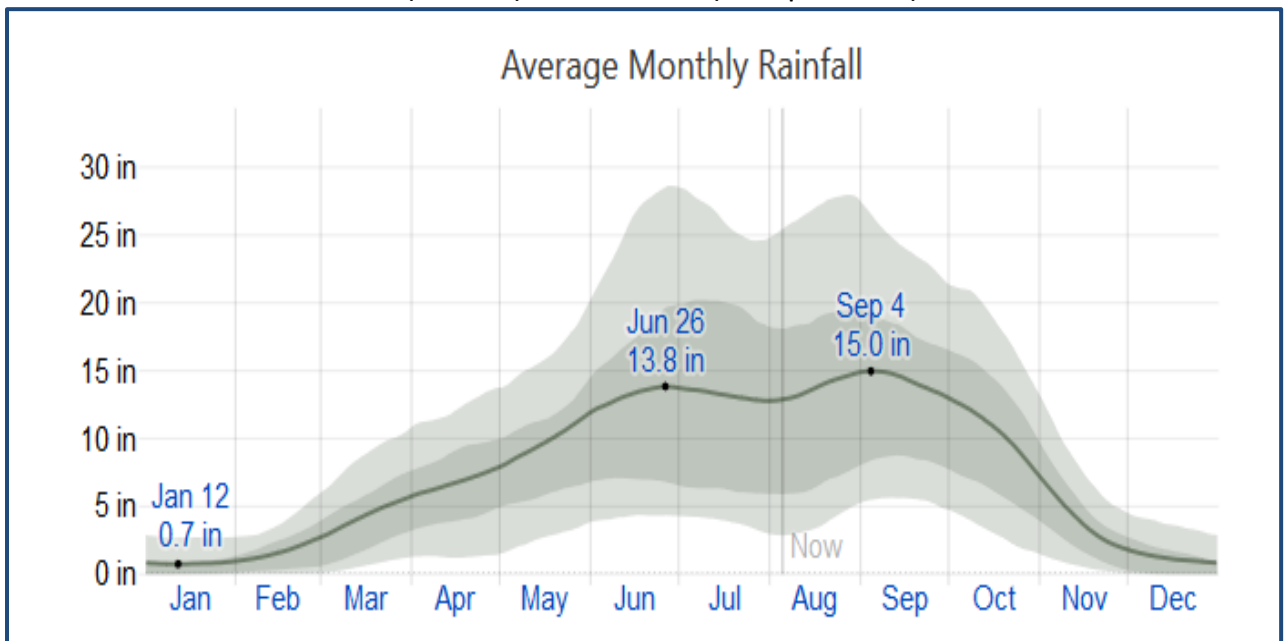


FIG 4.1 MEAN ANNUAL RAINFALL

Source: NIMET/weatherspark

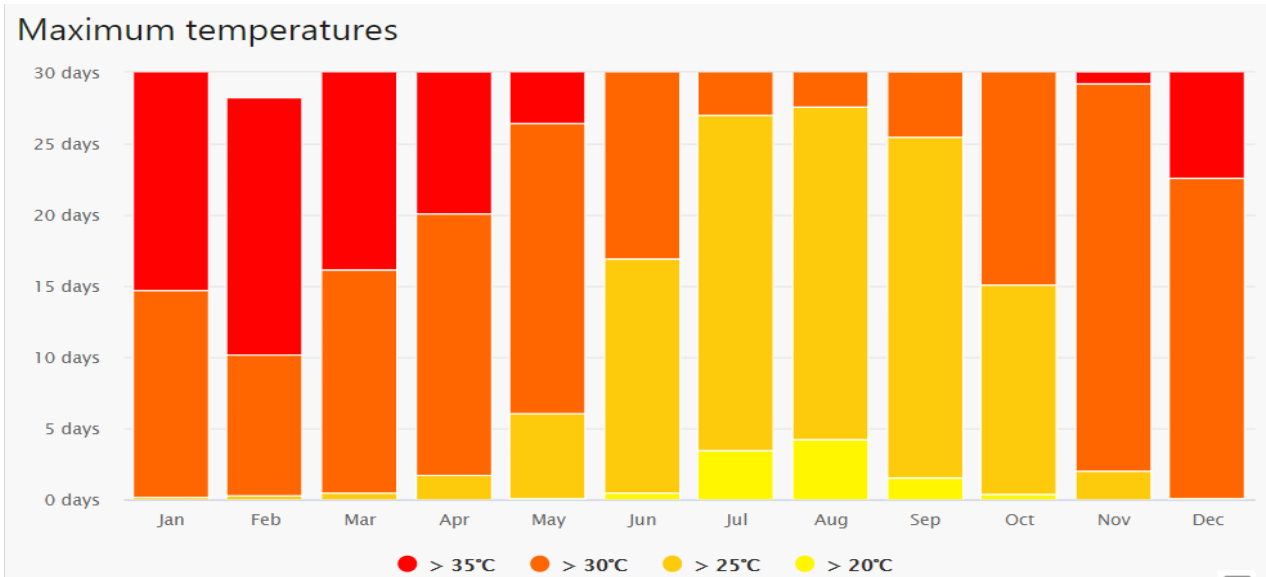
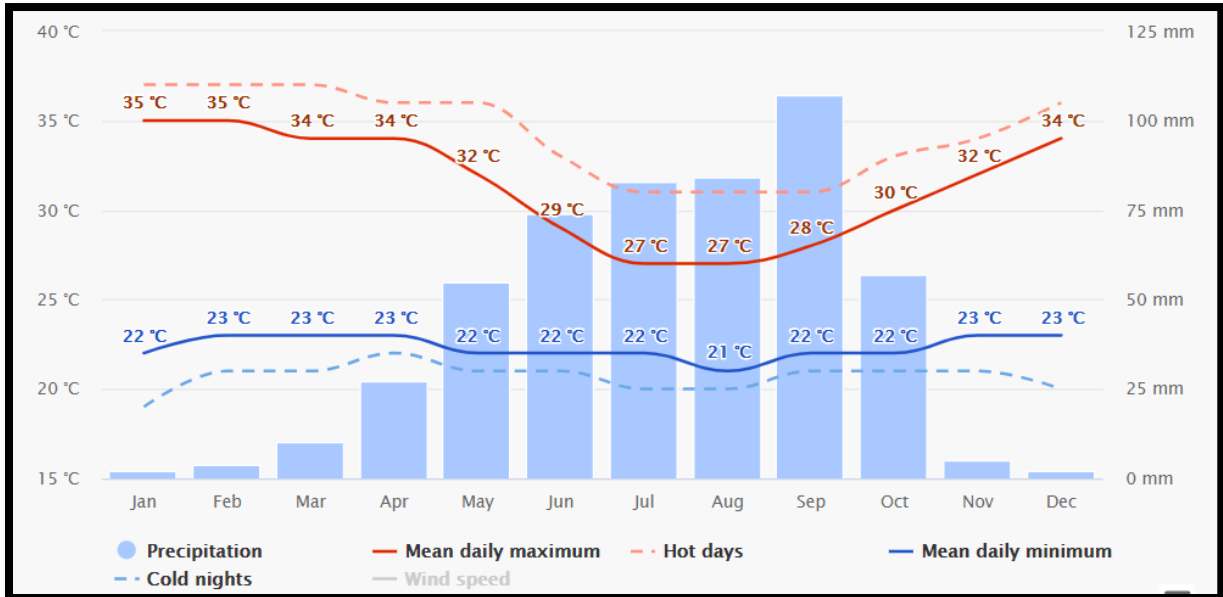


FIG. 4.2: ANNUAL MEAN TEMPERATURE DISTRIBUTION IN PROJECT AREA. (SOURCE: METABLU)

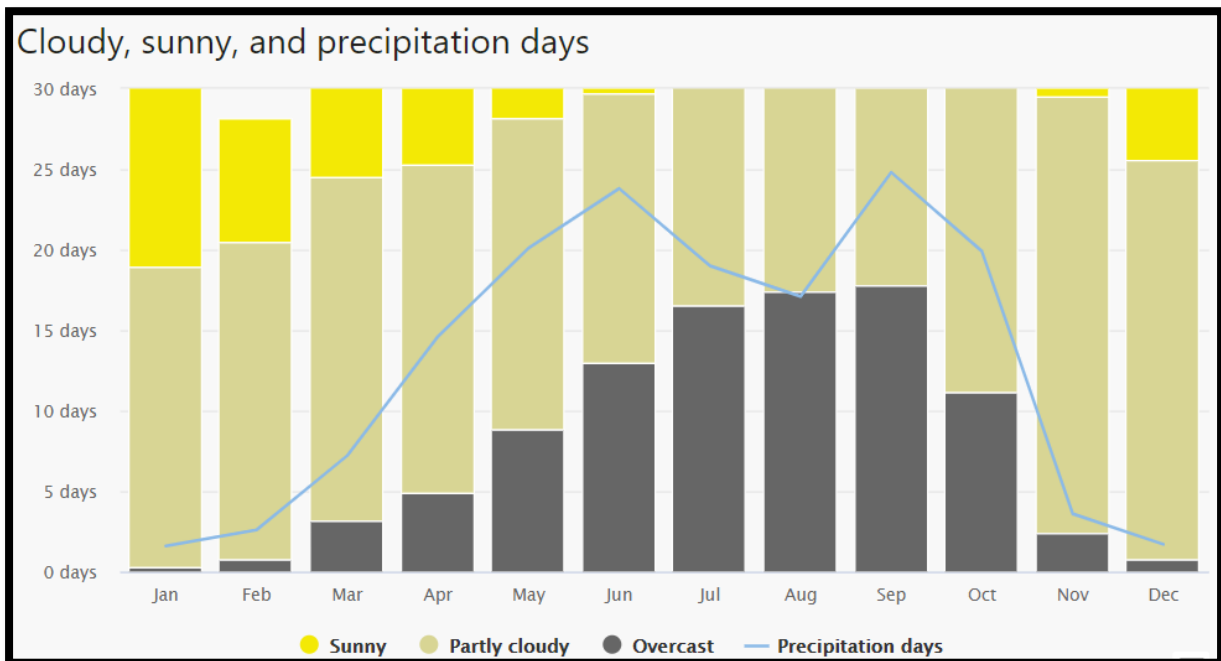
#### 4.1 TEMPERATURE, CLOUD COVER AND PRECIPITATION

The mean monthly temperature of Ibadan is in the range of 21°C to 31°C. Mean maximum monthly temperatures range from 27°C to 35°C. The hottest months are December to February. Relative humidity is high in the state throughout the year and decreases slightly in the dry season.

The mean daily maximum (solid red line) shows the maximum temperature of an average day for every month for Ibadan. Likewise, mean daily minimum (solid blue line) shows the average minimum temperature. Hot days and cold nights (dashed red and blue lines). The data indicates that lower temperatures were recorded during the wet season, between May to October, while higher temperature were recorded in the dry season from October to April. It is obvious that the rains appear to have a moderating influence on temperatures in Nigeria which imparts a demarcation in microclimatology of north and south Nigeria.



**FIG. 4.3: TEMPERATURE, CLOUD COVER AND PRECIPITATION OF THE PROJECT AREA. (SOURCE: METEOBLUE)**



**FIG 4.4: CLOUDINESS, SUNSHINE & PRECIPITATION OF THE PROJECT LOCATION**

## 4.2 RELATIVE HUMIDITY

Relative humidity (RH) is the ratio of the partial pressure of water vapour to the equilibrium vapour pressure of water at a given temperature. Relative humidity depends on temperature and the pressure of the system of interest. It requires less water vapour to attain high relative humidity at low temperatures; more water vapour is required to attain high relative humidity in warm or hot air. Relative humidity is normally expressed as a percentage; a higher percentage means that the air–water mixture is more humid. Poor indoor air quality (IAQ) is caused by several factors and can cause a variety of general symptoms, including headaches, eye irritation, sinus pain, and fatigue. Poor IAQ can also exacerbate existing respiratory illness or intensify eye, ear, nose and throat, conditions. Inappropriate air temperature or humidity levels can cause sinus problems and general discomfort.

Generally, in Nigeria, July is the middle of the wet season and the relative humidity is high because of the warm wet air that prevails. The monthly means of relative humidity in Ibadan, Oyo State ranged 58-78% with the aggregate monthly mean of 68.8%. Relative humidity greater than 68.8% occurs from March to October while RH below 68.8% occurs from January to February and November to December **Figure 4.5**. The ambient temperature and relative humidity of the project location were measured using the Smart Sensor (Model: AR830) which can measure Relative Humidity, Temperature and Particulate Matter.

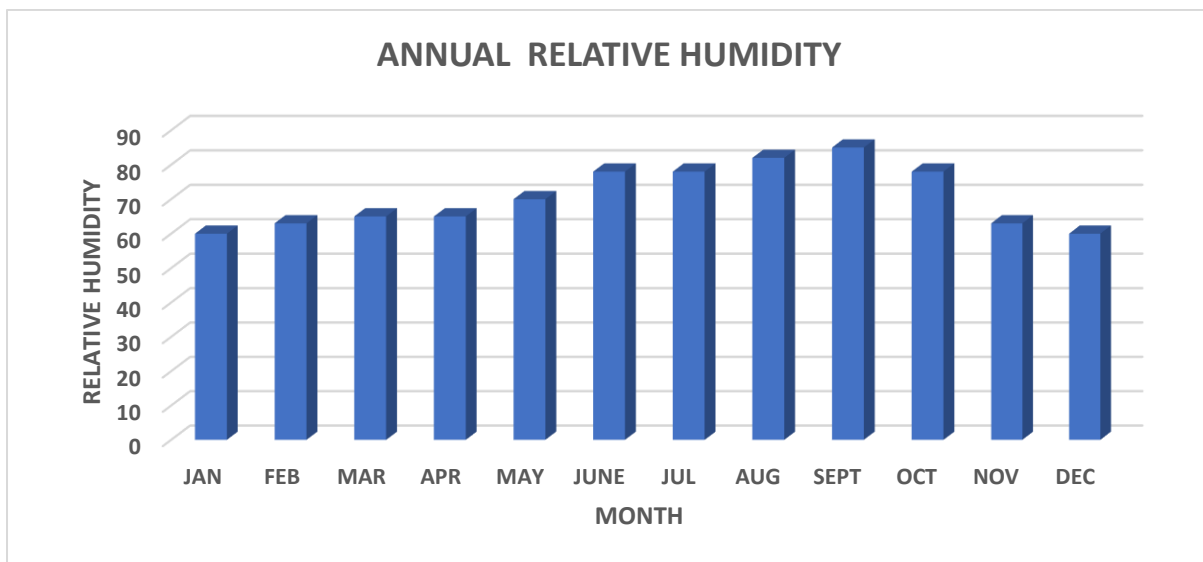


FIG. 4.5: RELATIVE HUMIDITY DISTRIBUTION IN PROJECT AREA. (SOURCE: NIMET)

### **4.3 WIND SPEED AND DIRECTION**

The mean annual wind speed varies between a narrow range of 4.0 and 6.2m/s. Speeds are higher between July and August; the period of break is August. Conversely, at the peak of the rainy season in September and October, wind speeds are lowest, measuring between 4.1 and 4.2m/s. From December, wind speeds begin to rise steadily till March, just before the rains begin and later rise during the August break. There are slightly lower speeds in October/February while high wind speeds are obtained from March to September. The wind pattern follows the migratory ITD. According to the statistics available for the last fifteen years, the prevalent wind directions is Southly-westerly, often, the South-westerlies dominate the wetter period of the year in the area while North-easterlies dominate the drier season. Depending on the shifts in the pressure belts in the neighbouring Gulf of Guinea, they are interspersed respectively by South- easterlies and North-westerlies at different times during the year. In view of the strong influence of sea breezes from the adjoining maritime environment, the wetter winds prevail for upward of 50% of the time. Various wind directions were observed ranging from northeasterly, southerly, and southwesterly. However, the predominant wind direction was found to be southwesterly as indicated below.

**TABLE 4.1: MONTHLY WIND SPED AND WIND DIRECTION IN IBADAN**

Year		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
2019	W.S	115.53	141.72	161.01	155.89	131.01	127.18	144.33	139.06	125.90	100.61	78.09	101.8
	W.D	SW	SW	SW	SW	SW	W	W	W	W	SW	SW	W
2018	W.S	115.26	144.08	150.17	144.00	146.7	132.21	140.44	155.69	130.41	104.23	199.29	114.98
	W.D	SW	SW	S	S	SW	SW	S	W	W	W	SW	SW
2017	W.S	134.02	130.54	157.60	134.2	130.90	132.23	156.51	130.40	120.40	120.40	081.03	086.66
	W.D	S	S	S	S	S	W	W	SW	SW	S	S	W
2016	W.S	125.15	139.79	148.32	175.63	139.29	127.64	175.87	149.28	121.37	210.63	111.67	105.21
	W.D	SW	SW	SW	W	W	W	S	SW	S	W	W	S
2015	W.S	130.68	145.06	111.0	155.52	143.33	119.06	140.88	144.52	130.00	105.09	102.58	101.60
	W.D	W	SW	SW	SW	W	W	SW	SW	SW	S	SW	S
2014	W.S	123.88	133.03	146.42	158.14	137.89	131.87	142.31	135.81	123.67	102.64	104.85	118.26
	W.D	SW	SW	W	W	SW	SW	S	SW	W	W	W	W

EIA for the proposed Scrap Tyre Recycling Plant, Apata, Ibadan, Oyo State.

2013	W.S	114.09	139.31	160.20	158.89	144.46	137.92	153.62	160.81	128.25	089.85	108.49	122.69
	W.D	SW	SW	SW	W	W	W	S	S	SW	SW	SW	SW
2012	W.S	130.56	147.59	182.07	157.41	134.59	144.75	147.09	133.18	126.41	095.02	179.33	129.93
	W.D	W	W	W	SW	SW	SW	SW	S	W	W	W	SW
2011	W.S	125.37	154.61	149.22	150.40	136.90	122.79	123.9	1481.91	110.43	155.74	158.00	154.40
	W.D	SW	SW	SW	S	S	S	W	W	W	SW	SW	SW
2010	W.S	102.39	125.88	158.78	177.65	161.93	150.66	150.95	1611.55	122.50	114.13	117.61	125.60
	W.D	SW	SW	S	S	S	SW	SW	SW	W	SW	SW	SW
2009	W.S	155.97	177.19	174.46	188.78	141.95	144.82	146.35	155.74	128.82	323.64	111.10	113.98
	W.D	SW	SW	SW	SW	SW	W	W	S	S	S	W	SW
2008	W.S	140.75	175.98	170.6	164.05	135.95	131.45	169.11	158.00	123.24	105.79	100.51	110.00
	W.D	SW	W	W	W	W	SW	SW	SW	S	S	SW	W
2007	W.S	157.26	167.23	183.06	104.66	134.00	148.61	142.39	154.40	119.04	099.14	97.45	116.29
	W.D	SW	SW	SW	SW	W	W	W	W	SW	SW	S	S



EIA for the proposed Scrap Tyre Recycling Plant, Apata, Ibadan, Oyo State.

2006	W.S.	3.8	4	3.5	3.5	3	3.3	3.9	8.6	6.2	3.5	3	1.9
	W.D	S	S	S	S	S	SW	SW	S	S	S	W	W
2005	W.S.	3.2	3.5	3.4	3.7	3.4	4.4	4.7	2.3	3.8	0.3	2.1	1.9
	W.D	SW	SW	SW	SW	SW	W	W	W	W	SW	SW	W



FIG 4.7.: WIND ROSE OF THE STUDY AREA

#### **4.4 PHYSIOGRAPHY AND GEOLOGY**

##### **Physiography and Geology of Apata, Ido Local Government Area**

The proposed scrap tyre recycling plant is located at km 10, Ibadan-Abeokuta Road, Apata within Ido Local Government area, Ibadan, Oyo State. The project is located within Apata in Ido Local Government Area, Ibadan, Oyo State. The project location just as Ibadan city is a tropical wet and dry climate with a lengthy wet season and relatively constant temperatures throughout the course of the year. Ibadan's wet season runs from March through October. The month of November to February forms the city's dry season, during which Ibadan experiences the typical West African harmattan. The mean maximum temperature is 26.46 C, minimum 21.42 C and the relative humidity is 74.55%.

#### **4.5 BASE LINE DATA ACQUISITION METHODOLOGY AND STUDY APPROACH**

##### **ACQUISITION OF BASELINE DATA**

The purpose of the baseline data acquisition is to establish the status of the various environmental components before the execution of the project. To achieve this, the environmental parameters were acquired from literature survey. The components of the environment covered are biophysical, social, and health.

The broad objectives of this process included:

- Education and enlightenment of identified stakeholders (communities, Government agencies, non-governmental organizations (NGOs), community based organisations (CBOs) on the need for their involvement in the conduct of the study and to assist the project team in articulating the concerns of the communities as well as those of their immediate environment.
- Building trust and confidence that would enhance the capacities of the identified stakeholders through participation in the project and
- Forming and promoting partnership with identified stakeholders through networking, information sharing and participation in consultation exercises.

#### **4.6 QUALITY ASSURANCE/QUALITY CONTROL (QAQC)**

The quality control & quality assurance (QA/QC) of all samples and the whole process is a vital aspect of this project and the conduct of the Environmental & Social Impact study. This starts from field works, collection of samples, analysis, and documentations. Standard methods and procedures have been strictly adhered to during this study. QA/QC procedures were implemented during sample collection, labelling, analyses, and data verification. Chain of custody procedures including sample handling, transportation, logging, and cross-checking in the laboratory have also been implemented. All analyses were carried out in FMENV accredited laboratories. The methods of analyses used in this study were in compliance with nationally and other internationally accepted analytical procedures, in order to ensure the reliability and integrity of the data obtained.

#### **4.7 SAMPLING STRATEGY**

The sampling strategy is an essential component of quality assurance and quality control. The sampling and data collection for the environmental components and parameters were in accordance with recommended procedures and practices for environmental data collection in Nigeria (FMENV 1992 and DPR, 2002 Part vii D – sampling and handling of samples). This is done to ensure that the nature, characteristics of the samples is not altered in any way. Samples were collected and stored in coolers to maintain their characteristics and compositions.

#### **4.8 AIR QUALITY AND NOISE STUDIES**

The rate of air pollution is becoming worrisome and therefore needs an urgent redress. It is becoming a major factor in the quality of life of urban and rural dwellers, and it poses risk to both human health and the environment. Therefore, it is necessary to study the background quality of the air prior to any project and to predict the impact(s) such a project would have on the air quality. Thus, the following air quality parameters were sampled during the field work viz: Particulate Matter (PM), Sulphur IV Oxides (SO<sub>2</sub>), Nitrogen IV Oxide (NO<sub>2</sub>), Carbon Monoxide (CO), Hydrogen Sulphide (H<sub>2</sub>S), Volatile Organic Compounds (VOCs), ammonia (NH<sub>3</sub>) and Hydrocarbon gases using highly sensitive digital in-situ Gas Monitors. The background noise levels were measured using a portable digital sound level meter.

##### **4.8.1 AIR QUALITY MEASUREMENT**

In the process of previewing the environmental performance of a proposed project, the ambient air condition is studied, to monitor air pollutant concentrations. During this study, key pollution indices (air pollutants) like PM ( $\mu\text{g}/\text{m}^3$ ), CO ( $\mu\text{g}/\text{m}^3$ ), SO<sub>2</sub> ( $\mu\text{g}/\text{m}^3$ ), NO<sub>2</sub> ( $\mu\text{g}/\text{m}^3$ ), H<sub>2</sub>S ( $\mu\text{g}/\text{m}^3$ ), and NH<sub>3</sub> ( $\mu\text{g}/\text{m}^3$ ) were measured at designated transects, using portable gas meters. In the present project, as part of knowing the air quality parameters, the above parameters were monitored and are monitored at designated locations as given below.

**TABLE 4.3: GPS COORDINATES OF AIR QUALITY MONITORING**

S/N	AIR QUALITY SAMPLING POINTS	COORDINATES		ELEVATION
		E	N	
1	AQ1	03° 47.891	07° 23.918	711m
2	AQ2	03° 47.952	07° 23.945	693m
3	AQ3	03° 47.933	07° 23.005	710m
4	AQ4	03° 47.888	07° 23.968	714m
5	AQ5	03° 47.910	07° 23.969	687m
6	AQ6	03° 47.953	07° 23.989	713m
7	AQ7	03° 47.924	07° 23.933	674m
8	AQ8	03° 47.889	07° 23.910	696m
9	AQ9	03° 47.865	07° 23.960	720m
10	AQ10	03° 47.890	07° 23.920	712m
11	AQ11	03° 47.884	07° 23.977	710m
12	AQ12	03° 47.885	07° 23.915	692m

Where AQ= Air Quality & AQC= Air Quality Control

Source: Field work



PLATE 4.0: AIR QUALITY MONITORING KITS

The details of the air quality results are given below. It has been observed that overall, all the parameters are well within the permissible limits.

#### 4.8.2 NOISE QUALITY

Noise levels monitoring was conducted in twelve (12) locations in an around the project area. For getting a quality result, well planned monitoring location has been selected. The details of noise quality assessment are given in **Tables 4.1**.



PLATE 4.1: EIA CONSULTANT CONDUCTING NOISE & GASEOUS POLLUTANT MONITORING

TABLE 4.4: AIR POLLUTANTS & EFFECTS

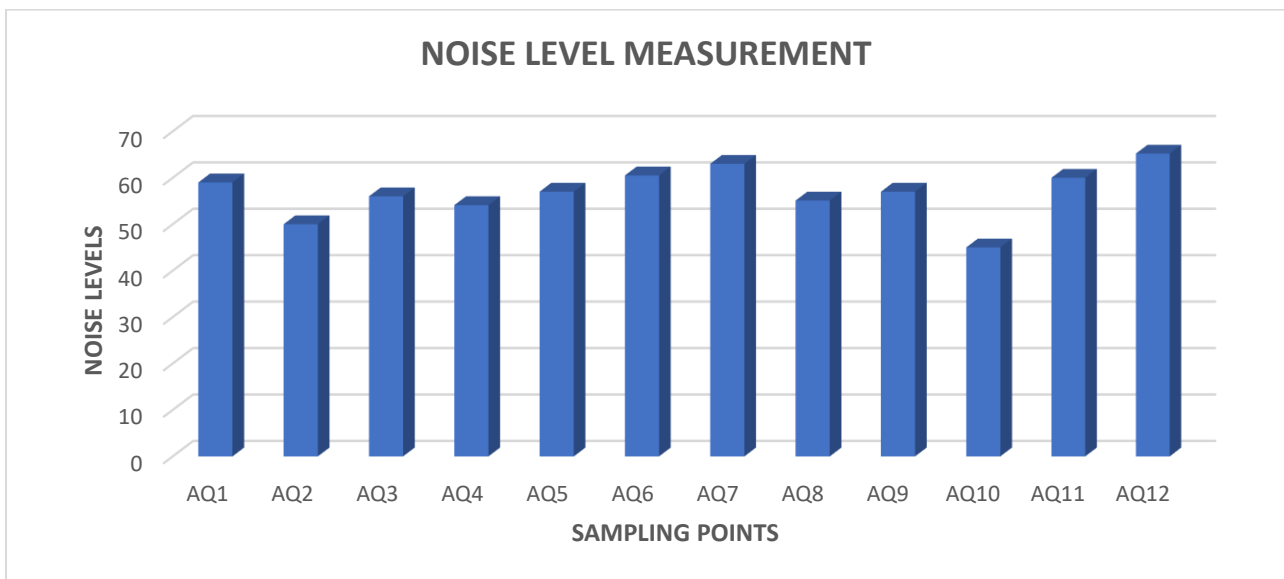
POLLUTANTS	POSSIBLE EFFECTS (HEALTH)	ENVIRONMENTAL EFFECTS
Sulphur (IV) Oxide (SO <sub>2</sub> )	Worsening respiratory illness from short-term exposure; increased respiratory symptoms including chronic bronchitis from long-term exposures.	Acidification of soils, lakes & rivers, damages to plants & crops; corrosion of buildings, monuments & works of art.
Suspended Particulate Matter	As for SO <sub>2</sub> ; combined exposure to SO <sub>2</sub> & SPM are associated with pulmonary effects; are carcinogenic elderly & the young are particularly susceptible.	Stain fabrics, painted surfaces & buildings, reduces life of materials and surface finishes.
Nitrogen (II) Oxide (NO <sub>2</sub> , N <sub>2</sub> O and NO)	NO <sub>2</sub> affects lung function in asthmatics from short-term exposures; causes chest tightness, burning of the eyes & headaches.	N <sub>2</sub> O can absorb infrared radiation & may enhance global warming & destruction of Earth & Ozone layer
CO	Reduced Oxygen-carrying capacity of blood by formation of Carboxyhaemoglobin instead of oxyhaemoglobin formation	CO has no known effects on vegetation or materials.
Hydrocarbons C <sub>x</sub> H <sub>y</sub>		Greenhouse gases that trap heat leading to global warming

SOURCE : URBAN AIR POLLUTION, UNEP.

**TABLE 4.4.1: NOISE LEVEL MONITORING WITHIN THE STUDY AREA**

S/N	Sampling Points	Coordinates		Elevation (m)	Noise Level (dBA)
		E	N		
1	AQ1	03°47.891	07°23.918	711m	59.0
2	AQ2	03°47.952	07°23.945	693m	50.0
3	AQ3	03°47.933	07°23.005	710m	56.0
4	AQ4	03°47.888	07°23.968	714m	54.1
5	AQ5	03°47.910	07°23.969	687m	57.0
6	AQ6	03°47.953	07°23.989	713m	60.5
7	AQ7	03°47.924	07°23.933	674m	63.0
8	AQ8	03°47.889	07°23.910	696m	55.1
9	AQ9	03°47.865	07°23.960	720m	57.0
10	AQ10	03°47.890	07°23.920	712m	45.0
11	AQ11	03°47.884	07°23.977	710m	60.0
12	AQ12	03°47.885	07°23.915	692m	65.2

The noise measurements within the project location were conducted and are presented below. The noise levels ranged from 37.4 – 63.7dB(A).



**FIG 4.8 : NOISE LEVEL MEASUREMENT WITHIN STUDY AREA**

**SOURCE : FIELD WORK**



**TABLE 4.4.2 : GASEOUS AIR POLLUTANTS MEASUREMENT**

S/N	Sampling Points	NO <sub>2</sub> (µg/m <sup>3</sup> )	SO <sub>2</sub> (µg/m <sup>3</sup> )	H <sub>2</sub> S (µg/m <sup>3</sup> )	CO, (µg/m <sup>3</sup> )	NH <sub>3</sub> PPM	PM (µg/m <sup>3</sup> )	VOC mg/m <sup>3</sup>	CO <sub>2</sub> PPM	CH <sub>4</sub> PPM
1	AQ1	0	0.0	0	01	0.0	24	0.960	770	0
1	AQ1	0	0.0	0	02	0.0	24	0.763	723	0
2	AQ2	0	0.0	0	01	0.0	21	0.612	721	0
3	AQ3	0	0.0	0	03	0.0	17	0.542	707	0
4	AQ4	0	0.0	0	04	0.0	16	0.554	731	0
5	AQ5	0	0.12	0	04	0.0	19	0.510	711	0
6	AQ6	0	0.0	0	02	0.0	30	0.514	700	0
7	AQ7	0	0.0	0	01	0.0	35	0.517	715	0
8	AQ8	0	0.0	0	05	0.0	40	0.959	763	0
9	AQ9	0	0.0	0	03	0.0	20	0.650	540	0
10	AQ10	0	0.0	0	01	0.0	22	0.750	747	0
11	AQ11	0	0.0	0	01	0.0	20	0.650	750	0
12	AQ12	0	0	0	3	0.0	30	0.610	730	0

Notes: NS - No Specification; FMENV: Federal Ministry of Environment.

µg/m<sup>3</sup>: Microgram per cubic meter; PPM: Parts Per Million; BDL: Below Detection Limit

## REMARKS

All the gases analyzed in the above-mentioned locations were within their respective limits as at the time of measurement.

## NITROGEN IV OXIDE

Nitrogen IV Oxide is a product of high temperature combustion like vehicle engines, domestic fires and industrial combustions. Studies have shown that man or animal exposure to NO<sub>2</sub> concentration above 0.563ppm may cause pulmonary diseases and increased susceptibility to bacterial infection (ACGIH, 1995). NO<sub>2</sub> acts mainly as an irritant affecting the mucosa of the eyes, nose, throat, and respiratory tract. The continuous exposure to high NO<sub>2</sub> levels can contribute to the development of acute or chronic bronchitis and may cause increased bronchial reactivity in some asthmatics, decreased lung function in patients with chronic obstructive pulmonary. The values recorded within the project location were below detection limit (BDL).

### **SULPHUR IV OXIDE (SO<sub>2</sub>).**

Sulphur IV Oxide (SO<sub>2</sub>) amongst the Sulphur acidic oxides is a more important oxide of Sulphur as a primary pollutant and is formed from the oxidation of Sulphur containing fuels. Exposure to SO<sub>2</sub> at concentrations above 13.0ppm could stimulate bronchoconstriction (as in asthma), mucus secretion, and eye irritation in man and other animals. The value of SO<sub>2</sub> recorded was 0.12ppm.

### **CARBON MONOXIDE**

Carbon monoxide (CO) is the most common air pollutant. It is a colourless, odourless, tasteless and poisonous gas produced by the incomplete combustion of carbonaceous materials or fossil fuels (gas, oil, coal and wood). Adverse health effect has been observed with CO concentrations of 12–17mg/m<sup>3</sup> for 8 hours (Richard and John, 2012) while prolonged (45 minutes to 3 hours) exposure to concentrations between 200mg/m<sup>3</sup> and 800mg/m<sup>3</sup> often results in severe headache, dizziness, nausea and convulsions (Derek, 2013). It also induces fatigue, impairs alertness, inhibits foetal development and aggravates cardiovascular diseases. The value of carbon monoxide recorded ranged from 0.0-5ppm.

### **HYDROGEN SULPHIDE**

Hydrogen Sulphide (H<sub>2</sub>S) is a toxic, odorous, and corrosive gas, which is rapidly oxidized to Sulphur dioxide in the atmosphere. It can be present in natural gas in certain areas and can be released by sulphate reducing bacteria in certain aquatic environments. Exposure to excessive concentrations can be fatal and injurious to health. Sustained exposure to H<sub>2</sub>S gas above 500mg/m<sup>3</sup> could result in death (Derek, 2013). Hydrogen Sulphide was not detected.

### **VOLATILE ORGANIC COMPOUNDS(VOCs)**

VOCs are released into the atmosphere by anthropogenic and natural emissions. They include a variety of chemicals, some of which may have short and long term adverse health effects although higher indoors than outdoors, VOCs are emitted by a wide range of products which include but not limited to, paint, paint strippers, cleaning supplies, pesticides, building materials, office equipment (printers, copiers, correction fluids etc.), photographic solutions, fuels, disinfectants, etc. The health effects of VOC's vary from those which are highly toxic to those with no known health effect and this may also be dependent on the level of exposure. Eye and respiratory tract infections, dizziness, impaired memory as well as visual disorders are among immediate symptoms experienced soon after exposure to some organics. The values of VOC recorded ranged from 0.510ppm & 0.960ppm.

### **CARBON IV OXIDE (CO<sub>2</sub>)**

Carbon IV Oxide (CO<sub>2</sub>) is a greenhouse gas that is naturally occurring and harmless in small quantities, it becomes harmful to health and environment. Carbon iv oxide is given off during breathing. There is a natural level of its occurrence and when the threshold is exceeded it becomes harmful to the environment, which leads to greenhouse effect. Green plants make use of carbon dioxide to produce starch during photosynthesis in the presence of sunlight. The values of CO<sub>2</sub> recorded ranged from 540 & 770µg/m<sup>3</sup>.

### **4.9 SOIL STUDIES/CHARACTERISTICS**

The importance of soil in environmental consideration is underscored by its unique position as a medium that supports life, stores water and energy, anchors and supports physical structures, receives and transmits materials and substances in a manner that determines the quality of liquid, solid and even gases below and above it. Anthropogenic variables exert considerable influence on soil, thereby, directly, and indirectly impacting other environmental systems in the general global equation. The vertical links (arrows) signify intensity of movement and exchange, pollutants especially between the four compartments/systems of the overall environment.

The central role played by soil in the sustenance of environmental quality thus makes it mandatory that probable impacts of planned projects on soil be understood. The understanding of soil's susceptibility enables the putting of preventive and/ or ameliorative measures in place to take care of deleterious impact right from the planning stage. The principal objective of soil assessment in an EIA is to determine the physical and chemical properties of the soil to predict the effects of pollutants that will be discharged from proposed industrial activities. Degradation of soils by planned activities and their execution at all phases of the project (land preparation, construction, operation and abandonment) can cause significant changes in the microbiological, chemical, physical, hydrological and engineering properties of the soil. For example, vegetation growth in degraded areas may become retarded. or extinct in extreme cases depending on the changes that have taken place in soil properties.

In terms of agriculture, soil properties that are important to plant growth are the plant nutrients (i.e. mineral elements) and physical structure (e.g. pore and particle size). As such, it is necessary to determine the baseline levels of various fertility indices and textural characteristics of soils within each designated site prior to evaluating the potential impacts associated with the proposed project in Oyo State.

Twenty-Four (24) soil samples were collected from each of the twelve (12) sampling points with the aid of a Dutch Hand Auger, hand gloves, a spool and hammer. Thus, most of the soil nutrients useful to plants and soil micro-organisms are concentrated at these depths. The samples for microbiological analysis were collected in McCartney bottles and stored in an ice chest. Samples for physicochemical analysis were collected in polythene bags. Twelve (12) soil samples at depths of 0-30cm were collected within the project area.



**PLATE 4.2: CONSULTANT REPRESENTATIVE CONDUCTING SOIL SAMPLING WITH HAND AUGER**

#### **4.9.1 EXISTING SOIL TYPES AND CHARACTERISTICS**

The soil of the area is rainforest soils that include soft loam which consists mainly of sand, clay, and silt. The soils are colonized by trees and are located partly on land and partly on rocky areas. As such soil in the project site is also heterogeneous and compacted under its own weight. Soil sampling was done to establish the baseline characteristics and to assess the anticipated impacts due to the proposed project. Soil samples were collected from the project area using soil auger from a depth of 0-15cm and 15-30cm from the project site and adjoining locations.

#### **4.9.2 SOIL BULK DENSITY AND PERMEABILITY**

Undisturbed core cutter soil samples were collected based on the texture of the soil of the site at 0.5m in the project area. The soil was loose to medium dense sand and clay, with varying moisture content. The project location soil has bulk density that range from  $1.092\text{mg}/\text{m}^3$  to  $2.089\text{mg}/\text{m}^3$  with permeability constant that varies between  $1.231 \times 10^{-5} \text{K}(\text{ms}^{-1})$  and  $2.278 \times 10^{-5}\text{K}(\text{ms}^{-1})$ .

**TABLE 4.5: BULK DENSITY AND PERMEABILITY OF SOIL SAMPLE**

Sample codes	Depth (m)	Moisture content (%)	Bulk Density Mg/m <sup>3</sup>	Permeability K(m <sup>5</sup> -l)	Description
SS TS	0.50	12.5	2.035	2.133 x 10 <sup>-5</sup>	Brown, medium dense silty sand
SS1 SS	0.50	38.2	1.092	2.321 x 10 <sup>-5</sup>	Dark brown,dense silty sand
SS2 TS	0.50	10.4	1862	1.989 x 10 <sup>-5</sup>	Grey loose to medium dense sand clay
SS2 SS	0.50	22.5	1628	1.237 x 10 <sup>-5</sup>	Grey firm to medium dense sand clay
SS3 TS	0.50	24.1	2.089	1.231 x 10 <sup>-5</sup>	Greyish brown firm sandy clay
SS3 SS	0.50	14.6	2.081	2.278 x 10 <sup>-5</sup>	Black dense silty sand
SS4 TS	0.50	12.5	1760	1.231 x 10 <sup>-5</sup>	Dark grey firm dense sand
SS4 SS	0.50	13.2	1862	2.278 x 10 <sup>-5</sup>	Grey firm to medium dense sand clay
SS5 SS	0.50	22.5	1628	1.231 x 10 <sup>-5</sup>	Dark grey firm dense sand
SS5 TS	0.50	10.4	2.089	2.278 x 10 <sup>-5</sup>	Dark brown dense silty sand clay
SS6 TS	0.50	12.5	2.035	2.133 x 10 <sup>-5</sup>	Brown. medium dense silty sand
SS6 SS	0.50	38.2	1.092	2.321 x 10 <sup>-5</sup>	Dark brown,dense silty sand
SS7 TS	0.50	10.4	1862	1.989 x 10 <sup>-5</sup>	Grey loose to medium dense sand clay
SS7 SS	0.50	22.5	1628	1.237 x 10 <sup>-5</sup>	Grey firm to medium dense sand clay
SS8 TS	0.50	24.1	2.089	1.231 x 10 <sup>-5</sup>	Greyish brown firm sandy clay
SS8 SS	0.50	14.6	2.081	2.278 x 10 <sup>-5</sup>	Black dense sandy clay
SS9 TS	0.50	12.5	1760	1.231 x 10 <sup>-5</sup>	Dark grey loose sand
SS9 SS	0.50	13.2	1862	2.278 x 10 <sup>-5</sup>	Brown firm to medium dense sandy soil
SS10 TS	0.50	12.5	2035	2.133 x 10 <sup>-5</sup>	Brown, medium dense silty sand

SS10 SS	0.50	38.2	1092	$2.221 \times 10^{-5}$	Dark brown, loamy soil
SS11 TS	0.50	10.4	1862	$1.989 \times 10^{-5}$	Grey loose to medium dense sand clay
SS11 SS	0.50	22.5	1628	$1.237 \times 10^{-5}$	Medium dense sand clay
SS12 TS	0.50	24.1	2089	$1.231 \times 10^{-5}$	Greyish brown firm sandy clay
SS12 SS	0.50	14.6	2081	$2.278 \times 10^{-5}$	Dark brown dense silty sand

#### 4.9.3 SOIL FAUNA

Life in the soil is diverse ranging from microscopic single celled organisms to large burrowing animals. Hence there are well-defined food chain/energy flows within the soil ecosystem. The soil macro-fauna encountered within the study area include various arthropods (insects, millipedes, mites, butterfly), annelids (earthworms) and nematodes. These organisms are primary consumers; decomposers, mixers and utilizers of energy stored in plants and plant residues and contribute to the re-cycling of nutrients. Others were secondary consumers such as centipedes and spiders. These animals consume smaller sized animals, and they may also serve as food for organisms occupying higher levels of the food chain.

The soil fauna of special interest within the savannah ecosystem under study were termites, lizards, butterflies, rodent, earthworms etc. The importance of earthworms to soil includes aeration, improvement of texture, mixing (materials from the surface taken to lower depths and vice versa) and nutrient re-cycling. Currently, 16 genera of earthworms have been described in Nigeria, and of these, seven occur in the Savannah ecosystem (Segun, 1980). However, three genera (Hyperiodrilus, Ephyriodrilus and Eudrilus) were encountered in the present study.

#### 4.9.4 SOIL MICROORGANISMS

The micro-organisms and macro-fauna work together as a team in organic matter decomposition. The micro-organisms of concern in this study were fungi and bacteria and these play important roles in the transformation of soil nutrients.

**TABLE 4.6. LIST OF ANIMALS IN THE STUDY AREA**

S/N	SCIENTIFIC NAME	COMMON NAME	METHOD OF REPRODUCTION
1	Gatrocantha sp	Spider	Oviparity
2	Hemidactylus Brooki	Wall gecko	Oviparity
3	Rattus natalensis	Giant rat	Viviparity
4	Mantis Religiosa	Praying mantis	Oviparity
5	Bufo Regularis	West African toad	Oviparity
6	Anopheles sp	Mosquito	Oviparity

7	Lemniscomys Straitus	Spotted grass mouse	Viviparity
8	Macrotermis Bellicosus	Termites	Oviparity
9	Agama Agama	West African rainbow lizard	Oviparity
10	Canis lupus familiaris	Dog	Ovoviviparity
11	Capra aegagrus hircus	Goat	Ovoviviparity
12	Varanus Niloticus	Nile monitor lizard	Oviparity
13	Acraea terpicore	Butterfly	Oviparity
14	Nectarinia Cuprea	Copper Sunbird	Oviparity
15	Orthetrum Branchiale	Dragonfly	Oviparity

**TABLE 4.7: SOIL SAMPLING COORDINATE LOCATIONS**

SOIL SAMPLES COORDINATES			
S/N	SAMPLE DESCRIPTION	COORDINATES	
		N	E
1	SS1	07°23.918	03°47.891
2	SS2	07°23.945	03°47.952
3	SS3	07°23.005	03°47.933
4	SS4	07°23.968	03°47.888
5	SS5	07°23.969	03°47.910
6	SS6	07°23.989	03°47.953
7	SS7	07°23.933	03°47.924
8	SS8	07°23.910	03°47.889
9	SS9	07°23.960	03°47.865
10	SS10	07°23.920	03°47.890
11	SS11	07°23.977	03°47.884
12	SS12	07°23.915	03°47.885

SS: SOIL SAMPLE

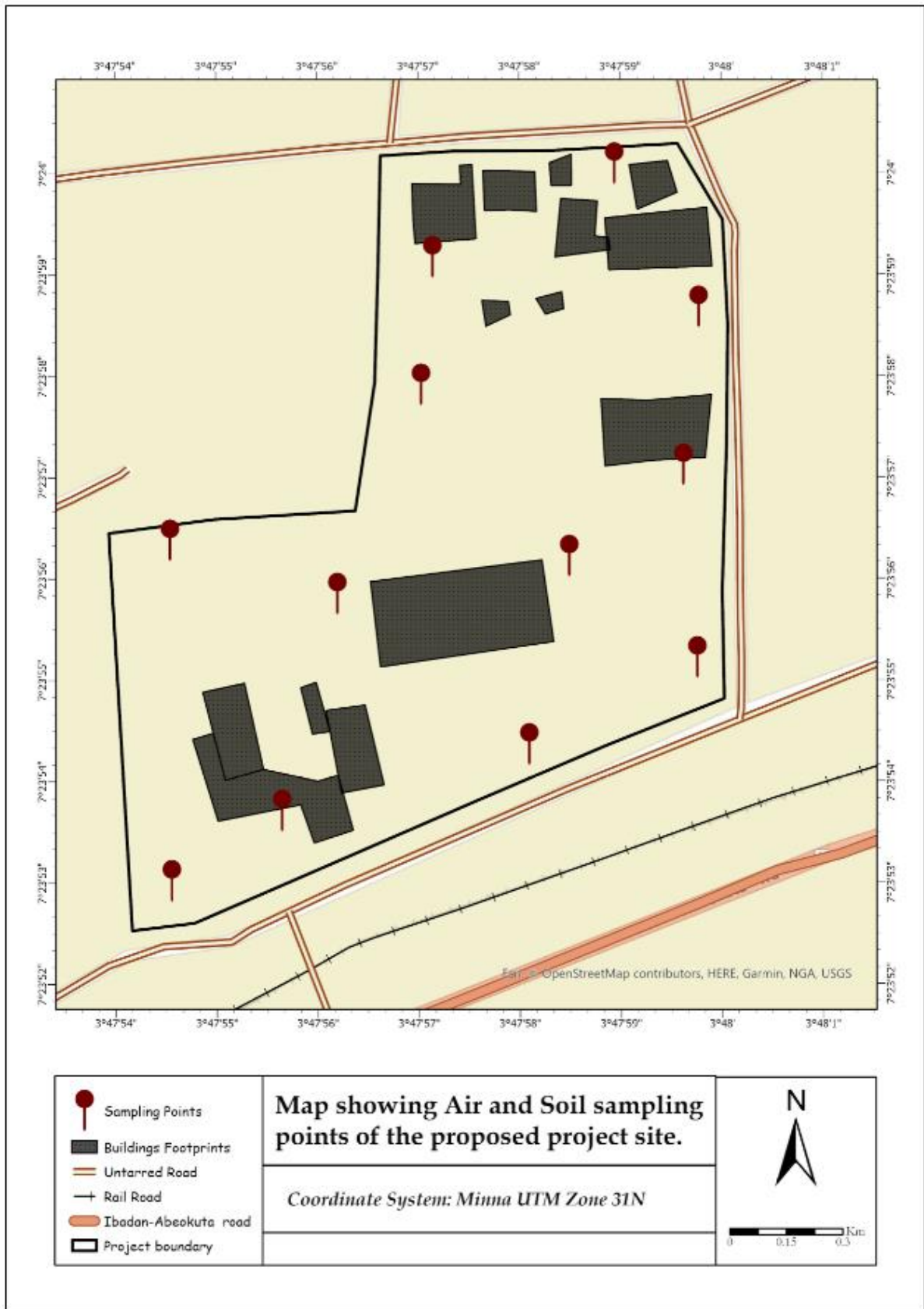


FIG 4.9: AIR QUALITY & SOIL SAMPLING POINTS WITHIN STUDY AREA

SOURCE : FIELD WORK



## 4.9.5 RESULTS OF LABORATORY ANALYSIS OF SOIL SAMPLES

### 4.9.5.1 SOIL TEXTURE AND PARTICLE SIZE

The physico-chemical characteristics of soils samples in both top and bottom obtained during the study of the proposed project areas are presented below. The topsoil (TS) down to 15cm shows that the soil was made up of grey clayey sand with trace of gravel and plant roots. The distribution of soil granite was 85.9% to 94.4% sand, 5.13% to 10.1% clay and 0.47% to 4.7% Silt particles. Control location topsoil had 89.9% sand, 6.36% clay and 3.72% Silt. The above stratum was underlain by grey clayey sand in the subsoil from 15cm to 100cm depth. This contains 87.9% Sand, 8.08% Clay and 4.00% Silt.

### 4.9.5.2 PHYSICO-CHEMICAL PARAMETERS OF THE SOIL SAMPLES

The laboratory physico-chemical parameters of the soil samples are shown below.

**TABLE: 4.8: PHYSICO-CHEMICAL PARAMETERS OF SOIL SAMPLES**

S/N	Sample ID	PH	Cond μS/cm	TOC mg/kg	Cl mg/Kg	NO <sub>3</sub> mg/kg	SO <sub>4</sub> mg/kg	PO <sub>4</sub> <sup>-3</sup> mg/kg
1	SS1(0-15cm)	4.93	22.10	1.10	1.30	66.2	53.2	18.6
2	SS1(15-30cm)	6.90	22.50	1.22	1.10	75.2	65.0	20.2
3	SS2 (0-15cm)	6.50	22.40	0.78	2.04	85.2	65.1	19.5
4	SS2 (15-30cm)	5.30	22.49	0.81	2.65	96.0	65.5	19.8
5	SS3 (0-15cm)	6.60	32.38	0.60	2.50	85.0	65.0	18.4
6	SS3 (15-30cm)	6.74	32.50	0.63	2.11	70.2	65.0	19.1
7	SS4 (0-15cm)	6.72	30.40	1.42	4.32	55.1	52.0	12.3
8	SS4 (15-30cm)	6.55	32.48	1.08	3.10	80.0	52.0	12.3
9	SS5 (0-15cm)	5.71	25.40	1.42	2.22	45.3	32.8	13.1
10	SS5 (15-30cm)	8.10	34.49	1.44	0.74	75.0	35.5	13.2
11	SS6 (0-15cm)	6.10	23.10	1.34	1.35	75.0	33.8	18.6
12	SS6 (15-30cm)	6.90	32.20	1.22	2.11	75.2	45.0	20.2
13	SS7 (0-15cm)	6.50	30.42	1.18	2.04	110	64.1	19.5
14	SS7 (15-30cm)	6.30	30.41	0.11	2.65	98.0	75.0	19.8
15	SS8 (0-15cm)	6.60	31.38	1.43	4.10	85.1	70.0	18.4
16	SS8 (15-30cm)	6.74	32.50	1.23	2.13	70.1	70.0	19.1
17	SS9 (0-15cm)	6.72	27.40	1.32	3.32	79.4	58.1	12.3
18	SS9(15-30cm)	6.55	30.42	1.08	3.60	80.0	58.1	12.3
19	SS10 (0-15cm)	5.71	28.40	1.42	2.53	80.2	29.0	13.1
20	SS10(15-30cm)	5.60	31.40	1.50	2.24	75.0	29.9	13.2
21	SS11 (0-15cm)	6.72	29.30	1.50	3.35	86.5	48.8	12.3
22	SS11(15-30cm)	6.55	32.45	1.48	3.40	80.0	50.5	12.3
23	SS12(0-15cm)	5.71	30.40	0.62	2.23	80.3	32.8	13.1
24	SS12(15-30cm)	5.60	32.10	1.44	2.10	75.0	35.5	13.2

S/N	Sample ID	Ni mg/kg	Pb mg/kg	Cu mg/kg	Fe mg/kg	Zn mg/kg
1	SS1(0-15cm)	0.28	1.20	0.98	1616	24.5
2	SS1(15-30cm)	0.83	0.90	0.85	1620	19.8
3	SS2 (0-15cm)	0.36	0.58	0.13	1580	16.1
4	SS2 (15-30cm)	0.98	0.10	0.20	218	17.8
5	SS3 (0-15cm)	0.60	0.22	0.31	171	51.4
6	SS3 (15-30cm)	1.20	0.20	0.19	370	33.5
7	SS4 (0-15cm)	1.02	0.36	0.05	375	20.3
8	SS4 (15-30cm)	1.90	0.62	0.30	332	68.7
9	SS5 (0-15cm)	1.00	0.80	0.62	416	54.2
10	SS5 (15-30cm)	1.10	0.48	0.20	307	24.2
11	SS6 (0-15cm)	1.20	0.98	0.98	98.4	1.34
12	SS6 (15-30cm)	0.83	0.90	0.85	56.2	1.80
13	SS7 (0-15cm)	0.36	0.58	0.13	55.8	1.62
14	SS7 (15-30cm)	0.98	0.10	0.20	61.8	1.75
15	SS8 (0-15cm)	0.60	0.22	0.35	58.4	2.14
16	SS8 (15-30cm)	1.20	0.28	0.19	37.2	2.50
17	SS9 (0-15cm)	0.12	0.36	0.51	37.5	2.33
18	SS9(15-30cm)	0.29	0.65	0.32	33.2	1.57
19	SS10 (0-15cm)	1.00	1.18	0.26	41.6	3.22
20	SS10(15-30cm)	1.40	1.08	0.27	30.7	2.42
21	SS11 (0-15cm)	1.12	0.36	0.25	85.3	2.50
22	SS11(15-30cm)	1.10	0.62	0.32	75.5	2.10
23	SS12(0-15cm)	0.00	1.10	0.62	103	0.45
24	SS12(15-30cm)	1.10	0.45	0.17	115	0.32

**pH:** The degree of acidity or alkalinity is usually considered a master variable that affects nearly all soil properties – chemical, physical and biological. pH influences aggregate stability as well as air and water movement in the soil. The amount of acid or alkali in the soil determines the availability of many nutrients for plant growth and maintenance. If the soil-pH is too high or too low, the nutrients are either locked onto the soil particles or are washed out of the soil. Most plants grow best when the soil-pH is between 5.5 and 6.5 (i.e., from the slightly acidic side to neutral).

The pH values of the surface subsurface (0 – 30cm) soils of the study area showed that the soils are slightly acidic with values that range from 4.93- 8.10 for the sub-surface.

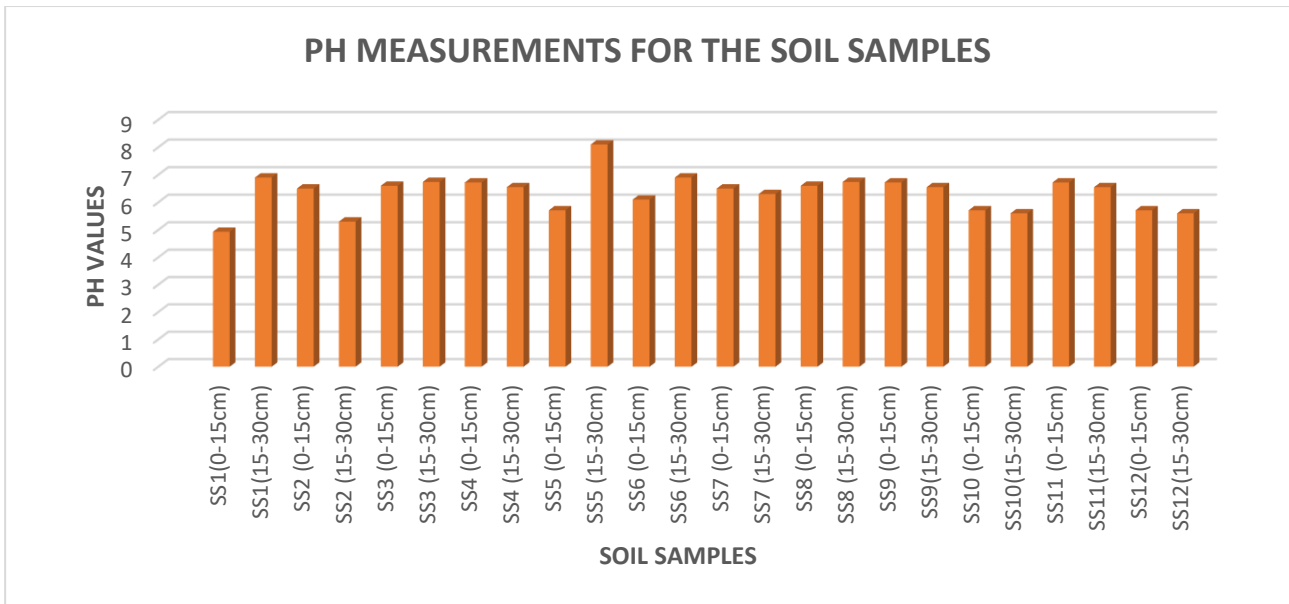


FIG 4.10 : PH LEVEL MEASUREMENT OF SOIL SAMPLES

SOURCE : FIELD WORK

#### 4.9.5.1 RESULTS OF LABORATORY ANALYSIS OF SOIL SAMPLES

#### 4.9.5.2 SOIL TEXTURE AND COLOUR

The physico–chemical characteristics of soils samples in both top and bottom obtained during the study of the proposed project areas are presented below. The topsoil (TS) down to 15cm shows that the soil was made up of grey clayey sand with trace of gravel and plant roots. The distribution of soil granite was 85.9% to 94.4% sand, 5.13% to 10.1% clay and 0.47% to 4.7% Silt particles. Control location topsoil had 89.9% sand, 6.36% clay and 3.72% Silt. The above stratum was underlain by grey clayey sand in the subsoil from 15cm to 100cm depth. This contains 87.9% Sand, 8.08% Clay and 4.00% Silt (See Table below).

TABLE 4.9: SOIL PARTICLES SIZE DISTRIBUTION

S/N	SAMPLE ID	PARTICLE SIZE DISTRIBUTION		
		Sand (%)	Clay (%)	Silt (%)
1	SS1 TS	89.4	6.80	1.10
2	SS1 SS	90.3	7.05	1.32
3	SS2 TS	94.0	5.11	0.45
4	SS2 SS	90.4	7.32	1.25
5	SS3 TS	85.0	10.1	4.00
6	SS3 SS	89.9	7.36	2.72
7	SS4 TS	87.9	7.36	4.72
8	SS4 SS	91.9	7.08	1.00
9	SS5 SS	89.9	6.36	3.72
10	SS5 TS	87.9	8.08	4.00
11	SS6 TS	85.4	7.45	3.54
12	SS6 SS	82.1	8.10	4.10
13	SS7 TS	86.4	7.55	3.20
14	SS7 SS	85.1	6.42	2.86
15	SS8 TS	92.0	6.22	1.00
16	SS8 SS	91.2	7.45	0.58
17	SS9 TS	84.2	5.45	0.45
18	SS9 SS	89.4	7.65	1.33
19	SS10 TS	85.0	8.54	4.11
20	SS10 SS	85.0	6.96	3.12
21	SS11 TS	87.2	7.30	4.30
22	SS11 SS	89.5	6.45	1.00
23	SS12	91.2	7.68	3.22

	TS			
24	SS12 SS	90.5	6.32	1.40

varies from sand to sandy, clay, silt from surface to sub-soil indicating a fertile soil for agriculture. The colour of the soil samples varies from yellow, light brown, dark brown and black.

#### 4.9.5.1 SOIL PARTICLE SIZE AND DISTRIBUTION

The table above shows the soil particle size, types, and distribution.

**Electrical Conductivity:** Electrical conductivity is a measure of the electric current carrying ability of an aqueous solution. This is determined by the ionic content and ion exchange capacity of the substance (soil in this case) in aqueous solution (KWW, 2001). The electrical conductivities of the range in subsurface soils were 22.1–34.49 $\mu$ S/cm.

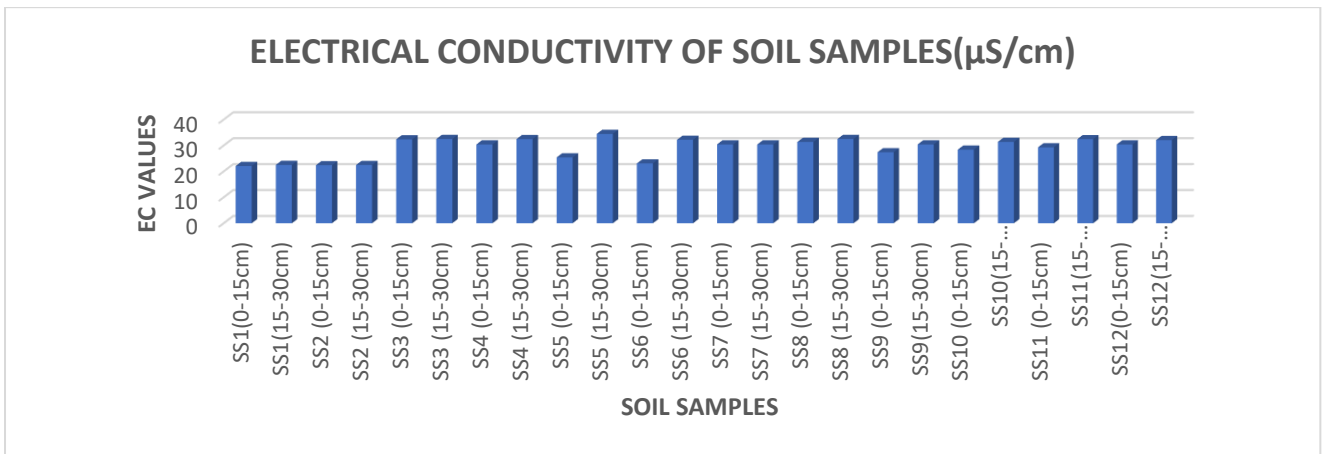
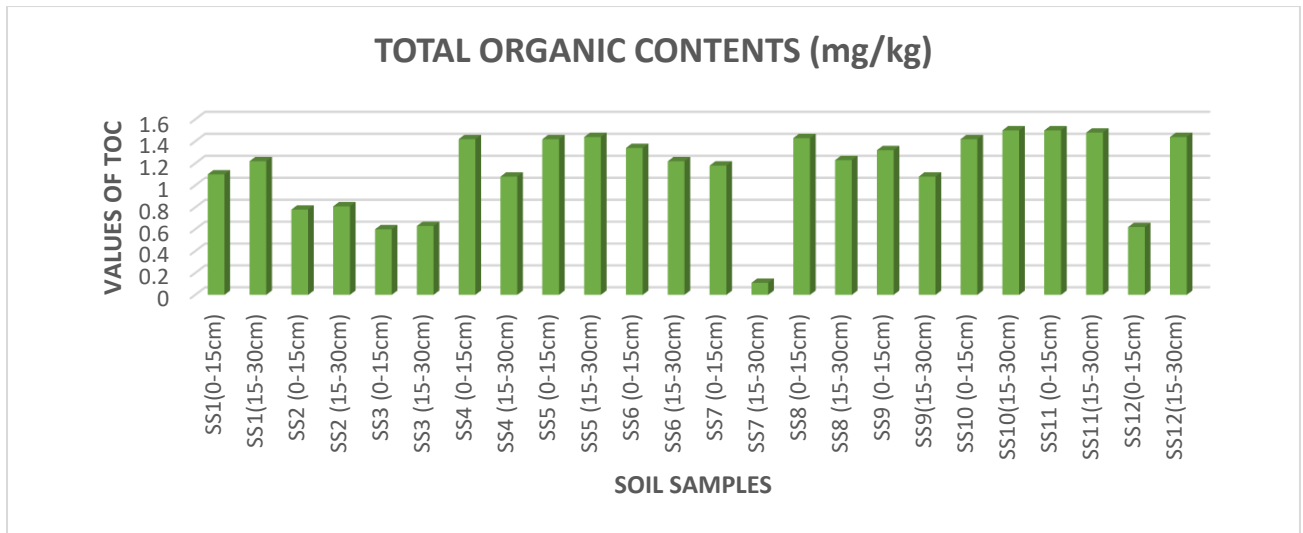


FIG 4.11: ELECTRICAL CONDUCTIVITIES OF THE SOIL SAMPLES.

**Total Organic Carbon:** Total Organic Carbon (TOC) level in the soil samples give an indication of a number of carbon-containing compounds and provides a means for determining the degree of organic contamination. High TOC content would result in increase in the growth of micro-organisms, which could contribute to the depletion of oxygen supplies (KWW, 2001). The TOC level for the subsurface soil samples ranged from 0.11mg/kg to 1.5mg/kg. The presence of dead decaying matter such as decaying vegetation observed on the surface of soil in the area may have accounted for the values of TOC in the surface than in the sub-surface.



**FIG 4.12: CONCENTRATION OF TOTAL ORGANIC COMPOUNDS IN THE SOIL SAMPLES**

**Nutrients:** Nitrate concentrations in soil samples ranged in the subsurface layer nitrate ranged from 45.3– 110mg/kg. Sulphate concentrations in soil samples in the subsurface layer ranged from 29.0-75.0mg/kg; phosphate ranged from 12.3– 20.2 mg/kg.

The importance of these nutrients in plants cannot be over-emphasized. Chlorophyll, plant proteins and nucleic acids are nitrogen compounds, which play major roles in plant growth. In addition, Phosphorous compounds are also key plant nutrients. They form an essential part of nucleo-proteins in plant cells and these control cell division and growth. Phosphorous is also a major constituents of deoxyribonucleic acid (DNA) molecules, which are the signature for genetic pools and inheritance characteristics of living organisms (Donahue *et al.*, 1990). It is also part of energy storage and transfer of chemicals (Adenosine triphosphate, ATP) in plants. Sulphur occurs in proteins and is required for plant vitamins. It could be derived from rainfall and agricultural chemicals. Rainfall dissolves the sulphur oxides evolved during the burning of plant-derived fuels such as wood, coal, and oil. In acidic soils sulphur comes from mineralization of organic matter, particularly weathered soil (Donahue *et al.*, 1990).

## Heavy Metals

The concentrations range of heavy metals for surface and subsurface soil samples (Cr, Fe, Hg, Mn, Ni, Pb, Cu, Zn, and V) in the study area are presented below:

**Total Iron:** The surface soil of the iron level ranged from 30.7-1620mg/kg. The soil samples are rich in iron which accounts for the good agricultural yield within the community.

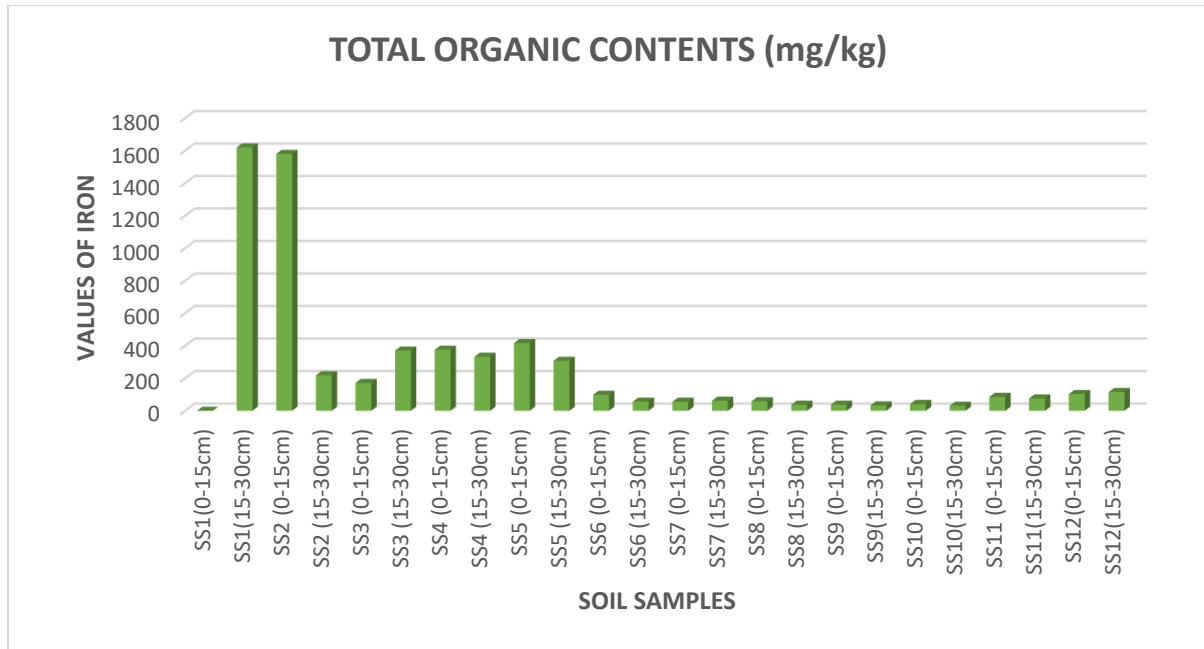


FIG 4.13: CONCENTRATION OF TOTAL IRON CONTENTS IN THE SOIL SAMPLES

**Mercury:** The concentration of Mercury was below equipment detectable limit of <0.001mg/kg subsurface soil.

**Nickel:** The recorded values for nickel in the soil samples ranged from 0.12-1.9mg/kg

**Lead:** The concentrations of lead in the soil samples ranged from 0.1-1.2 mg/kg.

**Copper:** The surface soil of the subsurface soil has values that ranged between 0.13-0.98mg/kg.

**Zinc:** The concentration of zinc in the soil samples ranged from 0.32-68.7mg/kg.

## MICROBIOLOGICAL STATUS OF SOILS

Results of microbial analyses of the soil samples are presented below. Results of microbiological parameters are shown on the table below.

**TABLE 4.10: MICROBIOLOGICAL PROPERTIES OF SOIL SAMPLES**

S/N	Sample ID	THB Cfu/sg	HUB Cfu/g	HBC Cfu/g
1	SS1(0-15cm)	4.22x10 <sup>8</sup>	0.1X10 <sup>2</sup>	28X10 <sup>3</sup>
2	SS1(15-30cm)	4.20x10 <sup>8</sup>	0.1X10 <sup>2</sup>	24X10 <sup>3</sup>
3	SS2 (0-15cm)	4.21X10 <sup>8</sup>	0.1X10 <sup>2</sup>	90X10 <sup>3</sup>
4	SS2 (15-30cm)	3.16X10 <sup>8</sup>	0.1X10 <sup>2</sup>	93X10 <sup>3</sup>
5	SS3 (0-15cm)	5.33X10 <sup>8</sup>	0.1X10 <sup>2</sup>	42X10 <sup>3</sup>
6	SS3 (15-30cm)	4.29X10 <sup>8</sup>	0.1X10 <sup>2</sup>	38X10 <sup>3</sup>
7	SS4 (0-15cm)	4.62X10 <sup>8</sup>	0.1X10 <sup>2</sup>	48X10 <sup>3</sup>
8	SS4 (15-30cm)	3.61X10 <sup>8</sup>	0.1X10 <sup>2</sup>	52X10 <sup>3</sup>
9	SS5 (0-15cm)	4.25X10 <sup>8</sup>	0.1X10 <sup>2</sup>	30X10 <sup>3</sup>
10	SS5 (15-30cm)	4.25X10 <sup>8</sup>	0.1X10 <sup>2</sup>	24X10 <sup>3</sup>
11	SS6 (0-15cm)	4.30X10 <sup>8</sup>	0.1X10 <sup>2</sup>	24X10 <sup>3</sup>
12	SS6 (15-30cm)	4.22X10 <sup>8</sup>	0.1X10 <sup>2</sup>	24X10 <sup>3</sup>
13	SS7 (0-15cm)	5.12X10 <sup>8</sup>	0.1X10 <sup>2</sup>	32X10 <sup>3</sup>
14	SS7 (15-30cm)	5.16X10 <sup>8</sup>	0.1X10 <sup>2</sup>	31X10 <sup>3</sup>
15	SS8 (0-15cm)	5.33X10 <sup>8</sup>	0.12X10 <sup>2</sup>	43X10 <sup>3</sup>
16	SS8 (15-30cm)	5.10X10 <sup>8</sup>	0.1X10 <sup>2</sup>	40X10 <sup>3</sup>
17	SS9 (0-15cm)	5.22X10 <sup>8</sup>	0.5X10 <sup>1</sup>	51X10 <sup>3</sup>
18	SS9(15-30cm)	5.60X10 <sup>8</sup>	0.1X10 <sup>2</sup>	52X10 <sup>3</sup>
19	SS10 (0-15cm)	4.22X10 <sup>8</sup>	0.01X10 <sup>1</sup>	28X10 <sup>3</sup>
20	SS10(15-30cm)	4.40X10 <sup>8</sup>	0.01X10 <sup>1</sup>	25X10 <sup>3</sup>
21	SS11 (0-15cm)	3.60X10 <sup>8</sup>	1.1X10 <sup>2</sup>	45X10 <sup>3</sup>
22	SS11(15-30cm)	3.85X10 <sup>8</sup>	1.0X10 <sup>3</sup>	50X10 <sup>3</sup>
23	SS12(0-15cm)	4.21X10 <sup>8</sup>	1.5X10 <sup>3</sup>	28X10 <sup>3</sup>
24	SS12(15-30cm)	4.21X10 <sup>8</sup>	0.5X10 <sup>2</sup>	24X10 <sup>3</sup>

Soil samples were examined for the presence of heterotrophic bacteria and fungi as well as hydrocarbon utilizing microorganism whose population may be affected by the project activities. Heterotrophic and hydrocarbon utilizing bacterial species encountered in majority of the sampling locations includes *Bacillus* sp., *Flavobacterium* sp., *Clostridium* sp., *Pseudomonas* sp. The predominant yeast/ fungi identified includes: *Saccharomyces* sp., *Penicillium* sp., *Aspergillus Niger*, *Aspergillus flavus*, *Fusarium* sp., *Rhizopus stolonifer*.

These identified microbial groups are associated with organic transformation and recycling in soils of the project area. No significant difference was observed in the heterotrophic microbial population in topsoil and subsoil. This might be attributed to the even distribution of organic nutrients in soil in the project area.



#### **4.10 AQUATIC STUDIES/HYDROLOGY**

Apata just like Ibadan city sits on a rolling topography with the basement rock types characterized by low porosity and permeability. The main rivers draining Ibadan are Ogunpa, Ogbere and Ona rivers with their tributaries, amongst which are the River Maje, Elere, Alaro, Alapata, Omi, Kudeti, etc. The city area sits on the basement complex rocksuit comprising older granite, quartz schists/quartzite and gneiss. There are ridges of quartzite/quartz schists, inselbergs of gneiss and older granite. These rocks are quite old predating the Pan African orogeny. Each rock type possesses its own typical failure plane. Gneiss foliations are marked by alternating white and black bands. In quartzite, micaceous bands constitute possible failure planes. The granite and granite gneiss complex have high residual stress, sub aerial weathering which enhances anisotropy. They also have deformability modules which vary non-linearly with micro-petrographic quality index.

##### **4.10.1 WATER RESOURCE STUDIES**

In arid and semi-arid regions, the search for water which are under increasing stress from the growing human population, poses a great challenge due to its scarcity. Groundwater, as a dynamic system, is located beneath the Earth surface and moves under the control of many factors, which are influenced by forces that are dependent on hydrogeology, hydrology, and climatology. Recharge, as one of the factors controlling the situation and fluctuation of groundwater, is an important parameter that needs to be assessed more fully. Recharge, occurring in small and large scales, spatially and temporally, is influenced by several factors, such as meteorology, soil characteristics, geology, surface cover, slope, and depth of the groundwater level. Groundwater recharge estimation from precipitation is an integral part of hydrology and hydrogeology. Although, precipitation is the most important source of groundwater recharge the accuracy of currently attainable techniques for measuring recharge are not completely acceptable.



**PLATE4.3 : CONSULTANTS CONDUCTING GROUND WATER SAMPLING**

**TABLE 4.11: PUBLIC HEALTH IMPACTS OF WATER PARAMETERS**

<b>PARAMETER</b>	<b>POTENTIAL IMPACT ON ENVIRONMENT</b>
Turbidity, colour, taste and odour	Aesthetically offensive and impair light penetration-thus productivity and quality
Temperature	High temperatures harmful to aquatic life
DO	Fish and other aquatic organisms need DO in water to survive and lack of O <sub>2</sub> portends problem
BOD	As biodegradable organic matters are metabolized by bacteria and other microorganisms, oxygen is consumed. The microbes consume the DO in water and so reduce it. The extent to which they do this is the BOD. Therefore, BOD should not be too high.
COD	This is like BOD but refers to the metabolization of all organics including non-organic substances. COD values are always higher than BOD values for the same sample.
TDS	May cause taste problems, hardness, corrosion, or aesthetic problems, if the TDS is too high.
TSS	Causes turbidity
Hardness	Hardness causes scale deposits in hot water pipes and difficulty in producing lather with soap. On the other hand, very soft water tends to increase corrosion problems in metal pipes, and, some health officials believe, the incidence of heart disease.
Fluorides	Contributes to good dental health in moderate amounts. Discolours teeth at higher concentrations.
Chlorides	Not harmful but have salty taste.

Sulphate	Has objectionable taste, may have laxative effects. In wastewater can result in offensive odours from the formation of Hydrogen Sulphide. Also leads to corrosion in water pipes.
Nitrogen	Excessive nitrate concentrations in surface waters encourage the rapid growth of microscopic plants called algae; excessive growth of algae degrades water quality. This problem is called eutrophication.
Phosphorous	Like Nitrogen, phosphorous also leads to eutrophication in lakes. It has little effect on health in drinking water.
Toxic substances	The heavy metals Cd, Cr, Pb, Hg, Ag, Be, as also As and Se are toxic, that is, they are poisonous inorganic elements.
Coliforms and E. coli	Biological indicators of water pollution.

Source : Nathanson et al, 1997

#### 4.10.2 GROUND WATER LABORATORY RESULTS

Three ground water samples were taken for analysis by the EIA study team. The ground water sampling was conducted at three points from one borehole and two wells within the project location. The insitu parameter values for ground water like pH, electrical conductivity, temperature, TDS & dissolved oxygen were measured with the results as shown below. From the insitu measurement, the pH of the ground water samples were slightly acidic within the required range of (4.80-5.82), conductivity values ranged from 1150-2850 $\mu$ S/cm, and Total Dissolved Solids values ranged from (575-1210mg/L).

**TABLE 4.12: GROUND (BOREHOLE) WATER SAMPLE COORDINATES**

S/N	GROUND WATER	SAMPLE DESCRIPTION	CO-ORDINATES (UTM)	
			E	N
1	Well Water (W1)	Well water	588123.0	818002.6
2	Well water(W2)	Well water	588139.1	817988.7
3	BH	Bore hole water	588133.2	817983.9

**TABLE 4.13: PHYSICOCHEMICAL LABORATORY ANALYSIS RESULT FOR GROUND WATER (WELLS AND BOREHOLE) SAMPLES**

SIN	PARAMETERS	WELL 1	WELL 2	BOREHOLE	DPR	FME
1	pH	4.80	5.10	5.82	8.5	6-9
2	Colour (Pt -Co)	5.85	5.40	12	NS	NS
3	Conductivity, pScml	1210	2850	1150		2100
4	Salinity.(‰)	ND	ND	ND		NS
5	Odour	Odourless	Odourless	Trace		NS
6	Cl mg/l	12	10	14		600
7	COD, mg/L	15.8	28.4	9.41	80	80
8	BOD mg/l	4.80	12.1	28		30
9	TDS mg/l	810	1210	575		2000
10	TSS, mg/l	25.1	22.8	28.2		30
11	Nitrate, mg/L	104	15.1	12.4	50	25
12	Phosphate, mg/L	1.10	1.25	0.155		5
13	Sulphate, mg/L	184	210	110		500
14	Dissolved oxygen, mg/L	3.10	4.30	2.80		>2
15	Ammonia (mg/L)	ND	0.01	0.01		NS
16	NO <sub>3</sub> (mg/L)	ND	ND	ND		0.2
17	Phenols (mg/L)	0.1	ND	0.001	0.2	0.2
18	Oil & Grease (mg/l)	3.10	0.001	0.001	10	10
19	Alkalinity (ppm)	15.0	21.2	18.1		NS
20	CN, mg/L	<0001	ND	ND		0
21	THC, mg/L	2.90	0.05	0.01		10
22	Detergent, mg/L	ND	1.0	0.05	10	15
23	Ba (mg/l)	ND	ND	ND	50	
24	Cd (mg/L)	0.001	ND	ND	0.4	
25	Cu (mg/l)	Trace	ND	ND	15	
26	Fe (mg/l)	0.01	0.001	0.01		3.0
27	Mn (mg/l)	0.1	0.22	0.18		
28	Ni (mg/l)	0.001	0.001	Trace	15	
29	Pb (mg/l)	0.001	ND	ND	15	
30	Cr (mg/l)	0.01	ND	0.001	1	

31	V(mg/l)	ND	ND	ND		
32	Zn(mg/l)	ND	ND	1.05	6.5	

**mg/L:** Milligram per Litre;

**µS/cm:** Micro Semen per Centimetre

**°C:** Degree Centigrade

**FNU:** Formazin Nephelometric Units

**NS:** Not specified

#### 4.10.3 PARAMETERS OF WATER QUALITY (NATHANSON, 1997)

The parameters that measure the quality of water may be grouped into three, namely, physical, chemical, and microbiological.

##### PHYSICAL PARAMETERS

The physical parameters are turbidity, temperature, colour, taste and odour.

**Temperature:** Fish and other aquatic organisms require certain levels of temperature to live and reproduce. The optimum temperature depends on the species of fish or organism and then on the chemical/physical nature of the water.

**Colour, Taste, and Odour:** These are physical characteristics that are important for the quality of the water. Although they do not cause direct physical harm, most people would object strongly to water that offends their sense of sight, taste, and smell. Too much colour impairs light penetration in a body of water and could affect the food chain.

##### CHEMICAL PARAMETERS

The chemical parameters are Dissolved Oxygen (DO), Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Total Suspended Solids (TSS), Total Dissolved Solids (TDS), Hardness, asbestos or any dust system containing fibers of the correct size, namely 0.1 µ m diameter and 2-20µm long, the heavy Metals, Aluminum (Al), Iron (Fe), Manganese (Mn), Lead (Pb)), the eight trace elements, (As, Cd, Cu, Cr, Pb, Hg, Ni, and Zn). Trace elements are elements that are generally present only in small quantities in natural systems. The other parameters are the anions (Fluorides, Chlorides, Sulphate, Nitrogen, Phosphorus), Acidity, Alkalinity and pH, Toxic and radioactive substances. The values of these parameters are as stated on the above table. The values of sulphate ranged from 110-210mg/L, Nitrate values ranged 10.4 & 15.1mg/L, chlorides values ranged from 10 & 14mg/L.

## **Metals & Heavy metals**

Iron content in the borehole water samples ranged from 0.001 & 0.01mg/L, The lead (Pb) contents ranged from <0.001mg/L, Zinc value was 1.05mg/L, Cadmium was <0.01mg/L, Nickel value was <0.001mg/L, Copper value was not detected, and the value of Chromium ranged from <0.001-0.01mg/L.

### **4.11 LAND USE/COVER & OWNERSHIP**

The land use pattern and land cover are driven by a variety of socio-economic, political, cultural, technological, and bio-physical factors. Land cover change is one of the most important variables of environmental change and represents the largest threat to ecological systems. Ido as the Local Government Area playing host to the proposed project is characterized by remarkable growth in population, expansion and developmental activities which have resulted in increased land consumption and alteration of the land. The increasing concern for the management of natural resources in recent times has been necessitated by the increase in demographic pressure and its associated anthropogenic activities which have led to serious environmental stress and ecological instability.

The foremost land-use and cover of the proposed project area and the host community is forestry, agriculture, and built-up areas (the built-up areas are mainly settlements and low & medium scale businesses). The land use within Apata Local Government Area is predominantly for farming, small scale businesses and housing development. Land ownership is freehold system within the Ibadan, Oyo State.

#### **4.11.1 FARMLANDS**

Majority of the indigene are predominantly peasant farming and fishermen/women. They occurred as small, cultivated plots and as plantations. The farmers cultivated crops such as pepper (*Capsicum sp*), sweet potatoes (*Ipomea batatas*), plantain (*Musa Paradisiaca*), groundnut (*Arachis hypogea*), banana (*Musa Sapientum*), cassava (*Manihot esculenta*), cocoyam (*Colocasia esculenta*), water yam (*Dioscorea Alata*), coconut (*Cocos nucifera*), okra (*Hibiscus esculentus*), sugarcane (*Saccharum Officinarum*), pineapples (*Ananas comosus*), maize (*Zea Mays*), and vegetables.



PLATE 4.4: FOOD CROPS WITHIN PROJECT LOCATION

#### 4.12 SITE'S NATURAL CHARACTERISTICS

The climate in the State favours the cultivation of crops like Maize, Yam, Cassava, Millet, Rice, Plantain, Cocoa tree, Palm tree and Cashew. The proposed site is on a well-drained, dry with gentle slope prone to sheet erosion, which is characterised by Rain Forest Zone with vegetations, trees and food crops like, oranges, pawpaw, cassava and other leguminous plants. The proposed project location is a built-up area with SMEs businesses.



**PLATE 4.5: PHYSICAL STRUCTURES WITHIN THE PROJECT LOCATION**

#### **4.12.1 THE BIOPHYSICAL ENVIRONMENT**

The following components of the biophysical environment were investigated:

- Climate and meteorology
- Air quality and noise
- Vegetation
- Land use/cover
- Wildlife
- Geology and hydrogeology, including groundwater quality
- Soil quality
- Aquatic studies
- Hydrobiology and fisheries

#### **4.13 TOPOGRAPHY, ECOLOGY AND GEOLOGY OF AREA**

The topography of the proposed project location is flat with gentle slope. The project area is on a low land. Various forms of morphological units and depositional



environments have been recognised in the study area, ranging from coastal flats, sand bars, ancient/modern sea, river and lagoon beaches, flood plains, seasonal flooded depressions, swamps, ancient creeks and river channels. The geographical landscape of the area and the entire state comprises extensive fertile soil loamy soil suitable for agriculture, because of the presence of grasses it is suitable for cattle rearing and farming. The adjoining area is predominantly savannah ecosystem. There are also vast forest reserves, rivers, lagoons, rocks, mineral deposits. Geologically, extensive deposits of sandstone, mineral deposits occur within the Local Government and the State. A topographic map is a two-dimensional representation of the Earth's three-dimensional landscape. It is a two-dimensional representation of a portion of the three-dimensional surface of the earth. Topography is the shape of the land surface, and topographic maps exist to represent the land surface. The presence of basement complex rocks has resulted in the formation of an inselberg landscape. This landscape is undulating and marked by numerous domed-shaped hills and by occasional flat-topped ridges. Summits reach between 300 and 700m. Elevation is generally increased northwards from approximately 150m to nearly 500m. Oyo State is entirely underlain with Precambrian basement complex rocks. Undifferentiated quartzo-feldspathic biotite and hornblende-bearing gneisses, schist's and migmatites dominate the basement complex. Intercalated among the gneisses and migmatites are numerous supracrustal relics which are referred to as the older metal sediments in Nigeria. They are structurally.

#### **4.14 VEGETATION COVER AND WILDLIFE**

The vegetation pattern of Oyo State is that of rain forest in the south and guinea savannah in the north. Thick forest in the south gives way to grassland interspersed with trees in the north. There are coastal barrier highland forests and mangrove forests. Coastal barrier highland forest vegetation is restricted to the narrow ridges along the coast. This vegetation belt is characterized by low salinity-tolerant freshwater plants. The assessment of the vegetation was done to identify the types of plants, crops, grasses that are found within the study area. This was done through visual inspection and observation along the project area. Inventory of plants species on the project area was taken at intervals. The characterization, identification and classification of the plant species and communities were undertaken both at the field and with reference materials. The ecological zone is made up of mixtures of trees, shrubs, herbs, grasses, and food crops. The floristic composition is highly diverse in species even over a relatively homogenous area. It consists of typical southern Guinea Savannah genera with its herbaceous species and grasses.



**PLATE 4.6: VEGETATION WITHIN THE PROJECT LOCATION**

#### **4.14.1 SURVEY PROCEDURE**

The vegetation study in the proposed project location was conducted by trekking and wading round the green area on foot with guards from the village introduced to us who accompanied us as guides. Identification of the vegetation types was done and recorded.

#### **4.14.2 FIELD OBSERVATIONS**

The proposed project site is an existing built-up factory with perimeter fence which was been used for manufacturing before it was abandoned. The road leading to the proposed located is untarred earth road. Most of the plant species observed in the forest areas were of economic and medicinal value as shown below. The grasses was encountered comprised trees and shrubs such as *Musa sapientum*, *Elaeis guineensis*, *Ficus mucoso*, *Bambusa vulgaris*, *Musa sapientum*, *Spondias mombin*, *Carica papaya*, *Vernonia amygdalina*, *Thevetia neriifolia*, *Ricinus communis*, *Phyllanthus reticulata*, *Abelmoschus esculentus*, *Tabernaemontana brachyantha*, *Malvastrum coromandelianum*, *Senna obtusifolia*, *S. hirsuta*, *S. occidentalis*, *Solanum erianthum*, *Sida rhombifolia*, *S. acuta*, *S. corymbosa*, *Chromolaena odorata*. The grasses and sedges found in the transect were *Mariscus alternifolius*, *M. fabelliformis*, *Cyperus esculentus*, *C. iria*, *C. rotundus* *Panicum laxum* *P. maximum*, *Axonopus compressus*, *Dactyloctenium aegypticum*, *Echinochloe colona*, *Oplismenus burmannii*, *Setaria barbata*, *Zea mays*, *Saccharium sp*, *Sorghum arundinaceum*, and *Eragrostic tenella*. Others were plants mainly weeds such as *Acalypha fimbriata*, *Gomphrena celosioides*, *Euphorbia hirta*, *Alternanthera sessilis*, *A. brasiliana*, *Aerva lanata*, *Celosia isertis*, *Amaranthus spinosus*, *A. hybridus*, *Ipomoea triloba*, *I. involucrata*, *I. mauritiana*, *Corchorus olitorius*, *C. aestuans*, *Heliotropium indicum*, *Phyllanthus niruri*, *P. muellerianum*, *Portulaca oleracea*, *Agerantum conyzoides*, *Asystagia gagentica*, *Ruelia tuberosa*, *Physalis angulata*, *Biden pilosa*, *Boerhavia coccinea*, *B. diffusa*, *Eclipta alba*, *Trianthema portulacastrum*, *Vigna unguiculata*, *Croton lobatus*, *Lagenaria breviflorus*, *Laportea ovalifolia*, *Talinum triangulare*, *Tithonia diversifolia*, *Sclerocarpus africanus*, *Abutilon mauritianum*, *Cyathula prostata*, *Oldenlandia corymbosa*, *Commelina benghalensis*, *C. africana*, *Synedrella nodiflora*, *Desmodium scorpiurus*, *Tridax procumbens* and *Luffa cylindrica*.



PLATE 4.7: FOOD CROPS WITHIN THE PROJECT SITE

TABLE 4.14: LIST OF SOME SELECTED COMMON ECONOMIC TREES/PLANTS IN THE STUDY AREA

S/N	Scientific Name	Family Name/ Species	Common Name	Economic Value
1	Acanthaceae	Asystasia Ganetico	Hunter's Greens	
2	Bambusa Vugaris	-	Bamboo	Craft work, stake for yams
3	Carica Papaya	-	Pawpaw	Fruits used as food
4	Mangifera indica	Anacardiaceae	Mango	Edible fruit, Medicinal
5	Citrus Aurantium	Rutaceae	Orange	Edible fruit
6	Elaeis Guineensis	Palmae	Oil palm	Edible, broom, sponge etc.
7	Combretaceae	Terninalia Cataps	Almond	
8	Convolvulaceae	Impomoea Triloba		poultice in the treatment against headaches

9	Pennisetum Purpureum	-	Elephant grass	Pasture
10	Cocos Nucifera	Palmae	Coconut	The fruits are edible, used for body oil
11	Imperata Cylindrica,	-	Spear grass	Pastural farming
12	Axonopus Affinis	-	Carpet Grass,	Pastural farming
13	Sida Acuta	Malvaceae	Wireweed	Pastural farming
14	Eupatorium Odorantum	Asteraceae	Siam Weed	Medicinal
15	Raphia Farinifera		Raffia Palms	Housing, drink etc
16	Talinum fruticosum	Talinaceae	Talinum Triangulare	

**TABLE 4.15: LIST OF SOME SELECTED FOOD CROPS ENCOUNTERED IN THE STUDY AREAS**

S/N	SCIENTIFIC NAMES	COMMON NAMES	ECONOMIC VALUE
1	Anacardium occidentale	Cashew	Edible
2	Magnifera Indica	Mango	Edible
3	Saccharum Officinarum	Sugar cane	Edible
4	Musa Parasidiaca	Plantain	Edible
5	Vernonina Amygdalina	Bitter Leaf	Edible and medicinal
6	Citrullus lanatus	Melon	Edible
7	Vernonia Amygdalina	Bitter leaf	Edible
8	Solanum Melongena	Garden egg	Edible fruits
9	Xanthosoma Sagittifolium	Cocoyam	Edible
10	Cola Nitida	Kola	Edible, drug and stimulant
11	Psidium Guajava	Guava	Edible
12	Saccharun Officinarum	Sugar cane	Edible
13	Elaeis Guinensis	Oil Palm	Edible, soap production
14	Zea Mays	Maize	Edible cobs
15	Lycopersicon esculentum	Tomato	Edible vegetable
16	Talinum Triangulare	Waterleaf	Edible
17	Citrus aurantiifolia	Lime Orange	Edible
18	Musa Sapientum	Banana	Edible
19	Carica Papaya	Pawpaw	Edible
20	Manihot Esculenta	Cassava	Edible tubers, used in textile industry
21	Abelmoschus Esculentus	Okro	Edible fruits

22	Capsicum	Pepper	Edible fruit
23	Corchorus Olitorius	Jute Mallow or bush okra	Edible vegetable
24	Orange	Citrus X sinensis	Edible fruit
25	Ipomoea batatas	Sweet Potato	Edible tuber

#### 4.14.3 FAUNA

Arthropoda were the most found fauna diversity in the Bambusa vulgaris thicket at the project site. Species such as Crabs digging holes by the River, Soldier ant; Spider, Millipede and Centipede were documented at the site, while snail was the only Mollusca found. The Amphibians is dominated by Bufo regularis and Frogs while Reptilia encountered on the site were Alligator, Lacertilia sp and Furcifer pardalis. Aves documented were Dove, Chicken, little weaver and Broad winged hawk. Most of the species are classified as lower risk. Six species of Mammalia were documented using both direct and indirect sampling methods; most of them are not resident species due to precarious habitat condition, these are Cat, Rat, Giant cain rat, Squirrel, Goat and Dog. The animal species were made up of 5 Arthropoda (24%), 6 Mammalia (29%), 3 Reptilia (14%), 2 Amphibians (10%) and 4 Aves (14%) and 1 Mollusca (5%) (Table 4.16).

**TABLE 4.16 SOME FAUNA COMPOSITION ENCOUNTERED IN THE STUDY AREAS**

S/No	Animal Name	Class	Scientific Name
1	Spider	Arthropoda	Eriophora
2	Chicken	Bird/Aves	Gallus Gallus domesticus
3	Cat	Mammalia	Felis catus
4	Broad Winged Hawk	Bird/Aves	Buteo platypterus
5	Goat	Mammalia	Capra aegagrus hircus
6	Little weaver	Bird/Aves	Ploceus luteolus
7	Dove	Bird/Aves	Zenaida sp
8	Soldier ant	Arthropoda	Insi formicidae
9	Centipede	Arthropoda	Lithobius sp
10	Snail	Molusca	Achatina fulica
11	Frog	Amphibian	Anura ranidae
12	Told	Amphibian	Bufo regularis
13	Giant cain rat	Mammalia	Papagomys armandvillei
14	Rat	Mammalia	Rattus rattus
15	Squirrel	Mammalia	Sciurus sp
16	Giant cain rat	Mammalia	Papagomys armandvillei
17	Lizard	Reptilia	Lacertilia



**PLATE 4.8: SOME FAUNA WITHIN THE PROJECT SITE**

#### **4.15 SOCIO-ECONOMICS**

The people are predominantly Yoruba. The social organisation revolves around community leaders including the traditional ruler, Community Development Associations (CDA) executives and other opinion leaders. Thus, the issue of the bridge and its attendant impacts on the community are taken up by any or the three groups. This was clearly revealed during the administration of questionnaires and interviews which members of CDAs participated actively

During the Environmental studies, the socio-economic data gathered comprises historical information, cultural norms, land tenure and land use pattern, population and demographic characteristics, health, morbidity, mortality, and fertility, occupations and income distribution, health social and other infrastructure. The Local Government Area in Ido State as the Local Government Area hosting the project has one of the largest crude oil and natural gas deposits in Nigeria. The major Agricultural products are cassava, maize, pepper, sugar cane, vegetables, yam, banana, plantain etc. Most of the farmers are peasants.

#### 4.15.1 SOCIAL INFRASTRUCTURE OF THE STUDY AREA

##### A) WATER SUPPLY

Major complaint in the community was inadequacy and non-functional infrastructural facilities. The community has some basic infrastructural and social facilities including electricity and roads, but they were ineffective hence source of water for domestic use is mainly from wells and boreholes. The bad state of these facilities was obvious during the on-the-spot assessments in the community and during the interactions in various fora that were held with the community members.



PLATE 4.9 A: WATER TANK



PLATE 4.9B: BOREHOLE SOURCE OF WATER

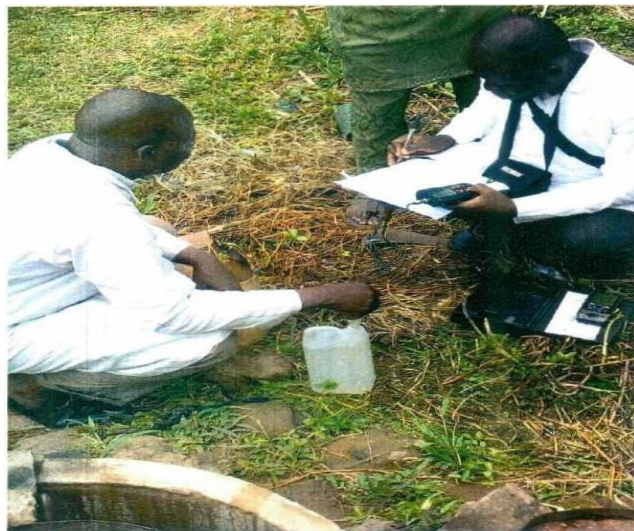


PLATE 4.9C: WELL WATER WITHIN THE PROJECT LOCATION



##### B) ROAD NETWORK

The road networks are mainly tarred roads, and earth (untarred roads) within the project area. The Ibadan-Abeokuta road is a tarred road while the road by the project site is untarred prone to sheet erosion.





**PLATE 4.10A: EARTH ROAD BY THE PROJECT SITE**



**PLATE 4.10B: TARRED ROAD TO PROJECT LOCATION**

#### **D) ELECTRICITY**

There is power supply from the National Grid into the Ido Local Government Area just like other parts of Ibadan city.



**PLATE 4.11: ELECTRICITY POLES WITHIN THE COMMUNITY**



#### **D) TRANSPORTATION**

The major transportation means is land using vehicles, train, motorcycles, bicycle and trekking within the project location as obtainable throughout the Ibadan City.



**PLATE 4.12: MEANS OF TRANSPORTATION WITHIN THE PROJECT LOCATION**

### **E) ETHNIC DISTRIBUTION/CULTURE/RELIGION**

The Oke'Badan Cultural Festival is a colourful event celebrated to commemorate the founding of Ibadanland and show gratitude to the founders. The festival, which means the 'Hills of Ibadan', celebrates how founders, led by Lagelu, originally settled on the hills of Ibadan and later came down to found the Ibadan town itself at the foot of the hills. The festival, which brings together the sons and daughters of Ibadan from far and near, holds on the third Thursday of March of every year. Highlights of the festival include cultural shows, stage plays, beauty pageants and competitions. The indigene of the project location are mainly, Christians, Moslems and traditionalists.

### **F). POLITICAL**

The Ido Local Government council was administered under the sole administratorship system from May to July 1989 and Caretaker Committee system from July 1989 to December 8, 1990. With the formation of the two political parties, Social Democratic Party (SDP) and National Republican Convention (NRC), the administration of Ido Local Government was handed over to democratically elected leaders. The Local Government Council is currently under the Peoples Democratic Party (PDP). Ido Local Government covers the area spanning Apata, Ijokodo, Omi-Adio, Akufo and Apete. It shares boundaries with Oluyole, Ibarapa East, Akinyele, Ibadan South-West and Ibadan North-West Local Governments in Oyo State and Odeda Local Government in Ogun State. The council formerly has six wards, which had been increased to ten for easy exercise of franchise. Among the major towns within the local Government Area are Ijokodo, Ido, Omi-Adio, Apata, Apete, Akufo and Bakatari as well as about 612 villages which include Ogunweide, Dada, Olowofela, Apooyin, Oderemi, Odetola, Erinwusi, Tade, Alagbaa, Iku- senla among others.

**G). EDUCATION**

The project Local Government Council (Ido) plays host to so many schools in the state both private and public teaching institutions. These included the Apete/ayegun Community Boys School( a Government Secondary School), Owode Estate Community High School, Awotan High School, Bakatari Community High School, and United Christain Senior Secondary Omi-adio to mention but a few.

**H) MARITAL STATUS**

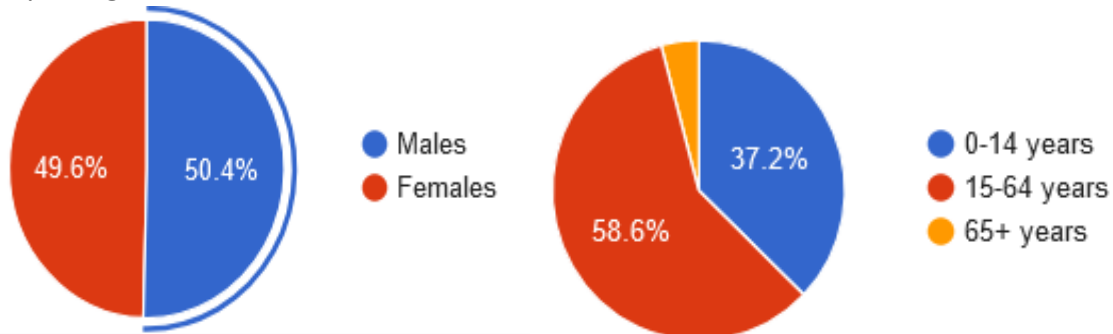
Marriage is an institution initiated by God Himself for procreation and if you are not married at the ripe age it shows some level of unseriousness. During the socio-economic survey, the percentage of married household respondents was higher than the singles within Apata community.

**I) RELIGION/TRADITIONAL INSTITUTIONS**

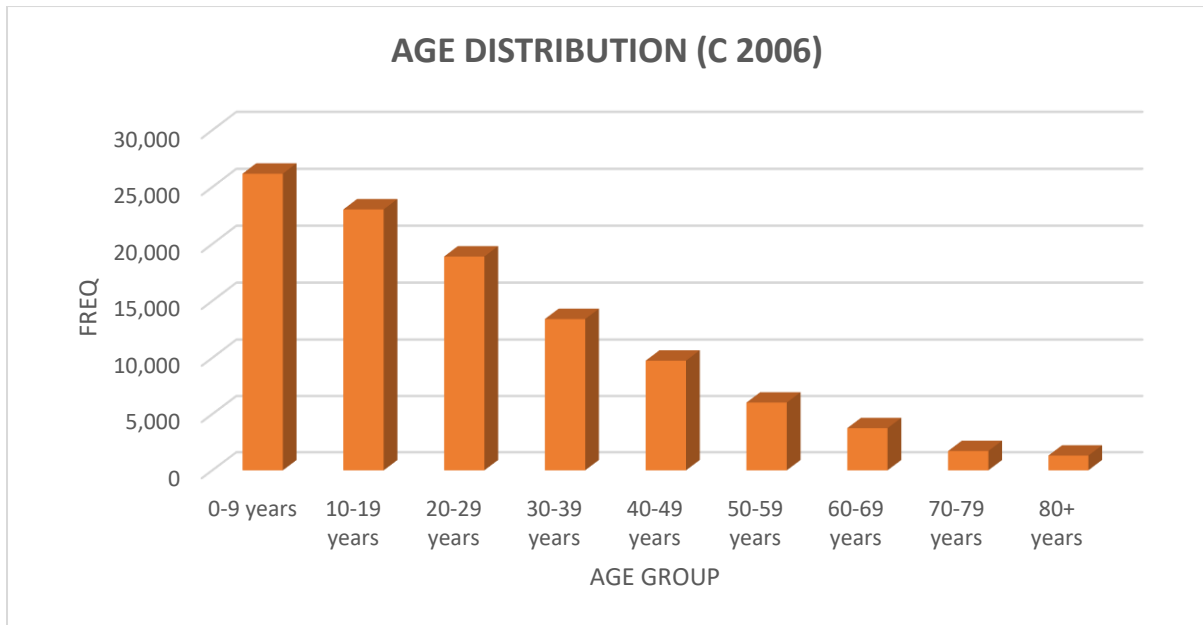
The religious background of the people within the project location is majorly Christianity, with some traditional worshippers. The traditional worshippers believe in the ability of deities to exercise strong influence on the destiny of man. Amongst the traditional activities is mainly the fishing festival held at Sabagreia.

**J) POPULATION**

The proposed project is located within the Ido Local Government Area of Oyo State. According to the 2006 Population census, the population of Ido LGA was 104,087 comprising male (52,465) and female (51,622).



**FIG 4.14: POPULATION DISTRIBUTION OF PROJECT LOCAL GOVERNMENT AREA**



**FIG 4.15: AGE DISTRIBUTION WITHIN THE PROJECT LGA**  
**Source: CENSUS 2006**

#### 4.16 HEALTH STATUS

The prevailing health status of the project area was conducted. There are health facilities within 3km of the project location such as the Government General Hospital and other private hospitals/clinics. Interactions with locals to identify nature of ailment was conducted, the following methods were deployed, and the observations gathered are as stated below, viz:

- Oral interviews
- Physical observations
- Focus Group Discussions (FGD) held separately with adults, women, and youths
- Socio-demographic data, with associated health impact
- Lifestyle/Health behavioural practices
- Common health hazards in the communities
- Immunization status
- General health status.
- Health services/ community health needs
- Environmental/Public health
- Knowledge, attitudes, and practices (KAPs)

#### **4.16.1 HEALTH ASSESSMENT METHODOLOGY**

The environment under study was visited by the study team for consultation during which the elders, youth leaders and women leaders were briefed on the aim and objectives of the study. Questionnaires were distributed to some individuals within the community and discussions were held to gather information. Well-structured questionnaires were applied in the community and this represents 5% of the adult populations. The questionnaires, which addressed some health issues, were randomly applied to ensure that the entire community is covered.

Adult and children of both sexes from the community were physically examined for disease symptoms. Focus group discussions were held separately with representatives and groups in the community and issues on health were discussed using the approved questionnaires for focus group discussing (FGD). The environmental health determinants were studied by walking through the community and observing all health facilities and the environmental factors that contribute to ill health e.g. water, toilet types, projects, light, housing and waste disposal practices. These assessments were done using the approved questionnaires on HIA environmental health studies.

#### **4.16.2 HEALTH IMPACT ASSESSMENT**

##### **Observations / Results**

1. Medical facilities & services are not adequate for the community.
2. There are a few Traditional Birth Attendants (TBA) and traditional healers.
3. Some common prevalent diseases were those common to other cities such as Malaria, Dysentery/ Diarrhoea, cough/URTI Gastroenteritis, Rheumatism /Body pains, Hypertension and Hernia.
4. Some environmental conditions noted to contribute to ill health in the community were light/electricity supply and non- availability of potable water, and the borehole/well that the indigene rely on are owned by a few privileged individuals and from whom all others get water. Other environmental conditions are poor waste disposal practices.

##### **COMMUNITY CONCERNS ON HEALTH**

The community needs better roads, they also need more readily available good drinking water, good electricity supply, good housing and all other modern facilities.

#### **4.17 WASTE MANAGEMENT**

There is poor waste management within the project location, as wastes are dumped in heaps within the project area. Different categories of wastes will be generated during different phases of the proposed project. During the construction phase, the Contractor must make provision for the appropriate removal of waste from the site to a permitted waste disposal facility. The accumulation of construction waste materials on site must be avoided. The waste manager should be the one approved by Oyo State Ministry of Environment. The waste management within the Apata community is common to other areas in Nigeria which is generally poor as solid wastes are disposed in an unkempt manner.

##### **4.17.1 DISPOSAL OF CONSTRUCTION DEBRIS**

The proposed recycling process will harness all the components of the scrap tyres to produce other items. However, each phase of the development will produce solid waste, which shall be managed the disposal of which, if not managed properly could have negative impacts to the site and the surrounding area. Cut vegetation resulting from the clearing of the area could pose a fire hazard and affect air quality if burned on location. Other construction materials including concrete waste, wood, steel, packaging plastics could be dispersed and could end up blocking drainage channels if not disposed of at approved disposal sites.

##### **4.17.2 SEWAGE AND GARBAGE DISPOSAL**

Inadequate provision of portable restrooms and garbage collection bins at the construction site could lead to unsanitary conditions. Resulting impacts could vary from unsightly littering of the site, fly and pests' infestations to increased nutrient levels in the environment.

##### **4.17.3 WASTE DISPOSAL FACILITIES / REDUCTION INITIATIVE**

###### **SOLID WASTE DISPOSAL**

The solid wastes that shall be generated include:

- Empty Containers
- Printer's toners/inks cartridges
- Vegetation from landscaping & foundation laying
- Machine parts
- Stationary wastes (paper, writing materials etc.)

There should be a designated place for the collection of generated wastes where Government approved waste consultants collect and disposes them in the approved dumpsite.

#### **4.17.4 WASTE REDUCTION / MINIMIZATION INITIATIVE**

The waste minimization options that shall be adopted by the scrap tyre recycling plant include;

- The generated metallic wastes shall be sold to other end users for manufacture of other metallic products.
- Use of only good quality raw materials for production
- Optimal use of raw materials to achieve minimum waste generation
- Repair, reuse, sale of waste materials such as wooden pallets, metal scraps plastic kegs, defective products, packaging sacks and drums.
- Meticulous use of water and diesel; recovering and disposal of spent oil.
- Routine checks on pipes and fixtures for fugitive emissions and leakages.

#### **4.17.5 APPOINTMENT OF AN ENVIRONMENTAL OFFICER**

An independent Environmental Officer should be appointed to oversee all environmental aspects relating to the development. He should ideally be appointed during the planning phase and his/her responsibilities will include:

- Auditing of compliance with the EMP (the frequency of audits will be determined during the planning phase);
- Writing of auditing reports and submitting it to FME;
- Liaison with relevant authorities;
- Liaison with contractors regarding environmental management;
- Reviewing of the complaints register that is to be kept on site during the construction phase;
- Liaison with interested and affected parties when complaints need to be addressed;
- Limiting construction activities to the construction areas;
- Waste management;
- Legal compliance with all relevant environmental legislation;

The Environmental Officer shall have the right to investigate the site at any time during the project phases and unexpected visits will be permitted. Weekly/Monthly auditing reports shall also be made available to all the relevant parties.

## CHAPTER FIVE

### PUBLIC CONSULTATION

#### 5.0 INTRODUCTION

The public participation process comprises an important step in identifying issues and expected impacts of the proposed development that may affect the natural and/or socio-economic environment. Consultation as part of the Environmental assessment process is a critical component in achieving transparent decision-making. Public consultations for the proposed scrap tyres recycling plant were conducted as required in the Environmental Impact Assessment Decree. Door to door public consultations were conducted for the residents neighbouring the project site. Questionnaires were also distributed personally to the indigenes to enable us to get the opinion.



PLATE 5.0: RESIDENTS DURING SOCIO-ECONOMIC SURVEY





PLATE 5.1: SOCIO-ECONOMIC SURVEY & HOST COMMUNITY IN THE PROJECT LOCATION

## 5.1 OBJECTIVES OF THE CONSULTATION AND PUBLIC PARTICIPATION

The objective of the Consultation and Public Participation (CPP) is to:

- Disseminate and inform the public and other stakeholders about the proposed mixed residential, institutional, and recreational and facility support infrastructure project with special reference to its key components, location and expected impacts.
- awareness among the public on the need for the Environmental & Social Impact Studies for the proposed project.  
Gather comments, concerns, and suggestions of the interested and, would be affected/ interested parties.
- Ensure that the concerns of the interested and, would be affected/ interested parties were known to the decision-making bodies and the proponent at an early phase of project development planning.
- Establish a communication channel between the interested, would be affected/interested parties, the team of consultants and the Government.
- Incorporate the information collected in the study by EIA Experts.

## **5.2 PROCESS OF ENGAGEMENT**

Public, or stakeholders' and Interested and Affected Parties' (I&AP's) participation formed an integral part of this EIA process. The main purpose of which was to:

- present the intended development as known to the consultants to all stakeholders, and IAP;
- provide stakeholders and IAP with information on the intended development that may bear directly on their health, welfare, and quality of life;
- enable stakeholders to make an informed and objective decision concerning the intended development;
- provide stakeholders and IAP the opportunity to raise their concerns regarding the intended development; and
- record the issues and concerns of stakeholders and IAP.

## **5.3 NOTIFICATION**

The following means were used to inform stakeholders and I&AP's of the proposed development:

- The project was registered with the Federal Ministry of Environment, Abuja
- Letter of invitation for stakeholder's workshop
- Focused group discussion
- House to house consultation

## **5.4 OPPORTUNITIES**

The following opportunities were available to contribute/comment:

- Registration of the Environmental & Social Impact Assessment with Federal Ministry of Environment by getting the list of requirements, preparation of Terms of reference and accompanied by evidence of Remita payment into single treasury account and communication with the consultant.
- Registering comments/concerns raised by stakeholders.

## **5.5 STAKEHOLDERS, INTERESTED AND AFFECTED PARTIES/CONSULTATION**

The local communities most likely to be impacted by the project include Apata, Owode, Ologuneru, Abapanu, Oluode, Powerline and Agbojo in Oyo State. It was not convenient to have a single meeting of representatives of the neighbours and stakeholders, hence the Socio-economic team, the environmental consultant decided to visit neighbours in turns, to meet and obtain their views on the project. The facility has very few neighbours; a few residential houses in a settlement in the Neighborhood. Commercial buildings were sited around the facility. Questionnaires were distributed to the residents and those that may be affected by the project for their comments within project area.

### **5.5.1 ISSUES/COMMENTS**

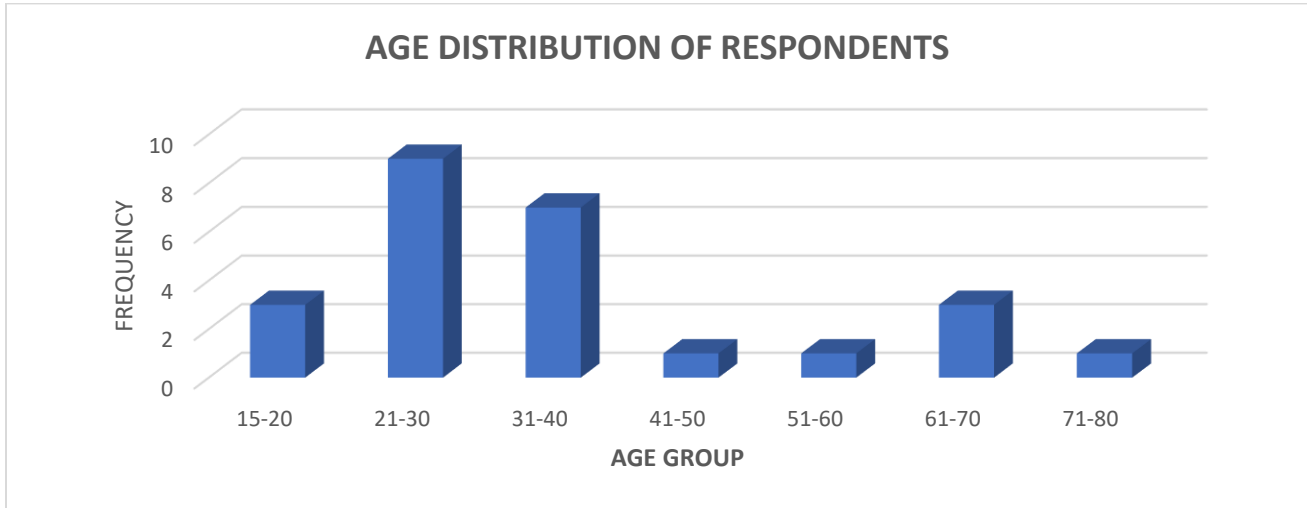
At the meetings, the environmental consultant informed the neighbours that:

- i. The proponent was planning to establish a used hydrocarbon recycling plant
- ii. The planned development was likely to impact positively and/ or negatively on them their businesses and environment, hence the need for the meeting for them to discuss and express their opinions
- iii. They had been commissioned to carry out an Environmental Impact studies study of the activity
- iv. The natural biophysical and built-up environment of the area would be studied by a team of scientists to assess the environmental impacts
- v. They were being informed beforehand for them to give definite qualified/unqualified approval or frank criticism of the proposal.

## **5.6 OUTCOME OF SOCIO-ECONOMIC SURVEY:**

### **Questionnaire Administration during consultation**

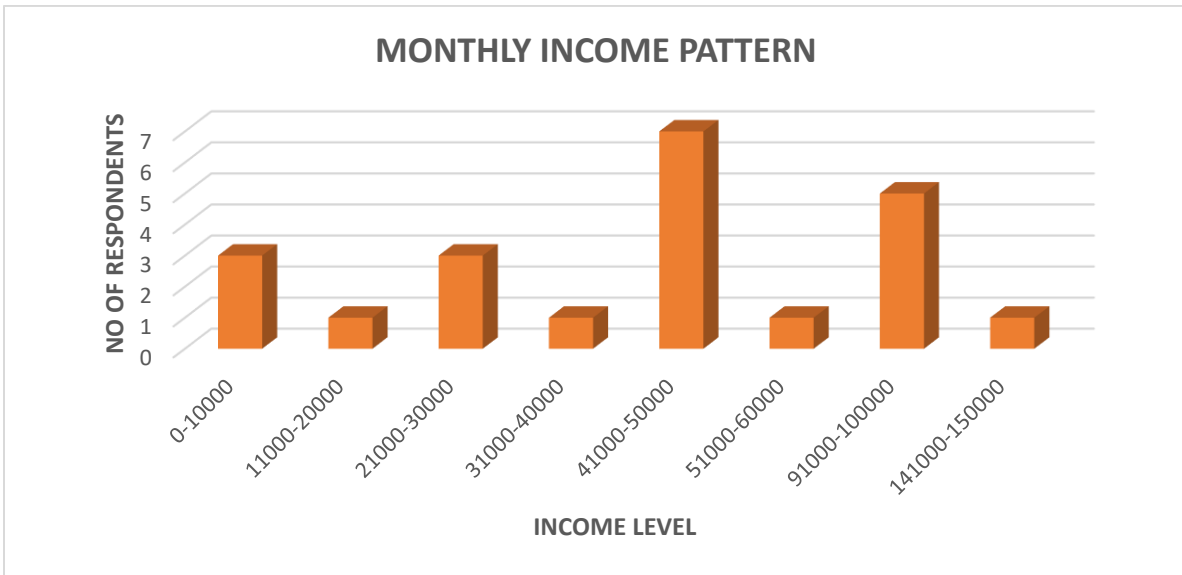
Questionnaires were also distributed to the indigenes to enable us to get the opinion. About twenty six(26) questionnaires were personally distributed due to the nature of the project area while guiding them how to fill the questionnaires. The questionnaires were analyzed and data presented below. 26 responded to the questionnaire of the total number given. From the Histogram, 20 respondents are within the age range of 18years to 30 years, 30 respondents within age 31 years to 50 years, 12 respondents within age 51years to 70years while 2 respondents are within 71 years to 90 years respectively.



**FIG 5.0: SOCIO- ECONOMIC SURVEY QUESTIONNAIRE**

**INCOME PATTERN**

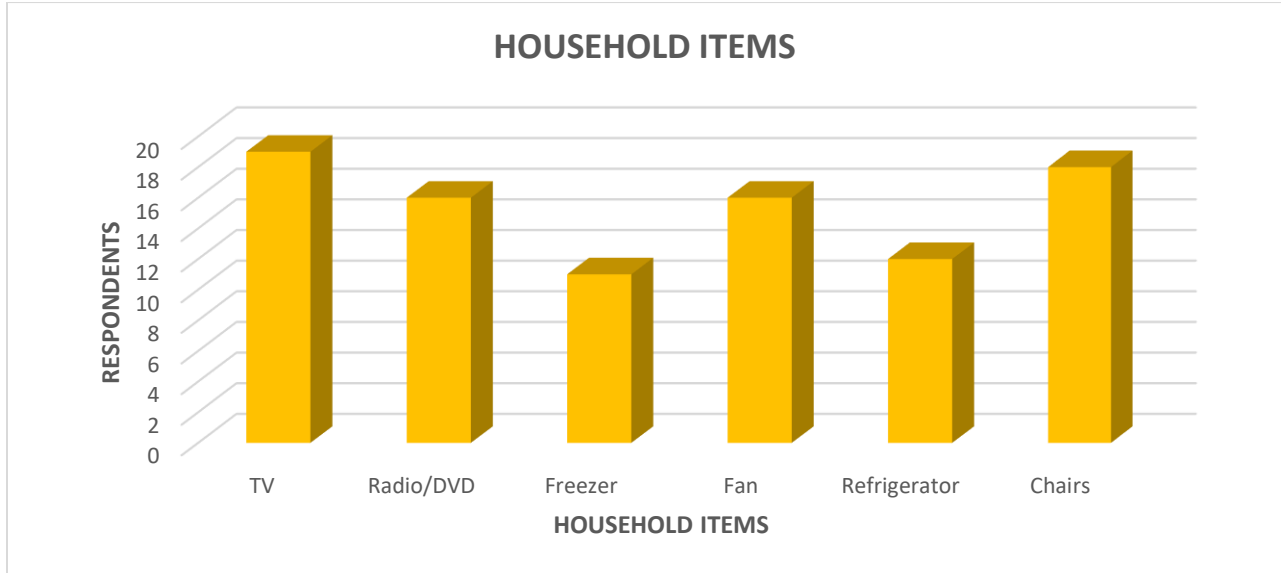
About 14% of respondents fall within monthly Income less than N0.0-10,000, while 5% fall within a monthly income between N11,000-20,000. 14% respondents fall each within monthly income limit of N21,000- 30,000, while 32% falls within N41,000-50,000 monthly income, 23% respondents fall within 91,000-100,000 and so on. Details are shown in Figure 5.1.



**FIGURE 5.1: INCOME PATTERN OF POPULATION**

**HOUSEHOLD ITEMS OWNED BY INDIGENE:**

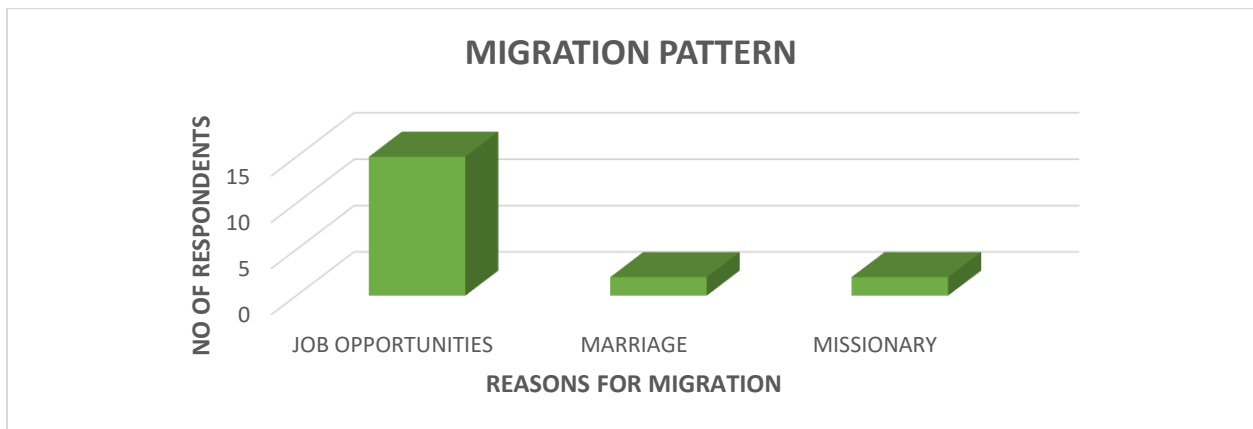
The socio-economic survey conducted, it was observed that most of the respondents do possess the radio/transistor, musical equipment, television, refrigerators, fans, etc., this is shown as below.



**FIGURE 5.2: HOLDING OF DURABLE COMMODITIES**

**MIGRATION:**

The data gathered from the socio-economic survey, there are reasons for migration out of Apata community, which is hinged solely on the quest to seek greener pastures to better their lives, to be close to their respective families or friends; religious reasons. Another factor identified is that some family influences their member to moves abroad for better adventure and many adventure-seekers stay in other communities and start a new life in the chosen community. Marriage was another reason for migration.



**FIGURE 5.3: MIGRATION PATTERN**

## WOMEN INVOLVEMENT AND DECISION MAKING

From the socio-economic survey conducted it was observed that women are involved in almost all the activities. The histogram below shows activities that women are involved and the reasons for involvement. The major reason for women involvement is to support the family.

Within the project area and the community, it was observed that women are involved in decision making in consensus with men. The sectors where women consensus with men involved in decision making in different sectors like:

- Family Financial Matters;
- Education to Child;
- Health care to child;
- Purchasing of any asset;
- Day to day activities;
- Social functions and marriages.
- Local governance

Males are the final decision maker in financial matters, purchase of asset and local governance. From our Survey women are not discriminated in any way, they are allowed to work and involved in decision making.

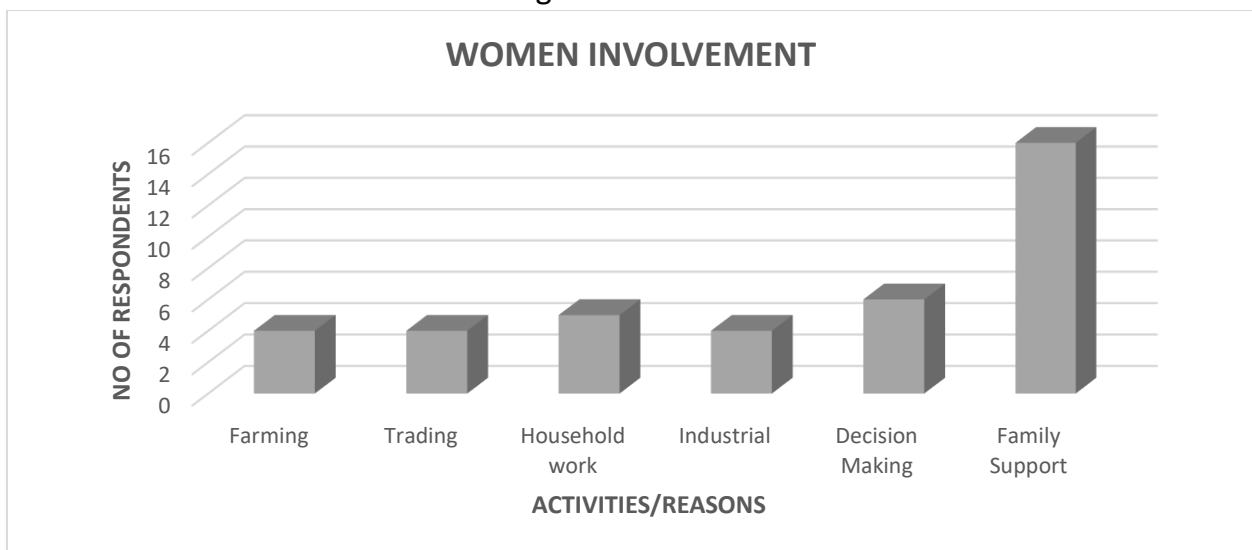


FIGURE 5.4: WOMEN INVOLVEMENT

### **COMMUNITY PERCEPTION ABOUT THE PROJECT**

The Apata community is in total support of the proposed project as it will create good business and employment opportunities to the host community. From survey, the Host community are of the opinion that once the proposed project is established, it will bring about creation of jobs, improve general wellbeing of the host community, availability of products to the indigenes. The project is a welcome development in the community.

### **HEALTH IMPACT ASSESSMENT (HIA)**

Every settlement has its peculiar environmental factors influencing the health of the inhabitants and these factors become deleterious it creates health challenge. The health of a community is the cumulative health status of the individual person in Apata community. The health status of the community is affected by various contributing factors in the environment as well as within the household. The physical environment, income level, level of education, social support system, individual metabolism and genetics as well as individual health habits and available health services all determine the health of those within the project area. The health impact assessment of the host community was done during the environmental study. The report reflects the poor quality of health care available in the study area. A closer look at the health seeking behaviour of the study population revealed that self-medication; visits to patent medicine stores, traditional birth attendants and alternative medical practice are key practices that define their health care situation.

### **MORBIDITY AND MORTALITY**

Several factors contribute to the morbidity and mortality pattern of a given locality and such factors include poverty level, infectious diseases, inadequate health facilities, poor housing, unsanitary environmental conditions, and nutrition. Survey results indicate that members of the project area suffer from several conditions and sicknesses. The most common conditions include: Malaria, diarrhea diseases (including dysentery), tuberculosis, respiratory tract infections, typhoid fever, and hypertension.

## CHAPTER SIX

### ASSOCIATED AND POTENTIAL ENVIRONMENTAL IMPACTS

#### 6.0 INTRODUCTION

This Chapter contains summary of impacts that are inherent with the project because of the interaction between various project components and environmental elements. The method of impact identified and evaluated is also given in this chapter. A number of potential impacts associated with the proposed development have been identified through the public participation process, baseline data acquisition process, biophysical specialist assessment and one-one interaction. The impacts cover all project phases, i.e. planning and design, preconstruction, construction, and operation. Environmental impacts can be direct or indirect and they are either positive or negative in nature. Direct impacts are impacts directly associated with the projects; its effects are felt immediately as a result of initiating the project. While indirect impacts are consequences not directly caused by the project, but its existence indirectly lead to some effects. All these forms of impacts were identified, and mitigation measures are initiated.

#### 6.1 IMPACT QUANTIFICATION AND DETERMINATION OF SIGNIFICANT IMPACTS

Hazards can be assessed by:

- Identifying all materials stored which are classified as hazardous, their quantities and proposed safe storage and handling (e.g. fuel, raw materials, lubrication oils for maintenance and laboratory testing chemicals);
- Identifying potential hazards from fire, explosion or release of chemicals or polluted waters, natural occurrences such as floods, storms, and landslip. (e.g. handling of fuels and packaging using high pressure, protection of storages from runoff waters, maintenance of discharge system for effluents, maintenance of machinery and abatement for air emissions, prevention of dust emissions from fugitive sources –like covering of transfer points and conveyors, water spraying point sources, paving, road wetting and wind barriers for open piles);
- Identifying potential risks to local people and local resources in the event of an emergency.

During the environmental impact assessment process, the identified inherent impacts of the proposed project were quantified using the Risk Assessment Matrix and the ISO



14001 procedure for evaluation and registration of Environmental Aspects and identifying significant environmental aspects/impacts. Criteria and Ratings for Identifying Significant Environmental Impacts of the project are as follows:

Legal / Regulatory Requirements (L) – is there a legal/regulatory requirement or a permit requirement?

0 = There is no legal/regulatory requirement

3 = There is a legal/regulatory requirement

5 = There is a permit required

Risk (R) – What is risk/hazard rating based on Risk Assessment Matrix (RAM) (**Figure 6.0, Tables 6.1 & 6.2**)?

1= Low risk

3 = Medium/intermediate risk

5 = High risk

Environmental Impact Frequency (F) – What is frequency rating of impact based on RAM?

1 = Low frequency

3 = Medium / intermediate frequency

5 = High frequency

Importance of Affected Environmental Component and Impact (I) – What is the rating of importance based on consensus of opinions?

1 = Low importance

3 = Medium/intermediate importance

5 = High importance

Public Perception (P) – What is the rating of public perception and interest in facility and impacts based on consultation with stakeholders?

1 = Low perception and interest

3 = Medium/intermediate perception and interest

5 = High perception and interest

The significant potential impacts of the facility were identified.

$(L+R+F+I+P) \geq 15$ : Sum of weight of legal requirements. Risk factor, frequency of occurrence, importance, and public perception greater than or equal to the benchmark (15).

(F+I) is >6: Sum of weight of frequency of occurrence and importance of affected environmental component exceeds the benchmark (6).

P=5: The weight of the public perception/interest in the potential impact exceeds the benchmark (5).

## 6.2 PROJECT RISK ASSESSMENT

Risk Assessment is a special assessment tool or procedure that aims at managing uncertain consequences of anthropogenic(human) activities. Risk analysis is the measurement of the likelihood and severity of harm. Risk analysis is usually made up of risk identification and risk estimation; the latter is the attempt to estimate scientifically, mathematically, statistically, or by some other rigorous procedure the probabilities of an event and the consequences associated with it. Generally, risk analysis is the most time-consuming, costly and technically difficult part of risk management, requiring data collection and analysis, in areas where needed data often do not exist and where analysis of these data is more of an art than a science. Because risk analysis often involves probabilities, statistics and epidemiological data, it may be difficult to convey the results of an analysis to the public and to non-specialists.

Two key benefits of Environmental risk assessment (ERA) within EIA, discussed further below, are that it provides a means to:

- i. systematically identify potential hazards of the proposed project and scope the detailed investigations required for the EIA; and,
- ii. set EIA priorities and manage uncertainty.

The field of risk analysis has assumed increasing importance in recent years given the concern by both the public and private sectors in safety, health, and environmental problems. Risk analysis encompasses three interrelated elements: risk assessment, risk perception and risk management.

**RISK:** Risk can be defined as “the chance of something happening that will have an impact on objectives or proposed project or on the community. A risk is often specified in terms of an event or circumstance and the consequences that may flow from it. Risk is measured in terms of a combination of the consequences of an event and their likelihood”.

“Likelihood” describes how often a hazard is likely to occur and is commonly referred to as the probability or frequency of an event. However, the consequence describes the effect or impact of a hazard on a community. Both likelihood and consequence may be expressed using either descriptive words (i.e. qualitative measures) or numerical values (i.e. quantitative measures) to communicate the magnitude of the potential impact.

The calculation of risk can be given as:  $R = L \times C$

where R is the risk (for environment), C is severity of harm environment (consequence), L is the likelihood of the occurrence of that harm.

### 6.2.1 PROPOSED PROJECT RISK PARAMETERS

In environmental risk assessment, there are basic parameters that should be targeted to enable effective risk mitigation measures. These parameters are the climate and meteorology, air quality, noise levels, groundwater, geology and geomorphology, soils and soil erosion, drainage patterns and flooding, unique physical features, and aquatic ecosystem, vegetation, occupational health risks, land use cover etc.

### 6.3 ASSESSMENT CRITERIA

The criteria developed for the assessment of the affected environment is based on the requirements as stipulated by the regulatory Agencies, regulations, and WHO regulations. 'It seeks a balance that promotes economic development on the one hand and the conservation of visual, aesthetic, tourism, environmental and heritage characteristics and resources of the study area on the other hand.

		Increasing Probability				
		A	B	C	D	E
		Never heard of in the Company	Heard of incident in the company	Incident has occurred in company	Happens several times per year :	Happens several times per year in our location
1	Slight Effect					
2	Minor effect					
3	Localized effect					
4	Major effect					
5	Massive effect					

Categories		
LOW	MEDIUM	HIGH
Area 1	Area 2	Area 3

FIG 6.0: RISK ASSESSMENT MATRIX (RAM) FOR ENVIRONMENTAL CONSEQUENCES

**TABLE 6.0: DEFINITION CONSEQUENCE CATEGORY (DAMAGE TO ENVIRONMENT)**

Hazard Rating	Definition Consequence Category (Damage to environment)
1	<b>Slight environmental effects (Zero effect):</b> Local environmental damage within the fence and within systems. Negligible financial consequences.
2	<b>(Minor Effect)</b> Contamination, damage sufficiently large to affect the environment single exceeding statutory or prescribed criteria, single complaint. No permanent effect on the environment
3	<b>(Localized Effect) Limited loss of discharges of known toxicity.</b> Repeated exceeding statutory or prescribed limit. Affecting neighbourhood
4	<b>Severe environmental damage (Major effect).</b> The company is required to take extensive measures to restore the contaminated environment to its original state. Extended exceeding statutory or prescribed limits
5	<b>Persistent severe (Massive effect) environmental damage</b> or severe nuisance extending over a large area. In terms of commercial or recreational use or nature conservancy, a major economic loss for the company. Constant high exceeding statutory or prescribed limits.

**TABLE 6.1. RELEVANT CRITERIA FOR RISK CALCULATION**

Stressor: Emission	IMPACT TO ATMOSPHERE		
	Likelihood	Level (L)	Emissions of particulate matter
	negligible	1	< 1
	low	2	1 - 5
	medium	3	5 - 10
	high	4	> 10
	Consequence	Category „C“	The concentration of PM <sub>10</sub> in the air [µg.m <sup>-3</sup> ]
	negligible air pollution	1	< 15

	low air pollution	2	15,01 – 20,00
	medium air pollution	3	20,01 – 4000
	high air pollution	4	> 4001
Stressor: Waste water	<b>IMPACT TO WATER ENVIRONMENT</b>		
	Likelihood	Level (L)	Number of population equivalent
	negligible	1	< 2 000
	low	2	2 001 – 250 000
	medium	3	250 001 – 500 000
	high	4	> 500 001
	Consequence	Category ©	Quantity of discharged wastewater [.10 <sup>3</sup> m <sup>3</sup> .y <sup>-1</sup> ]
	slight pollution of stream	1	< 200
	medium pollution of stream	2	< 1 000
	heavy pollution of stream	3	< 15 000
	extreme pollution of stream	4	> 15 000
	Stressor: Floods	<b>IMPACT TO WATER ENVIRONMENT</b>	
Likelihood		Level „L“	Total average monthly precipitation in % of normal for the year
negligible		1	< 100
low		2	101 - 110
medium		3	111 - 120
high		4	> 121
	Consequence	Category (C)	Number of days with the achieved degree of the flood activity

	endangered area	1	0 – 10
	medium threatened area	2	11 – 50
	highly threatened area	3	51 – 100
	extremely threatened area	4	> 101

Environmental Impact Assessment is an essential tool for the sustainable management of environmental resources. A new approach to environmental impact assessment, based on method of risk analysis has been present. We have always faced many challenges in dealing with environmental risks. Successful risk analyses require scientists and engineers to undertake assessments to characterize the nature and uncertainties surrounding a particular risk. One also needs social scientists to characterize the factors that influence the perception of a risk. Finally, there is a need for develop strategies that involve risk communication, economic incentives, standards and regulations for the managing these risks.

We have used risk criteria to define the acceptable risk level for the environment. We cannot expect to achieve a risk level equal to zero. Thus, defining which level of risk considered as acceptable for the environment been analysed. The risk criteria should be based on the acceptability requirements for the environment.

#### **6.4 ANTICIPATED ENVIRONMENTAL AND SOCIAL IMPACTS**

The environmental impacts caused due to the development of the project can be categorized as primary (direct) and secondary (indirect) impacts. Primary impacts are those which are induced directly by the project whereas the secondary impacts are those which are indirectly induced and typically include the associated investment and changing patterns of social and economic activities due to the proposed action. Interaction of the project activities with environmental attributes is presented as Activity-Impact matrix in **Table 6.2.**

**Potential direct and indirect impacts of the project during construction phase will be the following:**

- Filling in low-lying areas for embankments of the project area.
- Loss of vegetation due to cutting of trees
- Loss of Topsoil due to Clearing & Grubbing of new alignment.
- Temporary impacts in terms of polluted environment on flora and fauna due to the construction activities.
- Impacts on the drainage pattern due to raised embankment, introduction of new culverts.
- Impacts on traffic management system.
- Increased air pollution (including dust) during project construction.
- Increased noise level due to the movement of vehicles and construction activities.
- Increased soil erosion.
- Infestation of mosquitoes due to water gathering in the tyres during rainy season.
- Pollution due to generation of spoils and solid waste.

**Potential direct and indirect impacts of the project during operation phase are the following:**

- Increased noise pollution due to the vehicular movement.
- Impact on natural drainage pattern of the project area.
- Pollution of water bodies and impacts on its ecosystem due to hazardous chemical or oil spillage into the canals and streams.

**The positive impacts of the project will be:**

- Reduced air pollution due to better service levels of the Industrial hub.
- Generation of local employment.
- Improvement of local economy and industry due to better infrastructure facilities.

**TABLE 6.2: ACTIVITY - IMPACT IDENTIFICATION MATRIX**

S/N	Activities	Impacts on Physical Environment			Biological Environment		Geology		Topography
		Air	Water	Noise	Flora	Fauna	Natural Drainage	Soil	
<b>A.</b>	<b>Construction Phase</b>								
1	Labour Camp Activities		-Ve/T						
2	Quarrying	-Ve/T		-Ve/T	Ve/T		-Ve/T		-Ve/P

S/N	Activities	Impacts on Physical Environment			Biological Environment		Geology		Topography
		Air	Water	Noise	Flora	Fauna	Natural Drainage	Soil	
3	Material Transport & Storage	-Ve/T		-Ve/T					
4	Earthwork						-Ve/T	-Ve/T	-Ve/T
5	Pavement Works	-Ve/T	-Ve/T	-Ve/T	-Ve/T			-Ve/T	-Ve/P
6	Use of Construction Equipment	-Ve/T	-Ve/T	-Ve/T		-Ve/T			
7	Plantation	+Ve/P		+Ve/P	+Ve/P				
8	Drainage Works						+Ve/P		
9	Stripping of Top Soil								
10	Debris Generation						-Ve/T		
<b>B.</b>	<b>Operational Phase</b>								
1	Vehicular Movement	-Ve/P		-Ve/P	-Ve/P	-Ve/P			
2	Impacts on forest areas including wildlife sanctuary, national park	No Wild Life Sanctuaries, Forests and any other eco-sensitive areas are present along the Industrial hub							

**Note: T - Temporary; P - Permanent.**

As part of the project there will be some construction stage impact to the local site and water bodies which can be taken care by the onsite environmental management measures as suggested in EIA. The general Environment, Health and Safety guidelines of international standard will be followed to ensure that the workers are provided with adequate health and safety facility and are provided with safe drinking water, sanitation, and medical facilities as and when required.

The project area is not bordering any natural stream or water body and is also does not involve any kind of diversion of forest land. The project impacts are confined within the proposed location earmarked as industrial hub. The impacts on the various environmental



components can occur at any of the following stages of the project planning and implementation:

- Planning and design stage
- Construction stage and
- Operation stage

**TABLE 6.3: SIGNIFICANT IMPACTS OF PRODUCTION PLANT**

PROJECT ASSOCIATED IMPACTS		ASSESSMENT CRITERIA					TOTAL SCORE L+R+F+I+P	CATEGORY
PROJECT ACTIVITY	POTENTIAL IMPACTS	L	R	F	I	P		
<b>Horticulture</b> (Site Survey, Soil Testing, Bush Clearing)	The removal of vegetation will expose the soil to weather conditions and there is the tendency for migration of wildlife	0	1	1	1	1	4	Not Significant
<b>Production &amp; Maintenance Phase</b> (Trenching, block work, Pipe laying, Back filling, Transportation of materials, equipment, and personnel, Operations of machines and vehicles)	- Damage to underground utilities during Excavation	1	1	1	1	1	5	Not significant
	- Change in water quality due to inflow of run-offs, suspended particles etc.	1	1	1	1	1	5	Not significant
	- Changes in noise and exhaust gases from excavators. Increase in dust during the dry season.	3	3	1	3	3	13	Significant
	- Increase in turbidity due to expose of soil surface run-offs carry sediment drainage pattern due to changes in topography and improper re-instatement.	1	1	1	1	1	5	Not Significant
	- Road users would be exposed to higher road incidents due to increase in heavy traffic.	3	3	3	3	3	15	Significant
- Temporary road obstructions/diversions	1	1	1	1	1	5	Not significant	
- Emission of exhaust gases from the fuel combustion								

	engines can alter the local ambient air quality.								
	- Soil contamination and loss of aesthetics from liquid leaks,	1	1	1	1	1	5		Not significant
<b>Operation Phase</b> (Production, Disposal of industrial and domestic wastes, Maintenance)	- Contamination of soil and water system with effluent and used oil resulting from maintenance activities. - Odour and aesthetic devaluation may result from improper handling. Increase in disease if dumped in water - Release of gases into the atmosphere - Accidental damage to equipment leading to fire incident	1	1	1	1	1	5		Not Significant

## 6.5 PHYSICAL ENVIRONMENT

### 6.5.1 Climatological Parameter

Though no change in the macro-climatic setting (precipitation, temperature, and wind) is envisaged due to the project, the microclimate is likely to be temporarily modified by vegetation. There will be an increase in daytime temperature arising from some heat that will be generated from the factory and soil due to loss of shade and vegetation, which in turn might lead to formation of heat islands especially along the inhabited sections. However, it may be pointed out that the entire stretch is blessed with natural vegetation on either side of the industrial hub and hence the impact on meteorological parameter will be temporary in nature and with the growth of vegetation such impact will be minimized to a large extent.

### 6.5.2 Physiography and Land Use

#### Pre-construction and Construction Stage

Project activities involve alterations in the local physiography and drainage patterns. The impacts on physiography may include de-stabilization arising from slopes due to cut and fill operations. Cut-and-fills will be designed for improvement to the area geometry, and

drainage structures will be added to improve drainage.

### **6.5.3 Geology and Seismology**

#### **Pre-Construction, Construction and Operation Stage**

The available seismic information of the state indicates that the project area is free of earthquake and do not have any such history. The project will not pose impact on geology and seismic condition.

### **6.5.4 Soil Erosion**

#### **Pre-construction Stage**

The removal of scrapped materials and vegetation will increase the sheet erosion prevalent in the project area, and increased run-off would in turn lead to erosion of productive soil. The direct impact of erosion is the loss of embankment soil and danger of stability loss for the project. This impact is generally restricted within the project location. The project has taken care of this issue at the engineering design stage.

#### **Renovation/Construction Stage**

Elevated sections particularly at high embankments would be vulnerable to erosion and need to be provided proper slope protection measures to prevent erosion. If the residual spoil generated during the up gradation of cross drainage structures are not properly disposed of then chances of increase in downstream sedimentation is likely. However, these impacts are temporary impacts and are limited to the construction period only and with improved design the drainage in the area are expected to be improved.

#### **Operation Stage**

No soil erosion is envisaged when the project is in full operation as all the slopes and embankments of the project shall be stabilised through sound engineering techniques.

### **6.5.5 Contamination of Soil**

#### **Construction Stage**

Contamination of soil during construction stage is primarily due to construction and allied activities mostly from the site where construction will take place etc. The construction camps generate solid waste and wastewater which may contaminate the soil.

The sites where constructions vehicles are parked and serviced are likely being carried out have chances of contamination due to leakage or spillage of fuel and lubricants.

Pollution of soil can also occur in hot-mix plants from leakage or spillage of petroleum products. Refuse and solid waste from construction activities also contaminate topsoil. Contamination of soil during construction might be a major long-term residual negative impact. Unwarranted disposal of construction spoil and debris will add to soil contamination. This contamination is likely to be carried over to water bodies in case of dumping being done near water body locations. Such contamination issues can be minimized through proper working measures and unauthorized disposal of contaminated materials as being suggested in EMP.

### **Operation Stage**

During the operation stage, soil pollution due to accidental vehicle spills or leaks is a low probability as one of the main objectives of the project is to reduce accidents, but potentially disastrous to the receiving environment if they occur. These impacts can be long term and irreversible depending upon the extent of spill. There should be an emergency management plan in case of such major spills occurring.

#### **6.5.6 Air Pollution**

The project has different phases, preconstruction, renovation/construction & operation phases and would create:

- Impact on air quality both during the construction and operation stages of the project.
- Impact during construction stage and will be of short term and have adverse impacts on the construction workers as well as the settlements adjacent to the project area, especially those in the down wind direction.
- Impacts during operation stage
- Both the construction and operation stage impacts can be effectively mitigated if the impacts have been assessed with reasonable accuracy in the design stage.

#### **6.5.7 Generation of Dust**

##### **Pre-construction Stage**

Generation of dust is the most likely impact during this stage due to:

- Site clearance and use of heavy vehicles and machinery etc.;
- Procurement and transport of raw materials and quarries to construction sites;
- The impacts will mostly be concentrated within the Industrial hub.

If adequate measures such as sprinkling of water on projects sites where clearance and excavation activities are on, covering material trucks especially those carrying sand and fly ash, then the impacts can be reduced. It is likely that impacts due to dust generation

are felt downwind of the site rather than on the site itself.

### **Renovation/Construction Stage**

Dust is likely to be generated to (limited) due to the various renovation/construction activities including:

- Removal of debris/ materials;
- Handling and storage of raw materials;
- Renovation and allied activities.

Generation of dust in the project is likely going to be limited to the project site since it is an existing facility requiring only renovation and will only have minor dust impacts. The proposed project site is secluded from the residential areas and as such acts as a buffer zone for dust generation.

### **Operation Stage**

- No dust generation is envisaged during the operation stage at least in the built-up section as all site are proposed to be paved and all slopes and embankments shall be turfed as per best engineering practices.

## **6.5.8 Generation of Exhaust Gases**

### **Pre-construction Stage**

The generation of exhaust emission gases is likely during the pre-construction stage due to some movement of construction vehicles.

### **Renovation/Construction Stage**

High levels of carbon monoxide (CO), Temperature and hydrocarbons are likely from plant operations. Although the impact is much localised, it can spread downwind depending on the wind speeds. The impact largely get reduces once the plant is located to a large distance from the local habitation. The Environment Management Action Plan prepared need to ensure adequate measures are being taken especially for health and safety of workers such as providing them with respirators during working hours. Also, the contractor should ensure that hot mix plants, stockyards, etc. are away from residential areas and residential quarters of all workers. If adequate measures are taken, then impacts from generated gases can be negligible.

### **Operation Stage**

The impacts on air quality will at any given time depend upon vehicular movement and

emission from equipment within a given stretch and prevailing meteorological conditions.

Air pollution impacts arise from two sources:

- i) inadequate vehicle maintenance; and
- ii) use of adulterated fuel in vehicles. Enforcement standards to meet better vehicle performance in emissions and the improvement of fuel constituents can assist in improving regional air quality.

### **Dust Control**

All precautions to reduce the level of dust emissions from the production hall, and other transportation of materials will be taken up including:

- Vehicles delivering loose and fine materials like sand and fine aggregates shall be covered to reduce spills on existing projects.
- Water will be sprayed on earth road if the dust emission becomes a public risks.

### **Emission Control**

To ensure the control of exhaust emissions from the various construction activities, the civil contractor shall take up the following mitigation measures:

- An adequate emissions control measures shall be in place to ensure every emission sources/ activities are checked.
- To ensure the efficacy of the mitigation measures suggested, air quality monitoring shall be carried out quarterly during the period the plant will be in operation.
- All vehicles, equipment and machinery used for construction will be regularly maintained to ensure that the pollution emission levels conform to the FMENV/ Oyo State Ministry of Environment requirement.

### **Operation Stage**

During the operation stage, the mitigation required is directed more on the facilities for checking levels of pollution. Additional measures proposed are as below:

- reduction of equipment and machinery emissions,
- ensuring vehicular maintenance,
- educating drivers about driving behaviour and methods that will reduce emissions.

### **6.5.9 Water Resources**

There is no direct impact on surface water that would arise from various renovation

activities during the construction stage as well as project operation stage.

### ***Loss of Water Resources***

Loss of water resources includes removal of private and community water resources like hand pumps, water taps, etc. There is no loss of this nature during the construction and operation phase.

### **Protection from Run off**

Surface run-off is discharged into natural/artificial drains of adequate capacity from ditches at the end of formation to prevent destabilization of the embankment. Scouring of banks of flowing water bodies due to high velocity run-off is also a potential danger, but there is no such area where there is an existing detrimental surface run-off.

### **Protecting Water Quality**

The proposed project site is an existing facility and there is no surface water close by, however to prevent any degradation of water quality both the surface and ground water resources due to the proposed project, the proponent shall work out the following mitigation measures during the renovation period:

- fuel storage for the generating plants shall be installed in such a way that it is far away from sources of underground water

### **Silt Fencing**

The existing production facilities were constructed in such a way that there is no excessive exposure to erosion and where desired, sheet erosion preventive measures shall be created. Where necessary silt fencing shall be done.

### **Oil interceptor**

Oil and grease from run-off is another major concern during renovation/construction as well as operation. During construction, discharge of oil and grease is most likely from workshops, oil and waste oil storage locations, and vehicle parking areas of the contractor and production floors. This is likely going to be minimal and there is plan in place to manage the oil during any aspect of the operation to avoid pollution. Any used oil generated shall be handled and disposed as per FMENV standards and guidelines. The location of all fuel storage and vehicle cleaning area will be at least 300m from the nearest drain.

## **Water Quality Monitoring**

Apart from provision of the mitigation measures, underground water quality shall be monitored to understand the effectiveness and further improvement in designs in reducing the concentration of pollutants. The monitoring plan shall be functional in construction as well as in operation stages. The frequency, duration and responsibility will be as per the Environmental Monitoring Plan.

## **Noise levels**

Environmental noise depends on factors such as traffic intensity, the type and condition of the vehicles plying on the area, machinery, and construction equipment. In the future years, the chances of increase in noise level is anticipated due to increase in traffic and number of employees and frequency of activities within the factory. The proposed project location is prone to heavy traffic and noise resulting from it will also affect the noise level within the factory.

### **Impact:**

During the construction phase of the project, the major sources of noise pollution are vehicles transporting the construction material to the site and the noise generating activities within the site. Mixing, casting and material movement are primary noise generating activities on site and will be uniformly distributed over the entire construction period. Construction activities are anticipated to produce noise levels in the range of 40 - 95 dB (A).

- The construction equipment will have high noise levels, which can affect the personnel operating the machines. Use of proper Personal Protective Equipment (PPE) such as earmuffs will mitigate any adverse impact of the noise generated by such equipment.
- The noise likely to be generated during excavation, loading and transportation of material will be in the range of 30 to 105 dB (A) and this will occur only when all equipment operates together and simultaneously. This is, however, a remote possibility.
- The workers in general are likely to be exposed to an equivalent noise level of 40 to 90 dB 8-hour's exposure per shift, for which all statutory precautions should be taken into consideration. However, careful planning of machinery selection, operations and scheduling of operations can reduce these levels.
- Uninterrupted movement of heavy and light vehicles may cause increase in ambient noise levels on the project area and its environs. It may have negative



environmental impacts on the sensitive receptors close to the project area. Table below present the source of noise pollution and the impact categorization.

**TABLE 6.4: SOURCE OF NOISE POLLUTION**

S. No	Phase	Source of Noise Pollution	Impact Categorization
1.	Pre-Construction	<ul style="list-style-type: none"> <li>▪ Man, material &amp; machinery movements</li> <li>▪ Establishment of labour camps onsite offices, stock yards and construction plants</li> </ul>	<ul style="list-style-type: none"> <li>▪ All activities will last for a short duration and shall be localized in nature</li> </ul>
2.	Construction Phase	Construction site: Concrete mixing, diesel generators etc.	Impact will be not significant within 500m.
3.	Operation Phase	<ul style="list-style-type: none"> <li>▪ Due to increase in traffic of vehicles to the location</li> </ul>	Observation of speed limit that will reduce noise generated by trucks.

The impacts of noise due to the project will be of temporary localized within the construction phase.

#### **6.5.10 Cultural Resources**

There is no such impact on cultural resources as such in the project location. The proposed project location has been designated as industrial facility and there are no identified cultural resources.

#### **6.5.11 Biological Environment**

The principal impact on flora involves the removal of grasses (secondary afforestation).

#### **6.5.12 Public health and safety**

There is no perceived Impacts on public health and safety that may arise during the phases of pre-construction, renovation/construction and operation phases other than the perceived increase in mosquito that would arise during wet season due to stagnant water that would accumulated in the scrap tyres. During the pre-construction and renovation phases, dismantling of the structures and construction activities may result in the

following health hazards:

- Debris generated because the above-mentioned activities if not properly disposed might give rise to health problems within the industrial hub. However, the structures to be dismantled during pre-construction phase will mainly be of semi-permanent and temporary nature and much of the waste shall be salvageable.
- Labourers hired from outside can have clashes with the local labourers because cultural and religious differences. The influx of a large work force to an area, already hard pressed for basic services (medical services, power, water supply, etc.), can impose additional stress on these facilities. Since as per the baseline environmental condition a significant number of workers is marginal workers, the proponent may source these local labours during the construction period.
- Unsanitary conditions on site might also result in impact on health of labourers. Transmission of diseases is also facilitated by the migration of people. During the construction phase work, crews and their dependents may bring with them a multitude of communicable diseases including Sexually Transmitted Diseases (STDs) like AIDS. This is more so if the nature of the project requires more male-workers, who have migrated from other parts of the state or country.
- During construction movement of raw materials into the Industrial hub may cause disruption of social and economic life of the indigene along the route & of the nearby areas.

#### **Traffic Control during Construction**

- There is already a well-structured existing tarred road linking the project location, however there will be traffic management strategy to reduce traffic build up. The project area is not prone to public traffic and congestion; however, the project proponent will lash its plan on the existing traffic control within the project location.
- Special consideration will be given in the preparation of the traffic control plan to the safety of pedestrians and workers at night.

#### **6.5.13 Risks Associated**

The project proponent is required to comply with all the precautions as required for the safety of the workmen during the project phases. The supply of all necessary safety appliances such as safety goggles, helmets, masks, etc., to the workers and staff is very compulsory. The project proponent should comply with all regulation regarding scaffolding, ladders, working platforms, gangway, stairwells, excavations, trenches and

safe means of entry and egress.

### **Risk from Electrical Equipment**

Adequate precautions will be taken to prevent danger from electrical equipment. No material or any of the sites will be so stacked or placed as to cause danger or inconvenience to any person or the public. All necessary fencing and lights will be provided to protect the public.

### **Risk at Hazardous Activity**

All workers employed on mixing concrete material, cement, lime mortars, concrete etc., will be provided with protective footwear and protective goggles. Workers, who are engaged in welding works, would be provided with welder's protective eye-shields. Stonebreakers will be provided with protective goggles and clothing and will be seated at sufficiently safe intervals. The use of any toxic chemical will be handled strictly in accordance with the manufacturer's instructions. A register of all toxic chemicals delivered to the site will be kept and maintained up to date by the project proponent. The register will include the trade name, physical properties and characteristics, chemical ingredients, health and safety hazard information, handling and storage procedures, and emergency and first aid procedures for the product.

### **Risk of Lead Pollution**

No man below the age of 18 years and no woman will be employed on the work of painting with products containing lead in any form. No paint containing lead or lead products will be used except in the form of paste or readymade paint. Face masks will be supplied for use by the workers when paint is applied in the form of spray or a surface having lead paint dry rubbed and scrapped.

### **Risk caused by Force' Majeure**

All reasonable precaution will be taken to prevent danger of the workers and the public from fire, flood, frowning, etc. All necessary steps will be taken for prompt first aid treatment of all injuries likely to be sustained during work.

### **Risk from Explosives**

The construction workers will not use explosives except as may be provided in the contract or ordered or authorized by the Engineer. Where the use of explosives is so provided or ordered or authorized, the Contractor shall comply with the requirements.

### **First Aid/Medical facilities**

At every workplace, a readily available first aid unit including an adequate supply of

sterilised dressing material and appliances will be provided as per the Factories Act 2004. There will be provision of first aid and medical facilities. The project proponent shall subscribe to the Federal Government National Health Insurance Scheme (NHIS) for all employees.

### **Potable Water**

The project proponent shall provide at suitable and easily accessible places a sufficient supply of potable water for all the employees.

### **Hygiene**

There will be provision within the precincts of every workplace, conveniences in an accessible place, and the accommodation, separately for each for these, as per standards. All temporary accommodation must be constructed and maintained in such a fashion that uncontaminated water is available for drinking, cooking, and washing. The existing sewage system for the project was well designed, built, and operated in such a way that no health hazard occurs and no pollution to the air, ground or adjacent watercourses take place. Compliance with the relevant legislation must be strictly adhered to. Garbage bins shall be provided in the project area and regularly emptied, and the garbage disposed of in a hygienic manner.

## **5.6 ENVIRONMENTAL IMPACTS IN LINE WITH IFC PERFORMANCE STANDARDS**

The project risks/impacts can be assessed using the International Finance Corporation (IFC) Performance Standards as shown below:

**TABLE 6.5: ENVIRONMENTAL IMPACTS IN LINE WITH IFC PERFORMANCE STANDARDS**

<b>(a) Title of Performance Standard (PS)</b>	<b>(b) Performance Standard requirements</b>	<b>(c) Assessment of potential risks and impacts</b>	<b>(d) Assessed risk</b>
PS1: Social & Environmental Assessment & Management Systems	When local communities are affected by risks or adverse impacts from a project, the project proponent must ensure adequate engagement with the communities to build and maintain a constructive relationship over time. Project proponent should disclose project-related information to help affected communities understand risks, impacts and opportunities of the project.	<ul style="list-style-type: none"> <li>▪ Typically, construction works of this nature includes handling or generation of dust particles. The location of the project is within the existing production facility and it has a sufficient Right of Way or buffer zone. Thus, significant adverse environmental and related social impacts from the project on the local community are not envisaged.</li> <li>▪ The project will provide employment opportunity. Freetown Waste Management &amp; Recycle Limited has its own robust Social Environmental Health and Safety Management System (SEHSMS) under the requirement of IFC PS1 requisites. Applicable environmental management procedures need to be developed and implemented throughout the project life cycle as an integral part of Occupational Health &amp; Safety Management System by Freetown Waste Management &amp; Recycle Limited.</li> </ul>	Low
PS 2: Labour and Working Conditions	The project proponent should provide the workers with a safe	<ul style="list-style-type: none"> <li>▪ It is anticipated that so many contract workers are likely to be deployed for the</li> </ul>	Medium

<b>(a) Title of Performance Standard (PS)</b>	<b>(b) Performance Standard requirements</b>	<b>(c) Assessment of potential risks and impacts</b>	<b>(d) Assessed risk</b>
	<p>and healthy work environment in accordance with applicable labour laws, considering inherent risks in its particular sector and specific classes of hazards in the client's work areas. The proponent should take steps to prevent accidents, injury, and diseases arising from, associated with, or occurring in the course of work by minimizing, so far as reasonably practicable, the causes of hazards. In a manner consistent with good international industry practice, the client will identify potential hazards to workers, particularly those that might be life-threatening; provide preventive and protective measures, including modification, substitution, or elimination of hazardous conditions or substances; train workers; document and report occupational</p>	<p>proposed project during construction phase. Hence Freetown Waste Management &amp; Recycle Limited as principal employer has obtained necessary registrations for the establishment in accordance with the provision of Nigerian Factories (Labour) Act 2004.</p> <ul style="list-style-type: none"> <li>▪ All contract workers engaged by the project contractor onsite need to be provided with an employment identity card specifying the worker, contractor and principal employer name, nature of work, wage rate, wage period etc. Adequate surveillance of construction work areas and muster roll need to be undertaken by Freetown Waste Management &amp; Recycle Limited to check for any deployment of child labour onsite which is prohibited under relevant provision of Child Labour (Prohibition and Regulation) Act.</li> <li>▪ There are existing three sources of ground water (two wells and one borehole within the factory) that will be used during the</li> </ul>	

<b>(a) Title of Performance Standard (PS)</b>	<b>(b) Performance Standard requirements</b>	<b>(c) Assessment of potential risks and impacts</b>	<b>(d) Assessed risk</b>
	<p>accidents, diseases, and incidents; and be prepared for preventing and responding to emergencies. The proponent should also ensure that child labour is not availed at any stage of the project.</p>	<p>renovation/construction phase. Freetown Waste Management &amp; Recycle Limited shall also ensure that drinking water for labour and staff during construction and operational phase must be the drinking water criteria of Federal Ministry of Environment.</p> <ul style="list-style-type: none"> <li>▪ Safety at work will have to be ensured during (a) manual excavation during construction (cut hazard), (b) manual loading and unloading of materials, (c) construction work of existing project having significant traffic movement, and (d) working on electrical equipment during repair and maintenance work (electrocution hazard). Taking into consideration the nature of activities expected during the operations phase, the only work-related emergency that seems likely is an outbreak of fire but the same should be controlled with fire extinguishers to be maintained by Freetown Waste Management &amp; Recycle Limited.</li> <li>▪ The company will need to ensure the health and safety of workers as required by Oyo</li> </ul>	

<b>(a) Title of Performance Standard (PS)</b>	<b>(b) Performance Standard requirements</b>	<b>(c) Assessment of potential risks and impacts</b>	<b>(d) Assessed risk</b>
		<p>State Ministry of Environment/FME guidelines and International Construction Measures Freetown Waste Management &amp; Recycle Limited to ensure proactive efforts are being made by the civil contractors towards provision of welfare facilities for contract workers viz. sufficient supply of drinking water, creches, latrines and urinals, washing facilities etc. In case the construction workers require temporary shelters at site during the construction period, the same will have to be managed as per the guideline published jointly by International Finance Corporation (IFC) and the European Bank for Reconstruction and Development (EBRD) and relevant provisions of the above-mentioned regulations.</p> <ul style="list-style-type: none"> <li>▪ Freetown Waste Management &amp; Recycle Limited need to ensure that the contract workers are subjected to timely payment of minimum rates of wages in line with labour law. Further necessary records viz. register of fines, overtime, wages, wage slip, annual</li> </ul>	



<b>(a) Title of Performance Standard (PS)</b>	<b>(b) Performance Standard requirements</b>	<b>(c) Assessment of potential risks and impacts</b>	<b>(d) Assessed risk</b>
		<p>returns, etc. need to be maintained by the project contractor as per the aforesaid regulations.</p> <ul style="list-style-type: none"> <li>▪ In line with the IFC PS requirements for development and implementation of EMS, Occupational Health and Safety Procedure and Worker Accommodation Guidelines including applicable national labour legislations need to be developed and implemented by Freetown Waste Management &amp; Recycle Limited in different phases of the project life cycle. This includes provision of adequate PPEs by contractor to the workforce, supply of potable drinking water to contractor workforce, medical support, adequate sanitary facilities, rest room, kitchen etc. Further Freetown Waste Management &amp; Recycle Limited need to enhance awareness of the contractor workforce on occupational health and safety risks through implementation of training programme in accordance with OHS &amp; EMS.</li> </ul>	

<b>(a) Title of Performance Standard (PS)</b>	<b>(b) Performance Standard requirements</b>	<b>(c) Assessment of potential risks and impacts</b>	<b>(d) Assessed risk</b>
		<ul style="list-style-type: none"> <li>▪ Freetown Waste Management &amp; Recycle Limited needs to make incident reporting and investigation as integral to its OHS &amp; EMS and the same has been communicated to the civil contractors.</li> </ul>	
<p>PS 3: Pollution Prevention &amp; Abatement</p>	<p>The project proponent should ensure that adequate control techniques are provided to minimize emissions or achieve a pre-established performance level. The proponent should ensure that generation of hazardous wastes are minimized, and handling, storage and disposal are managed properly to prevent any adverse social and environmental impacts.</p> <p>Reasonable inquiry about the location of the final disposal of their waste, even if the disposal is conducted by the third party and especially if the waste is considered to be hazardous to human health</p>	<ul style="list-style-type: none"> <li>• The proposed project location is an existing facility that will not require tractors to clear the vegetation and as such the negative effects of release of dust will drastically be reduced to barest minimum. However, during constructional phase, fugitive dust generated due to excavation work and material handling can temporarily contribute to the ambient air pollutant load at the work site. Vehicular emissions may lead to increase in air pollutant levels in ambient air. Considering absence of any sensitive receptors and the fact that the proposed project is within the project area and ambient air quality parameters well within the applicable national standards, impact of vehicular emissions and dust generation is not likely to cause any community health</li> </ul>	<p>Low</p>

<b>(a) Title of Performance Standard (PS)</b>	<b>(b) Performance Standard requirements</b>	<b>(c) Assessment of potential risks and impacts</b>	<b>(d) Assessed risk</b>
	<p>and the environment should be carried out.</p>	<p>and/or environmental impacts. The increase in air pollutant concentration and noise levels caused by the proposed project during its constructional phase is expected to be short-lived and insignificant.</p> <ul style="list-style-type: none"> <li>▪ Considering 80% of the total domestic water consumption being generated as waste water, very low volumes of sanitary waste water will be generated during renovation phase and operation phases. The domestic wastewater needs to be managed through suitably designed septic tank-soakaway pit system.</li> <li>▪ Freetown Waste Management &amp; Recycle Limited will need to ensure oil used in Diesel Generating sets during the construction work is free of Polychlorinated Bi-Phenyls.</li> <li>▪ Hazardous wastes such as empty paint containers (generated for the marking, painting and signages during construction and operation, will be handled and disposed in a manner that contamination of soil or groundwater is prevented.</li> </ul>	

<b>(a) Title of Performance Standard (PS)</b>	<b>(b) Performance Standard requirements</b>	<b>(c) Assessment of potential risks and impacts</b>	<b>(d) Assessed risk</b>
		<ul style="list-style-type: none"> <li>▪ During decommissioning phase, temporary impacts are envisaged. However, these impacts are likely to be short terms and localized in nature and can be mitigated through implementation of appropriate mitigation measures as outlined in the “Decommissioning Plan”</li> </ul>	
<p>PS 4: Community Health, Safety and Security</p>	<p>The project proponent should avoid or minimize risks to and impacts on the health and safety of the local community during the project life-cycle from both routine and non-routine circumstances.</p> <p>The proponent should also ensure that the safeguarding of personnel and property is carried out in a legitimate manner that avoids or minimizes risks to the community’s safety and security. The proponent should avoid or minimize the exacerbation of impacts caused by natural hazards, such as, landslides or floods that can arise from land</p>	<ul style="list-style-type: none"> <li>▪ With limited emissions to air, proper drainage, sediment control, topsoil conservation, noise barrier the threat to community health and safety is minimal. Septic tank-soak pit system, if not built with proper design, may contaminate the groundwater. Soil percolation capacity and depth in groundwater must be considered during designing. Integrity testing is to be done during commissioning to ensure that groundwater is not polluted.</li> <li>▪ Movement of heavy vehicles carrying materials and machines for a short period of time is not expected to disturb the local communities, provided that the locals are informed prior to beginning of such activities.</li> </ul>	<p>Low</p>

<b>(a) Title of Performance Standard (PS)</b>	<b>(b) Performance Standard requirements</b>	<b>(c) Assessment of potential risks and impacts</b>	<b>(d) Assessed risk</b>
	<p>use changes due to project activities.</p>	<p>The security personnel are planned to be locals employed from nearby villages.</p> <ul style="list-style-type: none"> <li>▪ Workforce required during constructional phase will be sourced locally from nearby villages depending on their literacy levels and skill sets. Freetown Waste Management &amp; Recycle Limited need to ensure that there is no conflict between the migrant workers and the local people, as this could adversely affect the reputation of the company. Individual or group protest against the project is not a likely scenario because of the non-polluting nature of the project and positive perception of the locals about the company and the project as documented during the public consultation programme. However, Freetown Waste Management &amp; Recycle Limited must be prepared for unforeseen emergencies such as an individual or group protest the project and the situation should be considered as an 'emergency'. The company will have to be prepared for such an emergency situation, </li> </ul>	

<b>(a) Title of Performance Standard (PS)</b>	<b>(b) Performance Standard requirements</b>	<b>(c) Assessment of potential risks and impacts</b>	<b>(d) Assessed risk</b>
		<p>ensure adequate management measures to handle such an emergency in a way that the situation is controlled, and the construction work and workers are protected against damage. In this regard, the company need to develop and implement a community engagement and grievance management procedure to address any such potential conflicts and/or concerns.</p>	
<p>PS 5: Land Acquisition and Involuntary Resettlement</p>	<p>The project proponent should preferably acquire land for project by negotiated settlement and should avoid expropriation.</p>	<ul style="list-style-type: none"> <li>▪ The proposed location for the project was acquired from the facility owner, which has been designated as an Industrial facility.</li> <li>▪ There will not be compensation to be paid as it was already an existing industrial facility.</li> </ul>	<p>Low impact</p>
<p>PS 6: Biodiversity Conservation &amp; Sustainable Natural Resource Management</p>	<p>The project proponent should protect and conserve biodiversity.</p>	<ul style="list-style-type: none"> <li>▪ There are no legally notified ecologically sensitive areas viz. National park, wildlife sanctuary etc. within the 1-km radius of the project site, therefore impacts on biodiversity are not expected due to the proposed project. However, clearing of vegetation will be involved.</li> </ul>	<p>Medium</p>

<b>(a) Title of Performance Standard (PS)</b>	<b>(b) Performance Standard requirements</b>	<b>(c) Assessment of potential risks and impacts</b>	<b>(d) Assessed risk</b>
PS 7: Indigenous People	The project proponent should minimize, mitigate, or compensate for adverse impacts on scheduled tribe and provide them opportunities for development benefits.	<ul style="list-style-type: none"> <li>▪ Since there are no affected tribal communities, the Performance Standard is not applicable to the project.</li> </ul>	No impact
PS 8: Cultural Heritage	The project proponent should ensure there are no adverse impacts on the cultural heritage in the project area.	<ul style="list-style-type: none"> <li>▪ No significant area or building of cultural heritage is present near the project site, hence no impact is envisaged here.</li> </ul>	No impact

## **CHAPTER SEVEN**

### **MITIGATION MEASURES**

#### **7.0 INTRODUCTION**

The project proponents have the responsibilities to; avoid, minimize, and remedy adverse impacts; internalize the environmental and social costs of the proposal; prepare plans for managing impacts and repair or make compensation for environmental damages. Impact management ensure mitigation measures are implemented to:

- establish systems and procedures to prevent such predicted impacts of any proposed project or cause of action
- monitor the effectiveness of mitigation measures

Mitigation measures ensure:

- initiation of action when unforeseen impacts occur
- better ways of doing things are sought
- enhancement of environmental and social benefits
- avoidance, minimize or remedy adverse impacts
- that residual impacts are within acceptable levels

The principles of mitigation measures are to:

- give preference to avoidance and prevention measures
- consider feasible alternatives to the proposal
- identify customized measures to minimize the major impact
- ensure they are appropriate and cost-effective
- use compensation as a last resort

#### **7.1 Mitigation Measures/Plan**

This chapter is dedicated to developing a mitigation measures to manage the identified and predicted impacts as stated in chapter six of this report as it concerns the project. Below are the detailed mitigation measures.



**TABLE 7.0: MITIGATION PLAN FOR POTENTIAL IMPACTS**

Potential Impacts	Related Activity/ Sources	Mitigation Measures
Gaseous emissions (CO <sub>2</sub> , NO <sub>2</sub> , SO <sub>2</sub> & CO), Particulates & hydrocarbons	Transportation of materials, plants and labour to site, operations involving the use of machinery; internal combustion from engines, occasional particulate release.	Where there is an event with an extended period where there will be release of dust or gaseous emissions, <b>Freetown Waste Mgt Recycling Ltd</b> shall spray water within the project location to moisten the soil and keep dust under control. In addition, workers will be provided with respiratory protective kits. <ul style="list-style-type: none"> <li>• All fuel combustion engines shall be maintained at optimal operating conditions to reduce the emission of exhaust gases.</li> </ul>
Hearing impairment, communication interference, & annoyance, work inefficiencies, psychological distress and other noise related health problems.	Construction activities, operations of machines/ engines, transportation, and excessive use of alarm systems.	<ul style="list-style-type: none"> <li>• All machinery and equipment likely going to produce noise should be serviced and noise abatement facilities should be installed.</li> <li>• The use of earmuffs shall be enforced for all staff working in noisy areas or engaged in the use of high noise equipment/ machinery</li> </ul>
Mosquito infestation leading to high rate of malaria within and around the project site	Stacking of scrap tyres in the open leading to stagnant water in the tyres creating a breeding habitat for the mosquito and other living organisms.	<ul style="list-style-type: none"> <li>• Stack scrap tyres in the store free from rain and water collection that can create breeding habitat for mosquitos</li> <li>• Embark on routine fumigation of the whole premises.</li> </ul>
<b>Geology/hydrogeology/ Geomorphology</b>  Drainage/discharge, hydrological pattern, sedimentation,	Sand winning, barrier construction, excavations and other foundations.	<ul style="list-style-type: none"> <li>• Waste pits shall be constructed to meet regulatory requirements for such facilities.</li> <li>• All boreholes shall be cased and sealed.</li> <li>• Construction to avoid introducing contaminants into the aquifer</li> <li>• <b>Freetown Waste Mgt Recycling Ltd</b> shall adopt the FMENV &amp; Oyo State Min. of Environment recommended approach in</li> </ul>

		the clean-up of any contaminated soil or groundwater. The approach involves location and isolation of site and recovery/clean-up of site
<b>Socio-Economic</b>  Community disturbance may result	Production	<ul style="list-style-type: none"> <li>• This shall reduce the impact on present infrastructure.</li> <li>• Sustain the current open-door policy to facilitate flow of information to and from host communities.</li> <li>• Skill improvement training programme and youth vocational training shall be extended to all the host communities.</li> </ul>
	Commencement of project and project implementation/ execution.	<ul style="list-style-type: none"> <li>• Freetown Waste Management &amp; Recycle Limited should diligently observe agreements reached with host communities.</li> <li>• Where practicable Freetown Waste Management &amp; Recycle Limited should continue to sponsor health education campaigns and the hazards and risks to which the people may be exposed because of the project.</li> <li>• Freetown Waste Management &amp; Recycle Limited shall aid the host communities in the area of hygiene</li> <li>• Freetown Waste Management &amp; Recycle Limited shall assist in strengthening government's effort in capacity building towards health care delivery services in the host communities.</li> <li>• Freetown Waste Management &amp; Recycle Limited shall ensure that all employees on the project undergo pre-employment and periodic medical examination.</li> </ul>
<b>Climatological Parameter</b> The microclimate is likely to be temporarily modified by vegetation. There will be an increase in daytime temperature arising	Site clearing	<ul style="list-style-type: none"> <li>• Green area and tree plantation shall be undertaken to conserve the affected species. Such tree plantation will restore the microclimate of the region.</li> </ul>

<p>from some heat that will be generated from the factory and soil due to loss of shade and vegetation</p>		
<p><b>Physiography &amp; Land Use during Pre-construction and Construction Stage</b> Project activities involve alterations in the local physiography and drainage patterns.</p>	<p>The impacts on physiography may include destabilization arising from slopes due to cut and fill operations.</p>	<ul style="list-style-type: none"> <li>• Appropriate embankments and culvert for erosion prone areas.</li> <li>• The soil has an angle of repose. Slope protection is normally required only for slopes.</li> <li>• Shrubs and grasses will be planted in sloppy area</li> </ul>
<p><b>Geology and Seismology During Pre-Construction, Construction and Operation Stage</b> The seismic information of the state indicates that the project area is free of earthquake and do not have any such history. The project will not pose impact on geology and seismic condition.</p>	<p>Excavation and civil construction activities</p>	<ul style="list-style-type: none"> <li>• No negative seismological impact is anticipated on the project.</li> <li>• However, all the structures and facilities/equipment should be constructed and installed considering the respective seismic information to obtain design safety.</li> </ul>
<p><b>Soil Erosion:</b> Elevated sections particularly at high embankments would be vulnerable to erosion and need to be provided proper slope protection measures to prevent erosion.</p>	<p>The topography of the existing facility is exposed to sheet erosion due to land structure</p>	<p>The project site is an existing industrial facility, and it is unlikely that there will be a detrimental removal of any topsoil. However, where it will be necessary, efforts shall be made to minimise the intake of productive lands. To conserve the productive topsoil the following measures have been proposed:</p> <ul style="list-style-type: none"> <li>• Where there will be excavation, topsoil from all areas of cutting and all areas to be permanently covered shall be stripped to a specified depth of 150mm and stored in stockpiles. At least 10% of the site shall be earmarked for storing topsoil.</li> </ul>

<p><b>Soil Contamination during Construction Stage.</b> Contamination of soil during construction phase is primarily due to construction and allied activities mostly from the construction area</p>	<p>Contamination of soil during construction stage</p>	<p><b>Construction debris:</b></p> <ul style="list-style-type: none"> <li>• It is not envisaged that debris of significant importance would be created but, in any case, it shall be stored safely and managed by Oyo State Ministry of environment approved waste vendor</li> </ul> <p><b>Soil Contamination due to accidental spills:</b></p> <ul style="list-style-type: none"> <li>• An emergency response team to be created to clean up any spill.</li> </ul> <p><b>Soil contamination due to run off</b></p> <ul style="list-style-type: none"> <li>• Improvements of design shall lead to less accidents and hence less spillage of oil and grease</li> <li>• Fuel storage will be in proper bounded areas.</li> <li>• All spills and collected petroleum products to be disposed of in accordance with guidelines of FMENV and as per the directions of the Emergency Response team.</li> <li>• Fuel storage and fuelling areas will be located at least 300m from all cross-drainage structures and significant water bodies</li> </ul>
<p><b>Noise Impact</b></p>	<p>All construction equipment, plants, machinery and vehicles will follow prescribed noise standards.</p>	<ul style="list-style-type: none"> <li>• All construction equipment used for an 8-hour shift shall conform to a standard of less than 85dB (A).</li> <li>• Vehicles and construction machinery shall be monitored regularly with attention to silencers and mufflers to maintain noise levels to minimum.</li> <li>• Workers near high noise area must wear ear plugs, hardhats and should be engaged in diversified activities to prevent prolonged exposure to noise levels of more than 85dB (A) per 8-hour shift.</li> </ul>

**THE SUMMARY OF MITIGATION MEASURES FOR IMPACTS ON AIR QUALITY**

**TABLE 7.1: SUMMARY OF MITIGATIONS FOR IMPACTS ON AIR QUALITY**

<b>S/ N</b>	<b>Description</b>	<b>Impact</b>	<b>Reason</b>	<b>Mitigation / Enhancement</b>
1.	Meteorological factors and climate	Marginal impact	Due to production and machinery operation	<ul style="list-style-type: none"> <li>▪ Comprehensive horticultural practice</li> </ul>
2.	Dust generation	Dust generation will be minimized as there will not be any magnificent excavation Temporary & location specific	Shifting of utilities, removal of trees & vegetation, transportation of material	<ul style="list-style-type: none"> <li>▪ Sprinkling of Water</li> <li>▪ Fine materials to be completely covered, during transport.</li> <li>▪ Plant to be installed in down wind direction from nearby settlement.</li> </ul>
3.	Gaseous pollutants	Moderate impact	Clearing and excavating materials & clearing of the surface	<ul style="list-style-type: none"> <li>▪ Air pollution monitoring plan will be enforced</li> <li>▪ Workers will be provided protective kits.</li> <li>▪ Local people will be educated on safety and precaution.</li> </ul>
4.	Air quality emissions	Moderate impact	Air pollutants from traffic	<ul style="list-style-type: none"> <li>▪ Compliance with future statutory regulatory requirements</li> </ul>
5.	Air quality monitoring		Effectiveness shortfall of any unforeseen impact	<ul style="list-style-type: none"> <li>▪ Measures will be revised &amp; improved to mitigate impact</li> </ul>

**TABLE 7.2: MITIGATIVE MEASURES, MONITORING ACTIONS AFFECTING ENVIRONMENTAL RESOURCES AND HUMAN AMENITY.**

Action	Potential impact	Mitigation Measures	Responsibilities
<b>A. During Maintenance &amp; Construction</b>			
Excavation and earth movement	Dust emission	<ul style="list-style-type: none"> <li>Wetting excavated surfaces</li> <li>Using temporary windbreaks</li> <li>Covering truck loads</li> </ul>	Maintenance Manager
	Noise generation	<ul style="list-style-type: none"> <li>Restriction of vehicular movement hours to daytime</li> <li>Employing low noise equipment proper maintenance of equipment &amp; vehicles, &amp; tuning of engines and mufflers</li> </ul>	Maintenance Manager/Envi. Manager
	Erosion	<ul style="list-style-type: none"> <li>Proper resurfacing of exposed Areas</li> <li>Inducing vegetation growth</li> </ul>	Maintenance Manager
	Disturbance to biodiversity	<ul style="list-style-type: none"> <li>Conservation of present vegetation and used as wind brakes and aesthetic cover for the facility.</li> <li>Inducing vegetation growth</li> </ul>	Maintenance Manager
Dumping of excavated and renovation debris/ material into the environment	Groundwater / soil pollution	<ul style="list-style-type: none"> <li>There will be prohibition of uncontrolled dumping in any phase of the project. Disposal at appropriate dumpsite.</li> <li>Awareness creation amongst workers on environmental protection</li> </ul>	Environmental Manager
Discharge of wastes (Chemicals, oil, lubricants, etc.) on-site	Soil and water pollution	<ul style="list-style-type: none"> <li>Prohibition of uncontrolled discharge. Proper disposal of hazardous product.</li> <li>Education of workers on environmental protection</li> </ul>	Environmental Manager
Storage of hazardous material, traffic deviation, deep excavation,	Hazards to public and occupational safety	<ul style="list-style-type: none"> <li>Proper supervision for high workmanship performance</li> <li>Provision of adequate safety measures, and implementation of health and safety standards</li> </ul>	Environmental Manager

movement of heavy vehicles, etc.			
Storage of scrap tyres	Breeding grounds for mosquitos	<ul style="list-style-type: none"> <li>• Store scrap tyres away from rain to avoid stagnant water</li> <li>• Fumigate regularly</li> </ul>	Production/ HSE Manager
<b>B. During Design; Operation &amp; Production</b>			
Inadequate process design and control	Generation of design engineer's obnoxious odours	<ul style="list-style-type: none"> <li>• Improving operation &amp; maintenance design procedures</li> <li>• Provision of covers where possible</li> <li>• Landscaping a proper natural windbreaker around the facility</li> <li>• Maintenance of leachate collection Containers</li> <li>• Maintaining proper cleanliness and housekeeping</li> <li>• Transportation of odorous by-products in enclosed container trucks</li> </ul>	Design Engineer
	Impaired aesthetics	<ul style="list-style-type: none"> <li>• Maintaining cleanliness around and within the plant</li> <li>• Proper fencing and landscaping</li> </ul>	Plant Manager
	Noise generation	<ul style="list-style-type: none"> <li>• Limit product collection and delivery of raw materials to daytime hours</li> <li>• Incorporating low-noise equipment</li> <li>• Locating mechanical equipment in proper acoustically lined enclosures</li> <li>• Proper fencing and landscaping</li> </ul>	„
	Traffic generation	<ul style="list-style-type: none"> <li>• Proper routing of material delivery trucks</li> <li>• Limiting product collection and delivery to daytime hours</li> </ul>	„
	Public & occupational	<ul style="list-style-type: none"> <li>• Restricting unattended public access</li> <li>• Providing adequate safety measures and monitoring equipment</li> </ul>	HSE Manager

	hazards	<ul style="list-style-type: none"> <li>• Emphasizing safety education and training for system staff</li> <li>Implementing health and safety standards</li> </ul>	
Inappropriate waste collection	Accumulation of waste at waste collection bins	<ul style="list-style-type: none"> <li>• Create and monitor waste collection schedules</li> </ul>	HSE Manager
Inappropriate equipment maintenance operations	Noise pollution and breakdown of equipment	<ul style="list-style-type: none"> <li>• Regular maintenance culture</li> </ul>	Plant Engineer.
	Incurring additional cost by machinery replacement		



**TABLE 7.3 IMPACTS ON WATER RESOURCES DURING THE CONSTRUCTION STAGE**

S/N	Item	Impact	Impact (Reason)	Mitigation / Enhancement
1.	Loss of water resource	Minor, indirect impact	Sheet erosion	<ul style="list-style-type: none"> <li>▪ Land acquisition has been done in line with Oyo State Govt. approval of the location for the facility.</li> <li>▪ There is likely not going to be negative impact that will warrant loss of water resource other than those for sanitary purposes</li> </ul>
2.	Runoff and drainage	Direct Impact	Siltation of water bodies Reduction in ground recharge Increased drainage discharge	<ul style="list-style-type: none"> <li>▪ Silt fencing to be provided where applicable.</li> <li>▪ Continuous drain is provided</li> </ul>
3.	Water requirement for project	Direct impact	Water requirement for construction & operation activity. Water requirement for labour	<ul style="list-style-type: none"> <li>▪ Construction workers shall minimise water usage</li> <li>▪ Avoidance of depletion of water sources.</li> </ul>
4.	Increased sedimentation	Direct impact	Increased sediment laden run-off after the nature and capacity of the watercourse	<ul style="list-style-type: none"> <li>▪ Silt fencing to be provided</li> </ul>
5.	Contamination of Water	Direct adverse impact	Oil and diesel spills Routine and periodical maintenance	<ul style="list-style-type: none"> <li>▪ Hazardous wastes Management and handling to be done as per the IFC &amp; FMENV guidelines</li> <li>▪ Oil Interceptor will be provided for accidental spill of oil and diesel.</li> <li>▪ Septic tank will be construction for waste disposal.</li> </ul>
6.	Water quality monitoring		Effectiveness / shortfall (if any) Any unforeseen impact	<ul style="list-style-type: none"> <li>▪ Measures will be revised and improved to mitigate / enhance environment due to any unforeseen impact.</li> </ul>

## 7.2 CONTINGENCY PLAN

The contingency plan in case of emergency was tackled in the design consideration of the facility. During operation phase the production hall will be hot but there is an adequate ventilation plan & installation of heat extractors and industrial fans in place. This zone shall be equipped with blowers to ensure proper aeration. Emergency evacuation plan shall be put in place to ensure that personnel and visitors to the factory are not trapped. These preventive measures and design considerations will ensure a continuous and uninterrupted operation in the facility.

The following emergency/contingency plans should be in place:

- Installation of fire suppression system for computer/control rooms
- Design of emergency evacuation routes and safety signs should be in place to ensure easy evacuation.
- Educate workforce and visitors on the emergency preparedness within the factory
- Constitute an in-house emergency committee to manage any emergency
- Integrate the community and government bodies in your emergency response plan.
- Regular inspection of the contingency management system.
- Train staff and visitors who may be affected in case of an emergency on the emergency plan of the proposed scrap tyre recycling plant.
- There shall be good access in any case of emergency.
- Installation of CCTV cameras to aid security measures

## **CHAPTER EIGHT**

### **ENVIRONMENTAL MANAGEMENT PLAN**

#### **8.0 INTRODUCTION**

The Environmental Management Plan (EMP) is a remedial action plan required to ensure sustainable development of the project during construction and operational phases. It is a concise framework initiated to curb the identified negative impacts of the proposed project. The EMP is drawn to be location, activity, and time specific. In general, Federal Ministry of Environment is the ministry responsible for enforcement of environmental mitigation measures. Mitigation measures for generic impacts are listed in **Table 8.1**. The list provides implementing organisation and responsible entity.

#### **8.1 SITE SPECIFIC MANAGEMENT PLAN**

##### **8.1.1 Cultural Properties**

The project is within an existing industrial structure and there is no impact on cultural property (e.g. temple, mosque etc.).

##### **8.1.2 Sensitive Features**

Noise barriers in the form of compound walls have been proposed where there is the tendency for excessive noise that may jeopardise the peace of people that may be affected by construction activities.

##### **8.1.3 Community Properties**

There is no community property that would be affected during construction or production phases since the proposed location is within the Industrial hub.

#### **8.2 IMPLEMENTATION OF ENVIRONMENTAL SOCIAL MANAGEMENT PLAN**

The Environmental Officer should be available for the entire duration of the project construction phase and production phases. The Environmental Officer shall primarily be responsible for compliance with the EMP. The Environmental Specialist shall monitor the compliance of the EMP. The key issues that require special attention along with the mitigations to be implemented have been detailed in Table 8.1.

**TABLE 8.0: ENVIRONMENTAL MANAGEMENT PLAN (EMP)**

Environmental Impact / Aspect	Mitigation Measures	Location	Time Frame	Responsibility		Cross reference
				Implementation	Supervision	
<b>DESIGN STAGE</b>						
Issues from stakeholder Consultations	Various issues raised were examined & suitably incorporated based on merit & other project safety measures. Further input if any come out from public review will be incorporated in the final EIA report		During Design	Freetown Waste Management & Recycle Limited / civil contractor	Freetown Waste Mgt & Recycle Limited / FMENV	
Orientation of Implementation Team	A comprehensive training / orientation schedule has been prepared at different stages.		During Design	Freetown Waste Management & Recycle Limited	FMENV	
<b>PRE-CONSTRUCTION /RENOVATION STAGE</b>						
Land Acquisition	Land requirement details to be sent to the Govt. and permission to be taken for the same.	N/A	N/A	Freetown Waste Management & Recycle Limited	FMENV	

<b>Mobilisation &amp; Site Clearance/Preparation</b>						
Removal of Vegetation	Vegetation that will be removed from the facility is on the existing walkways. No major impact on the vegetation is envisaged	Project location	During renovation activities	Freetown Waste Mgt Recycling Ltd/ Contractor	FMENV	
Procurement of scarp tyres/ Equipment	Specifications of machinery, Vehicles, and Equipment to be procured will comply with the requirements of the relevant current emission control legislations in Nigeria as directed by FMENV/ Oyo State Min. of Environment		Prior to mobilisation at site	Freetown Waste Management & Recycle Limited/ Contractors	FMENV	Procurement Document and Technical Specification provided by the plant operator
Renovation works	Where relevant the Civil Contractor shall provide, erect, and maintain necessary (temporary) structures/ scaffolds/ formworks, and ancillary facilities for labour to standards and scales approved by the Project Engineer.	All areas in immediate vicinity of renovation activities shall be approved by the Project Engineer	During Establishment, Operation and Dismantling of such structures.	Freetown Waste Management & Recycle Limited / Contractor	FMENV	

Setting up of equipment	Machinery and batching plants shall be located far away from the nearest habitation. The Civil Contractor shall obtain the consent to operate the plants from Oyo State Ministry of Environment.	All heavy equipment & Batching Plants	During erection, testing, operation and dismantling of such plants	Freetown Waste Management & Recycle Limited	FMENV	Guidelines of FMENV & Oyo State Min. of Environment on obtaining license for establishing such plant and machineries
Identification of dumping sites	Location of dumping sites shall be finalized based on the FMENV & Oyo State Min. of Environment guidelines shall certify that: <ul style="list-style-type: none"> <li>• These are not located within designated forest areas.</li> <li>• The dumping does not impact natural drainage courses</li> <li>•</li> </ul>	Throughout the corridor	During mobilisation	Freetown Waste Management & Recycle Limited/ Contractor	FMENV	
<b>CONSTRUCTION STAGE</b>						
Clearances & approvals	Where necessary relevant permits and clearance in line with Industrial activities/ Environmental Guidelines should be complied with. <ul style="list-style-type: none"> <li>• Adhere to all clearance terms and conditions</li> </ul>		Construction stage (Prior to initiation of any work).	FMENV	Freetown Waste Mgt & Recycle Limited	General Conditions of Contract

Land						
Soil Erosion and Sedimentation control	<p>Main reason of soil erosion is rains and the topography of the land. The project proponent shall plan the activities so that no naked / loose earth surface is left out before the onset of monsoon, for minimising the soil erosion following preventive measures to be taken such as:</p> <ul style="list-style-type: none"> <li>• Embankment slopes to be covered, soon after completion.</li> <li>• Next layer / activity to be planted, soon after completion of clearing and grubbing, laying of embankment layer, sub-grade layer, sub-base layer, scarification etc.</li> <li>• Top soil from construction site to be protected / covered for soil erosion.</li> <li>• Debris due to excavation of foundation, dismantling of existing cross drainage structure will be removed from the water course immediately.</li> </ul>	Throughout Project Corridor, Service projects and equipment storage sites, etc.	<p>Upon completion of construction activities at these sites.</p> <p>During construction</p>	Freetown Waste Management & Recycle Limited / Civil Contractor	FMENV	Standard engineering practices,

Loss of agricultural top soil	There are vegetations within the existing industrial facilities and will be maintained and improved upon	Project area	During renovation & operation phase	Freetown Waste Management & Recycle Limited / Civil Contractor	FMENV	Standard Engineering & Environmental Practices
Compaction of Soil and Damage to Vegetation	<ul style="list-style-type: none"> <li>• All construction works &amp; vehicles shall be operated within the area designated for the factory to avoid damage to soil and secondary vegetation.</li> <li>• While operating on temporarily acquired agricultural land for any construction activities, top soil will be preserved in stockpiles.</li> </ul>	Project area	During construction	Freetown Waste Management & Recycle Limited / Contractor	FMENV	



<p>Contamination of soil</p>	<ul style="list-style-type: none"> <li>• Vehicle/machinery and equipment operation, maintenance and refuelling shall be carried out in such a fashion that spillage of fuels and lubricants does not contaminate the ground. An “oil interceptor” will be provided for wash down and refuelling areas where applicable.</li> <li>• Fuel storage area shall be protected with bund walls. All spills and collected petroleum products shall be disposed of in accordance with Oyo State Min. of Environment /FMENV guidelines at designated locations.</li> <li>• Oil interceptor will be installed at construction site.</li> <li>• Septic tank will be constructed for safe disposal of waste.</li> </ul>	<p>At fuel storage areas – usually at construction camps, temporarily acquired site.</p>	<p>During Construction.</p>	<p>Freetown Waste Management &amp; Recycle Limited/Civil Contractor</p>	<p>FMENV</p>	
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10. Material sources	<ul style="list-style-type: none"> <li>• Sand shall be sourced from approved and licensed vendors</li> <li>• Adequate safety precautions shall be in place to ensure safe transportation of raw material from quarries to the construction site. Vehicles transporting the material shall be covered to prevent spillage.</li> </ul>		During construction	Freetown Waste Management & Recycle Limited/Civil Contractor	FMENV	
Air					FMENV	
Dust Generation	<ul style="list-style-type: none"> <li>• Vehicles delivering materials should be covered to reduce spills and dust blowing off the load.</li> <li>• Clearing and excavation to be done, just before the start of next activity on that site.</li> <li>• Civil contractor shall take every precaution to reduce the level of dust emission.</li> <li>• Plants, machinery, and equipment shall be so handled (including dismantling) as to minimise generation of dust.</li> <li>• Provision of breathing apparatus shall be made and issued to employees working in a dusty environment</li> </ul>	Work site	Beginning with & throughout construction.	Freetown Waste Management & Recycle Limited/Civil Contractor	FMENV	

Equipment Selection, Maintenance & operation	<ul style="list-style-type: none"> <li>• Regularly conduct checks on construction vehicles to prevent pollution.</li> </ul>	Work site	During Construction.	Freetown Waste Management & Recycle Limited/Civil Contractor	FMENV	
Pollution from Machinery	<ul style="list-style-type: none"> <li>• All machines to be used in construction shall conform to relevant dust emission control legislations.</li> <li>• Water will be sprayed during the non-monsoon months, regularly to minimize dust, in the whole crusher plant area.</li> </ul>	All machines	During Erection, Testing, Operation and Dismantling of such plants.	Freetown Waste Management & Recycle Limited/Civil Contractor	FMENV	
<b>Water</b>						
Water requirement for project	<ul style="list-style-type: none"> <li>• During renovation/construction, the existing borehole and wells will be used.</li> <li>• Civil contractor will ensure optimum use of water; discourage labour from wastage of water.</li> </ul>	Throughout Project area, all access projects, temporarily acquired sites.	During Construction	Freetown Waste Management & Recycle Limited/Civil Contractor	FMENV	

<p>Silting / sedimentation</p>	<ul style="list-style-type: none"> <li>Measures suggested under “Soil Erosion and Sedimentation control” will be enforced.</li> <li>Where silting will result, adequate precaution shall be observed. No surface water is close to the project site</li> </ul>		<p>Throughout renovation/ construction period</p>	<p>Freetown Waste Mgt Recycling Ltd/Civil Contractor</p>	<p>FMENV</p>	
<p>Contamination of water</p>	<ul style="list-style-type: none"> <li>Measures suggested under “Contamination of soil” will be enforced.</li> </ul>	<p>All areas in immediate vicinity of construction campsite chosen by the civil Contractor.</p>	<p>Throughout construction period, installation and dismantling of temporary structure for site workers.</p>	<p>Freetown Waste Management &amp; Recycle Limited/Civil Contractor</p>	<p>FMENV</p>	
<p><b>NOISE</b></p>						
<p>Noise from Vehicles, Plants and Equipment</p>	<ul style="list-style-type: none"> <li>Noise standard at construction sites, e.g. batching plant, furnace plant will be strictly monitored to prevent exceeding noise standards.</li> <li>Machinery &amp; vehicles will be maintained to keep their noise to a minimum.</li> <li>Provision of ear protection to workers</li> </ul>	<p>Production floor, sites</p>	<p>Throughout construction</p>	<p>Freetown Waste Management &amp; Recycle Limited/Civil Contractor</p>	<p>FMENV</p>	

<b>FLORA &amp; FAUNA</b>						
Vegetation clearance	<ul style="list-style-type: none"> <li>Clearing and excavation should be avoided beyond that which is directly required for construction activities.</li> <li>Next activity to be planned / started immediately, to avoid dust generation and soil erosion during monsoon.</li> <li>Re-vegetation should be done where necessary.</li> </ul>		During cleaning operations. During construction	Freetown Waste Management & Recycle Limited/Civil Contractor	FMENV	
Fauna	<ul style="list-style-type: none"> <li>Construction workers must protect natural resources and soil organisms and insects within the facility to ensure balanced ecosystem.</li> </ul>		During construction	Freetown Waste Management & Recycle Limited/Civil Contractor	FMENV	
<b>SOCIO – ECONOMIC ENVIRONMENT</b>						
Public Health and Safety	Debris generated will be disposed to the satisfaction in compliance with best practice. Monitoring of air, water, noise and land during construction and operational phase.		During Construction	Freetown Waste Management & Recycle Limited/Civil Contractor	FMENV	
Accidents	The Civil Contractor should provide, erect and maintain barricades, including signs marking flats, lights and flagmen where necessary.		During Construction	Freetown Waste Management & Recycle Limited/Civil Contractor	FMENV	

Temporary Loss of Access	The works shall not interfere with or cause inconvenience to public or restrict the access to use and occupation of public or private projects, and any other access footpaths to or of properties whether public or private.	Within Project location	During Construction	Freetown Waste Management & Recycle Limited/Civil Contractor	FMENV	
<b>Project Safety &amp; Construction Safety</b>						
Traffic Delays & Congestion	<ul style="list-style-type: none"> <li>• There is an existing detailed Traffic Control Plan within the Industrial hub. The traffic control plans shall contain details of arrangements for construction under traffic and details of traffic arrangement after cessation of work each day.</li> <li>• Traffic congestion is not envisaged in the project area, but adequate arrangement should be in place.</li> </ul>	Within the project site	During Construction	Freetown Waste Management & Recycle Limited/Civil Contractor	Freetown Waste Management & Recycle Limited	

<p>Risk from Operations</p>	<ul style="list-style-type: none"> <li>• The Civil Contractor is required to comply with all the precautions as required for the safety of the workmen.</li> <li>• The Civil Contractor shall supply all necessary safety appliances such as safety goggles, helmets, masks, etc., to the workers and staff.</li> <li>• The Civil Contractor should comply with all regulation regarding safe scaffolding, ladders, working platforms, gangway, stairwells, excavations, trenches and safe means of entry and egress.</li> <li>• No child labour shall be utilized in the project</li> </ul>	<p>Entire Project site.</p>	<p>During Construction</p>	<p>Freetown Waste Mgt &amp; Recycle Limited/Civil Contractor</p>	<p>Freetown Waste Mgt Recycling Ltd</p>	
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<p>Risk from Electrical Equipment</p>	<ul style="list-style-type: none"> <li>• Adequate precautions should be taken to prevent danger from electrical equipment.</li> <li>• No material or any of the sites will be so stacked or placed as to cause danger or inconvenience to any person or the public.</li> <li>• All necessary fencing and lights will be provided to protect the public.</li> <li>• All machines to be used in the construction will conform to the relevant Electrical codes, will be free from defect, will be kept in good working order, will be regularly inspected, and properly maintained as per provisions.</li> </ul>	<p>Entire Project site.</p>	<p>During Construction</p>	<p>Freetown Waste Management &amp; Recycle Limited/Civil Contractor</p>	<p>Freetown Waste Management &amp; Recycle Limited</p>	
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<p>Risk at Hazardous Activity</p>	<ul style="list-style-type: none"> <li>• All workers employed on mixing asphaltic material, cement, lime mortars, concrete etc., will be provided with protective footwear and protective goggles.</li> <li>• Workers, who are engaged in welding works, would be provided with welder's protective eye-shields. Stonebreakers will be provided with protective goggles and clothing and will be seated at sufficiently safe intervals.</li> <li>• The use of any toxic chemical shall be strictly in accordance with the manufacturer's instructions. A register of all toxic chemicals delivered to the site shall be kept and maintained up to date by the Civil Contractor. The register shall include the trade name, physical properties and characteristics, chemical ingredients, health and safety hazard information, safe handling and storage procedures, and emergency and first aid procedures for the product.</li> </ul>	<p>Entire Project site.</p>	<p>During Construction</p>	<p>Freetown Waste Management &amp; Recycle Limited/Civil Contractor</p>	<p>Freetown Waste Management &amp; Recycle Limited</p>	
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<p>Risk caused by Force' Majure</p>	<p>All reasonable precaution will be taken to prevent danger of the workers and the public from fire, flood, drowning, etc. All necessary steps will be taken for prompt first aid treatment of all injuries likely to be sustained during work.</p>	<p>Entire Project site</p>	<p>During Construction</p>	<p>Freetown Waste Mgt Recycling Ltd/Contractor</p>	<p>FMENV</p>	
<p>First Aid</p>	<ul style="list-style-type: none"> <li>• At every workplace, a readily available first aid unit including an adequate supply of sterilised dressing material and appliances will be provided as per the Factory Act.</li> <li>• Suitable transport will be provided to facilitate take injured or ill person(s) to the nearest applicable hospital.</li> </ul>	<p>Entire Project site.</p>	<p>During Construction</p>	<p>Freetown Waste Mgt Recycling Ltd/ Contractor</p>	<p>FMENV</p>	

<p>Safety Measures During Construction</p>	<ul style="list-style-type: none"> <li>• All relevant provisions of the Factories Act, 2004 and</li> <li>• Adequate safety measures for workers during handling of materials at site will be taken up.</li> <li>• The register will include the trade name, physical properties and characteristics, chemical ingredients, health and safety hazard information, safe handling and storage procedures, and emergency and first aid procedures for the product.</li> </ul>	<p>All construction sites</p>	<p>During construction</p>	<p>Freetown Waste Mgt Recycling Ltd / Contractor</p>	<p>Freetown Waste Mgt Recycling Ltd</p>	
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<p>Hygiene</p>	<ul style="list-style-type: none"> <li>• Conveniences shall be provided with septic tank. The effluents can be diverted for horticulture inside the camps.</li> <li>• All temporary accommodation must be constructed and maintained in such a fashion that uncontaminated water is available for drinking, cooking and washing.</li> <li>• Garbage bins must be provided in the camps and regularly emptied and the garbage disposed of in a hygienic manner.</li> <li>• Adequate health care is to be provided for the work force. Unless otherwise arranged for by the local sanitary authority, the local medical health or municipal authorities.</li> <li>• On completion of the works, all such temporary structures shall be cleared away, all rubbish burnt, septic tank and other disposal pits filled in and effectively sealed off and the outline site left clean and tidy, at the Concessionaire/ Contractor's expense, to the entire satisfaction of the Independent Engineer.</li> </ul>	<p>All Worker's Camps</p>	<p>During construction</p>	<p>Freetown Waste Mgt Recycling Ltd/Contractor</p>	<p>FMEnv</p>	
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Clearing of Construction & Restoration	Civil Contractor to prepare site restoration plans. On completion of the works, all temporary structures will be cleared away, all rubbish burnt, excreta or other disposal pits or trenches filled in and effectively sealed off and the site left clean and tidy. Where applicable residual topsoil will be distributed on adjoining / proximate barren.	Project location		Freetown Waste Mgt & Recycle Limited/Contractor	FMENV	
Monitoring at critical locations	The monitoring of Air, water and Noise to be carried out identified critical locations besides locations identified by along the project corridor.			Freetown Waste Mgt Recycling Ltd/Contractor	FMENV	
<b>OPERATION STAGE</b>						
Water quality degradation due to surface run-off	Silt fencing, Oil & Grease traps, etc. shall be provided at sensitive areas to ensure that the water quality is not impaired due to contaminants from project run-off. Monitoring shall be carried out as specified in the Monitoring plan	At sensitive water bodies identified. As specified in the monitoring plan	During Operational Stage	Freetown Waste Mgt Recycling Ltd/Contractor	FMENV	

<p>Contamination of Soil &amp; Water Resources from Spills</p>	<ul style="list-style-type: none"> <li>• Contingency plans to be in place for cleaning up of spills of oil, fuel and toxic chemicals.</li> <li>• Spill of oil, fuel and automobile servicing units without adequate disposal systems in place to be discouraged.</li> <li>• Accidental spills are potentially disastrous, but its probability is quite low as one of the objectives of this project is to enhance project safety.</li> <li>• The Public will be informed about the regulations on land pollution.</li> <li>• Land pollution monitoring program has been devised for checking pollution level and suggesting remedial measures.</li> </ul>	<p>Entire Project</p>	<p>During Operational Stage</p>	<p>Freetown Waste Mgt Recycling Ltd/Contractor</p>	<p>FMEnv</p>	
<p>Traffic and Accident within project area</p>	<ul style="list-style-type: none"> <li>• Depending on the level of congestion and traffic hazards, traffic management plans will be prepared.</li> <li>• Traffic control measures including speed limits to be enforced strictly.</li> </ul>	<p>All along the Project corridor and surrounding areas.</p>	<p>During Operational Stage</p>	<p>Freetown Waste Mgt Recycling Ltd/Contractor</p>	<p>Freetown Waste Mgt Recycling Ltd</p>	<p>Throughout Operation/production Stage.</p>

Accidents involving Hazardous Materials	<ul style="list-style-type: none"> <li>• Creation of an Emergency Response team</li> <li>• For delivery of hazardous substances, permit license, driving license and guidance license will be required.</li> <li>• In case of spill of hazardous materials, the relevant departments will be intimated at once to deal with it with the spill contingency plan.</li> </ul>	All along the Project corridor and surrounding areas	During Operational Stage	Freetown Waste Mgt Recycling Ltd/Contract or	FMENV	
Monitoring at critical locations	The monitoring of Air, land, water and Noise to be carried out	Factory	Monthly and report quarterly to FMENV.	Freetown Waste Mgt Recycling Ltd	FMENV	
Noise	<ul style="list-style-type: none"> <li>• Horn Prohibited signpost will be enforced at strategic locations</li> <li>• Maintenance of noise barriers</li> </ul>	Construction/operation phases.	During Operational Stage	Freetown Waste Mgt Recycling Ltd/Contract or	FMENV	
Mosquito infestation	<ul style="list-style-type: none"> <li>• Weekly fumigation of the scrap tyres and ensure tyres are not stored where water cannot gather in the tyres.</li> </ul>	All phases	All stages	Freetown Waste	FMENV	

## **8.3 ENVIRONMENTAL MONITORING PROGRAM**

The Environmental Monitoring Programme has been detailed as a stand-alone document. Successful implementation of the Environmental Monitoring Program is contingent on the following:

- The Project Proponent shall ensure compliance with the environmental monitoring plan.
- Submission of quarterly air quality and wastewater monitoring results to FMENV and Oyo State Ministry of Environment

### **Monitoring of Earthworks Activities**

Most of the environmental problems related to the construction works are anticipated to be associated with the earthworks, particularly for the excavations. Other environmental effects associated with the earthworks include the development of adequate temporary drainage to minimise detrimental effects (e.g. erosion) due to run-off, and safety aspects related to Works implementation.

#### **8.3.1 Monitoring of Construction Facilities, Plant and Equipment**

All issues related to negative environmental impacts of the construction facilities, Plant and Equipment are to be controlled through:

- Compliance with self-imposed quality assurance plan by project proponent and construction personnel on site;
- Regular / periodic inspection of the Site construction & Contractor's plant and equipment
- Regular appraisal of the construction works / Contractor.

Other environmental impacts are to be regularly identified and noted on the monthly appraisal inspection made to review all aspects of the Civil Contractor's operation. The responsible officer is to review all monthly appraisal reports, and to rectify all significant negative environmental impacts.



**TABLE 8.1 MONITORING PROGRAMME FOR THE FREETOWN WASTE MANAGEMENT & RECYCLE LIMITED MANUFACTURING PLANT**

S/N	Parameters	Key Performance Indicators (KPIs)	Frequency	Time frame for monitoring	Use
1	Soil quality	Soil samples should be collected within the factory to determine the following as a minimum against the baseline data: - pH values - Organic Carbon - Heavy metals	Annually	Throughout the lifespan of the production factory	- Internal Monitoring
2	Vegetation status & improvement	- Diversity - Morphology - Pathology	Bi- annually	Long term	-Compliance Purpose - Preservation of the vegetation
3	Ground water quality monitoring	- pH - TDS - TSS - BOD, COD - Turbidity; Etc.	Quarterly	Short term	- Internal monitoring  -Send report to FMENV
4	Air Quality Monitoring	- Noise level - Total suspended solid (TSS) - Ambient air quality - Gaseous emission	Quarterly	short term	- Internal monitoring -Send report to FMENV
5	Contingency Management	- Awareness on the plan - Compliance with evacuation plan - Practical exercises (Drills)	Monthly	Long term	- Internal monitoring

6	Environmental Audit & Report (EAR)	Environmental compliance monitoring	2Years	Long-term	EAR to be sent to FMENV/Oyo State Ministry of Environment
7	Liquid Effluent	Treat effluent water to meet regulatory standards & analyse	Monthly	short term	Internal use and send reports to FMENV on quarterly basis.

#### **8.4 IMPLEMENTATION AND MONITORING**

This section provides an assessment of the existing institutional arrangement within Federal Ministry of Environment, the state Government and, reflects on capacity building / training issues that need to be addressed to ensure timely implementation of EMP. The institutional arrangement proposed for this project has been presented here with newly defined roles and responsibilities. The responsibility of implementing the mitigation measures lies with the project proponent and the Federal Ministry of Environment. Freetown Waste Management & Recycle Limited will be responsible for planning all Environmental Management Plan (EMP) activities. In the pre-construction phase of the project Freetown Waste Management & Recycle Limited civil contractor shall study the ESMP to identify environmental issues and arrive at a suitable strategy for implementation.

#### **8.5 ENVIRONMENT AND SOCIAL MONITORING/ FMENV/ OYO STATE MINISTRY OF ENVIRONMENT**

The Federal Ministry of Environment has an institutional capacity to meet the requirements for implementation of the environmental mitigation measures in the ESMP. As part of the project it is envisaged that they will continue to:

- Monitor progress of the implementation of the ESMP measures in consonance with the timeline for the project;
- Maintain interaction with the various statutory bodies;
- Interact with the Environmental Expert / the Environmental Consultants on the state of the environment and mitigation and enhancement measures adopted;
- Occasionally inspect the environmental measures being implemented by the Contractor;
- Report progress of works, both in terms of physical progress and quality for transmission to statutory authorities such as the Ministry of Environment;
- Document and disseminate good practices, bottlenecks, and their resolution during the implementation of environmental measures.

#### **8.6 IMPLEMENTATION ARRANGEMENTS**

The Management of Freetown Waste Management & Recycle Limited is responsible for the implementation of the provisions made within the ESMP through its site offices. The services of the Environmental Consultant will be procured to assist the site offices for monitoring the environmental aspects of the project during implementation. The organization chart for implementation arrangements.

#### **8.7 CONTRACTOR**

Execution of works will be the responsibility of the contractor and the management of Freetown Waste Management & Recycle Limited (Proponent). Every plan shall be

complied with to ensure that the environment is always protected.

## **8.8 REPORTING SYSTEM**

Reporting system provides necessary feedback for project management to ensure quality of the works and that the program is on schedule. The rationale for a reporting system is based on accountability to ensure that the measures proposed as part of the Environmental Management Plan get implemented in the project. Reporting system for the suggested monitoring program operates at two levels as:

- Reporting for environmental condition indicators and environmental management indicators
- Reporting for operational performance indicators at the Freetown Waste Management & Recycle Limited at their site level.

The reporting system will operate linearly – contractor who is at the lowest rung of the implementation system reporting, shall report to the Management of Freetown Waste Management & Recycle Limited. The Freetown Waste Management & Recycle Limited's site office will be responsible for setting the targets for the various activities anticipated during construction phase in consultation with the site Engineer and obtaining agreement from the Contractor after mobilisation but before beginning of works on site. The contractor will report from then on regarding the status on each of these.

## **8.9 ENVIRONMENTAL CAPACITY BUILDING**

The project proponent has skill acquisition and training programs at different levels to equip her personnel on the efficient operation of equipment, safety and administrative aspects of the operation. Some short-term training is required for the Environment Manager, other staff members of the Environment Unit and the contractor staff to raise their levels of environmental awareness. The training can be conducted by either some external agency or through the help of in-house expertise of the consultants. In the long-term training, special environmental issues will be examined, and likely solutions provided to the Environment Department. The focus of future training programmes should be on implementation with special emphasis on the environmental protection. Identification of candidate locations for siting construction camps, disposal of excess cut material would be a priority in the short term.

The proposed training should also allow the officials to enhance their skills for effective monitoring of project by understanding the formats developed for reporting. In addition, close interaction is required among members of the project proponent and contractor responsible for the Environmental since it is envisaged that the two aspects will have a considerable overlap. It is envisaged that the training as part of the project include training on several issues important for both teams simultaneously.

## **8.10 DECOMMISSIONING & REMEDIATION PLAN**

Everything on earth has a lifespan so also developmental project and when the project proponent decides in the future that the facility is no longer needed and wants to do

away with it, the proponent is required to conduct a decommissioning plan for the equipment and reinstating the environment to a usable form. The plant is designed to last minimum of hundred (100) years and in case the plant will be shut down, the site will progress through decommissioning, remediation, and redevelopment. Though it is not always possible, it helps to know site reuse options early in the process to inform clean-up decisions and determine the appropriate level of work needed in each stage of the assessment, clean-up, and redevelopment process. Understanding the range of reuse options and needs associated with each will help in the development of realistic schedules and cost estimates. Time and costs associated with permits, approvals (of permits, plans, funding) and public involvement is factored into redevelopment plans as well. Decommissioning begins with an announcement that the plant is closing and ends when operations completely cease.

The Management of Freetown Waste Management & Recycle Limited shall develop a strategy for managing the decommissioning process that serves his or her business needs. A wide range of management strategies may be considered, from the proponent maintaining full control, to the selection of a third party to oversee the process. The proponent also may sell the property to a developer or municipality early in the process. During decommissioning, the electrical generating units shall be shut down and all operating permits are terminated. Any unused and hazardous materials associated with both the production process and the buildings/structures (e.g., process chemicals in the building or in equipment,) are removed. Production equipment is cleaned and may be removed for use at other locations or sold as scrap. Some demolition of buildings/structures may be performed to facilitate cleaning or equipment removal.

Remediation shall start with collection of soil and ground water samples to investigate and document any contamination. Next, a plan for clean-up is developed and once approved by FMENV & Oyo State Ministry of Environment. The Proponent shall develop a detailed decommissioning plan and environmental assessment of the area if the factory will be shut down.

#### **8.10.1 OBJECTIVES OF DECOMMISSIONING AND ABANDONMENT**

There are basic objectives for developing a decommissioning and abandonment Plan for the proposed scrap tyre recycling plant, which includes:

- developing a plan to remediate and minimize negative impacts on the precinct environment;
- ensures that the removal of equipment and machinery are done with utmost regards to the environment.

### **8.10.2 PURPOSE FOR THE DECOMMISSIONING GUIDELINES FOR DEVELOPMENTAL PROJECTS**

The purpose of this guideline amongst others is to:

- provide clear directions and guidance on the step by step process involved in decommissioning a facility in Nigeria.
- aid in achieving an effective and environmentally sustainable decommissioning process that shall be compatible with intended future land use on health concerns and environmental impacts.

### **8.10.3 BASIC REQUIREMENT FOR A DECOMMISSIONING ACTIVITY**

Decommissioning requirements expected of any facility is to provide acceptable standards required for eliminating environmental and health hazards during decommissioning and site clean-up. These requirements are applicable to development of decommissioning plan in line with regulatory authorities' framework on human health and environmental safety. The following strategies have been adopted by Freetown Waste Management & Recycle Limited:

- removal of structures on or beneath the ground,
- disposal or secure isolation and/or treatment of contaminated equipment in-situ or off-site,
- remediation of aesthetics (back-fillings, stained soil removal, waste disposals, etc.) and containment control of contaminant and general site clean-up.
- access controls for physical structures remaining on- site that are unsafe or hazardous to humans or animals
- remediation of aesthetically unacceptable portions of the site (filling of pits, removal of stained soil and odourous material, levelling of mounds, disposal of waste rock) etc.
- clean-up of the site to a level which will provide long-term environmental protection and will be safe for the intended future use
- registration on title to the property of any contaminants, wastes or structures left on site that restricts future land use or that require periodic monitoring to ensure continued integrity
- submission to the applicable regulatory agency and other required jurisdictions of a report confirming that decommissioning and clean-up has been completed

### **8.10.4 DECOMMISSIONING AND ABANDONMENT OPTIONS**

Two basic options are available when considering the decommissioning and abandonment of any facility. It can either be leaving the facility and removal of the facility. The two options have their own inherent advantages and disadvantages.

**OPTION 1 (LEAVE MACHINERY):** The option 1 results when Freetown Waste Management & Recycle Limited decides to sell it to any potential buyer with appropriate documentations in line with regulatory requirement or leaving it without further action. There are reasons while such facility can be left, reasons like unresolved impasse between project proponent and host community that is perceived to be harmful to both party and requires urgency to evacuate. In either scenario, the advantage is that it cost less to demobilise from site, risk of accidents is reduced. It has some disadvantages that such facilities can be used by hoodlums to perpetrate crimes and such facility can harbour dangerous animals and other living creatures.

**OPTION 2 (REMOVAL OF MACHINERY):** This option is when the project proponent decides to move all the equipment from the project location. This option has some advantages like, clean up of project site, total removal of all facilities / equipment and the location is total remediated to an acceptable level. The equipment can be reused in other locations. The disadvantages are the project proponent will spend more to remove the equipment. The project proponent can meet stiff resistance from host community.

#### **8.10.5 DECOMMISSIONING AND ABADONMENT PROCESS**

Freetown Waste Management & Recycle Limited shall conduct the abandonment and decommissioning by following some regulatory processes.

##### **8.10.5.1 PREPARATION OF ENVIRONMENTAL DECOMMISSIONNG REPORT**

Freetown Waste Management & Recycle Limited shall prepare decommissioning & abandonment environmental report before decommissioning and abandonment. The report shall detail the procedures to be adopted during decommissioning to avoid accidents and any perceivable incident. The report shall be sent to FMENV for approval before decommissioning.

##### **8.10.5.2 SAFETY OF PERSONNEL AND EQUIPMENT**

Freetown Waste Mgt Recycling Ltd shall deploy a formidable Occupational health and safety procedures that decommissioning team shall comply with. The personnel shall be well kitted for the task. A holistic and comprehensive risk assessment shall be conducted by the project proponent HSE Team.

##### **8.10.5.3 ENVIRONMENTAL CONSIDERATION**

Environmental sustainability is the watchword during decommissioning to avoid environmental pollution. Environmental data gathering (air, soil & water) shall be done and analysed in the laboratory to determine the level of the parameters before decommissioning. All the wastes generated shall be disposed-off and environment left

in a habitable condition. The proponent shall send a letter of intent to FMENV informing them of the plan to decommission and abandon the plant.

#### **8.10.5.4 STANDARDS APPLICABLE TO DECOMMISSIONING**

The International Organization for Standardization (ISO) has created a list of documents that states the requirements, specifications, guidelines, or characteristics that can be used consistently to ensure that materials, products, processes and services are fit for their purpose. For the decommissioning of facilities, every technical process/ analysis shall conform with international standards. These are but not limited to:

**TABLE 8.2 :INTERNATIONAL STANDARDS APPLICABLE TO DECOMMISSIONING**

ISO /17402:2008	Soil quality -- Requirements and guidance for the selection and application of methods for the assessment of bioavailability of contaminants in soil and soil materials.
ISO/PRF 18504	Soil quality -- Guidance on sustainable remediation (Under development)
ISO /11932:1996	Activity measurements of solid materials considered for recycling, reuse or disposal as non-radioactive waste
ISO /10381-1:2002	Soil quality -- Sampling -- Part 1: Guidance on the design of sampling programmes
ISO/DIS 20761	Water reuse in urban areas -- Guidelines for water reuse safety evaluation: assessment parameters and methods
ISO/TC147/SC6	Water sampling –general methods
ISO 45001	Occupational health and safety
ISO 14000 family	Environmental management
ISO 14004:2016	Environmental management systems -- General guidelines on



## **CHAPTER NINE**

### **CONCLUSION AND RECOMMENDATION**

The Environmental Impact Studies of the proposed scrap tyre recycling plant by Freetown Waste Management and Recycle Limited has been conducted in accordance with the regulatory requirements established by the Federal Ministry of Environment, Oyo State Ministry of Environment and Natural Resources, Department of Petroleum Resources and National Environmental Standards Regulations and Enforcement Agency other statutory and international standards. The potential impacts of the project on the existing environment (biophysical, social and health) have been identified and evaluated. The impact assessment was based on interactions between the project activities (site preparation, construction, operation, and decommissioning) and the various environmental sensitivities in all the phases of the project.

The magnitude of the anticipated impacts of the project activities on air, water, sediments, soils, vegetation, waste management, socio-economic and health issues were rated. Mitigation measures have been recommended for unavoidable impacts considered significant, to reduce the rating of their identified adverse effects to levels as low as reasonably practicable (ALARP). Recommendations have also been made to enhance the benefits of the identified positive impacts. The significance of the impacts was duly assessed through standard field and laboratory methodologies, predictive modelling as well as desk reviews.

This EIA report includes a draft Environmental Management Plan that will ensure and guarantee minimal adverse effects of the project on the environment. The implementation of the project will significantly open the areas for sustainable development. The project will assist to enhancing building and infrastructural development, boosting employment, and as well as improving the living standard of the people. The proposed project renovation/construction will not pose serious threat to the biophysical environment, as most organisms will easily migrate to adjoining pristine environment. This is because the area is an existing industrial facility.

The EIA has demonstrated that the overall impacts associated with the project can be managed within reasonable and acceptable limits by applying all identified mitigation

measures contained in this report. In consideration of the above therefore, there is no major environmental issue to impede the development of the proposed project, which is designed to improve the recycling of scrap tyres. All the identified potential adverse impacts of the proposed project shall be eliminated or reduced through the implementation of the recommended mitigation measures. The benefits that will be derived from the proposed project are therefore much greater than the short-term environmental effect.

Mitigation measures are developed to be implemented to prevent environmental degradation, it is therefore recommended that the project proponent adopt and ensures full implementation of the mitigation measures stated in the EIA report to prevent environmental pollution throughout the phases of the project and to decommissioning.

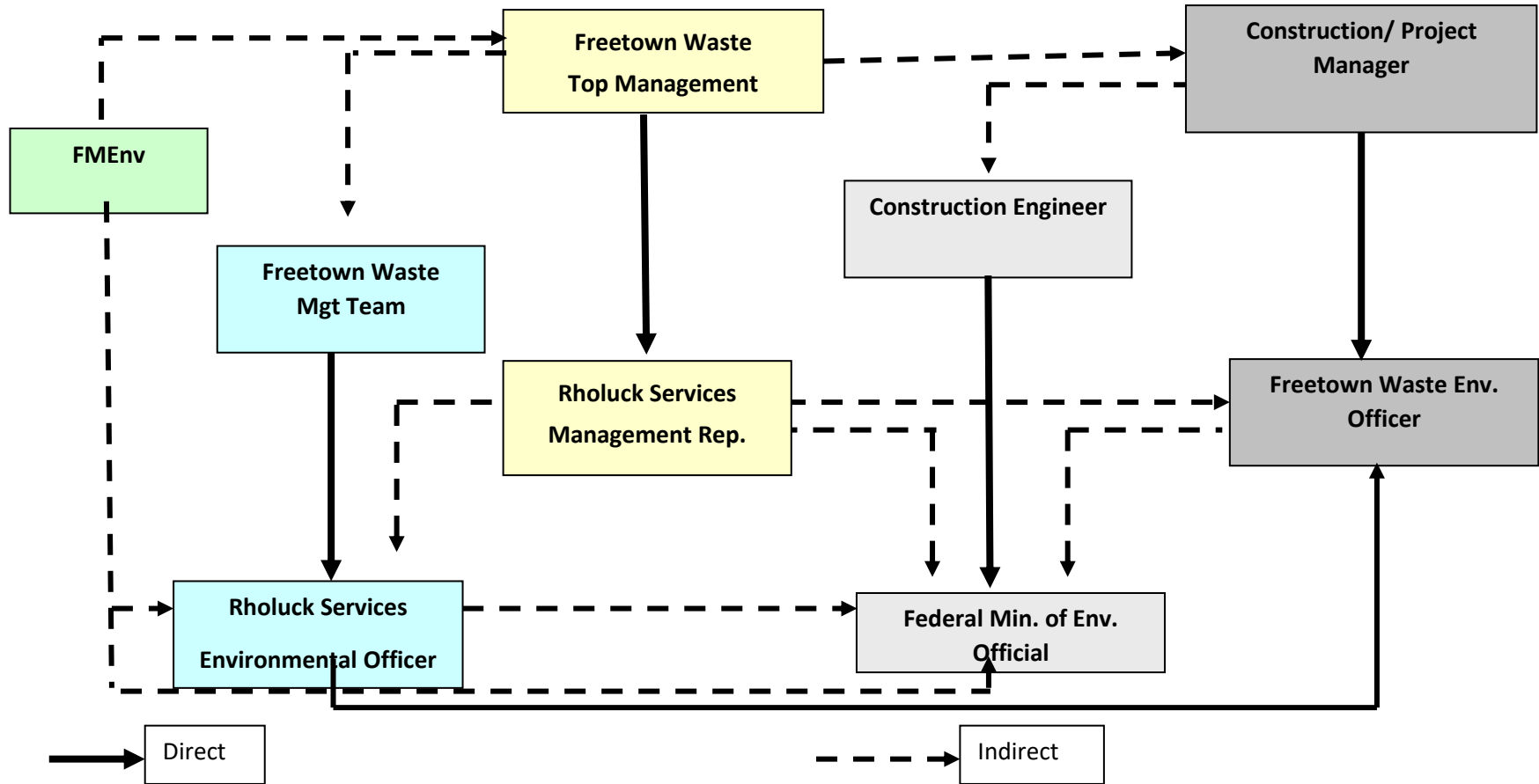
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### APPENDIX 1: PROPOSED PROJECT ORGANISATION CHART



**APPENDIX 2 A: PHYSICOCHEMICAL LABORATORY ANALYSIS RESULTS FOR SOIL SAMPLES**

S/N	Sample ID	PH	Cond Mscm-1	TOC mg/kg	Cl mg/Kg	NO <sub>3</sub> mg/kg	SO <sub>4</sub> mg/kg	PO <sub>4</sub> <sup>-3</sup> mg/kg	Ni mg/kg	Pb mg/kg	Cu mg/kg	Fe mg/kg	Zn mg/kg
1	SS1(0-15cm)	4.93	22.10	1.10	1.30	66.2	53.2	18.6	0.28	1.20	0.98	1616	24.5
2	SS1(15-30cm)	6.90	22.50	1.22	1.10	75.2	65.0	20.2	0.83	0.90	0.85	1620	19.8
3	SS2 (0-15cm)	6.50	22.40	0.78	2.04	85.2	65.1	19.5	0.36	0.58	0.13	1580	16.1
4	SS2 (15-30cm)	5.30	22.49	0.81	2.65	96.0	65.5	19.8	0.98	0.10	0.20	218	17.8
5	SS3 (0-15cm)	6.60	32.38	0.60	2.50	85.0	65.0	18.4	0.60	0.22	0.31	171	51.4
6	SS3 (15-30cm)	6.74	32.50	0.63	2.11	70.2	65.0	19.1	1.20	0.20	0.19	370	33.5
7	SS4 (0-15cm)	6.72	30.40	1.42	4.32	55.1	52.0	12.3	1.02	0.36	0.05	375	20.3
8	SS4 (15-30cm)	6.55	32.48	1.08	3.10	80.0	52.0	12.3	1.90	0.62	0.30	332	68.7
9	SS5 (0-15cm)	5.71	25.40	1.42	2.22	45.3	32.8	13.1	1.00	0.80	0.62	416	54.2
10	SS5 (15-30cm)	8.10	34.49	1.44	0.74	75.0	35.5	13.2	1.10	0.48	0.20	307	24.2
11	SS6 (0-15cm)	6.10	23.10	1.34	1.35	75.0	33.8	18.6	1.20	0.98	0.98	98.4	1.34
12	SS6 (15-30cm)	6.90	32.20	1.22	2.11	75.2	45.0	20.2	0.83	0.90	0.85	56.2	1.80
13	SS7 (0-15cm)	6.50	30.42	1.18	2.04	110	64.1	19.5	0.36	0.58	0.13	55.8	1.62
14	SS7 (15-30cm)	6.30	30.41	0.11	2.65	98.0	75.0	19.8	0.98	0.10	0.20	61.8	1.75
15	SS8 (0-15cm)	6.60	31.38	1.43	4.10	85.1	70.0	18.4	0.60	0.22	0.35	58.4	2.14
16	SS8 (15-30cm)	6.74	32.50	1.23	2.13	70.1	70.0	19.1	1.20	0.28	0.19	37.2	2.50
17	SS9 (0-15cm)	6.72	27.40	1.32	3.32	79.4	58.1	12.3	0.12	0.36	0.51	37.5	2.33
18	SS9(15-30cm)	6.55	30.42	1.08	3.60	80.0	58.1	12.3	0.29	0.65	0.32	33.2	1.57
19	SS10 (0-15cm)	5.71	28.40	1.42	2.53	80.2	29.0	13.1	1.00	1.18	0.26	41.6	3.22
20	SS10(15-30cm)	5.60	31.40	1.50	2.24	75.0	29.9	13.2	1.40	1.08	0.27	30.7	2.42
21	SS11 (0-15cm)	6.72	29.30	1.50	3.35	86.5	48.8	12.3	1.12	0.36	0.25	85.3	2.50
22	SS11(15-30cm)	6.55	32.45	1.48	3.40	80.0	50.5	12.3	1.10	0.62	0.32	75.5	2.10
23	SS12(0-15cm)	5.71	30.40	0.62	2.23	80.3	32.8	13.1	0.00	1.10	0.62	103	0.45
24	SS12(15-30cm)	5.60	32.10	1.44	2.10	75.0	35.5	13.2	1.10	0.45	0.17	115	0.32

**APPENDIX 2 B: LABORATORY ANALYSIS RESULTS FOR SOIL HEAVY METALS PARAMETERS**

S/N	Sample ID	Mg mg/kg	K mg/kg	Ca mg/Kg	Na mg/kg	Mn mg/kg	Cd mg/kg	THC mg/kg
1	SS1(0-15cm)	8.33	2.34	110	21.3	0.25	0.28	0.06
2	SS1(15-30cm)	7.95	2.50	84.2	32.1	0.28	0.10	0.01
3	SS2 (0-15cm)	6.10	2.42	65.8	22.0	5.12	0.41	0.01
4	SS2 (15-30cm)	6.42	2.49	64.1	22.6	6.10	0.52	0.01
5	SS3 (0-15cm)	6.30	1.33	70.0	18.5	3.05	0.40	0.01
6	SS3 (15-30cm)	7.75	2.50	70.6	32.1	1.82	0.39	0.01
7	SS4 (0-15cm)	7.70	0.40	68.2	24.2	2.18	1.18	0.30
8	SS4 (15-30cm)	8.20	0.48	60.0	32.1	0.50	2.10	0.10
9	SS5 (0-15cm)	4.75	2.10	54.2	18.2	0.35	2.85	0.02
10	SS5 (15-30cm)	5.10	3.42	58.4	20.4	0.58	1.56	0.04
11	SS6 (0-15cm)	6.10	2.10	85	42.5	0.22	0.28	0.02
12	SS6 (15-30cm)	5.25	2.50	68	36.4	0.20	0.10	0.01
13	SS7 (0-15cm)	6.10	2.42	65.8	40.0	2.10	0.41	0.01
14	SS7 (15-30cm)	6.42	2.49	64.1	22.6	2.10	0.52	0.01
15	SS8 (0-15cm)	6.25	1.33	65.3	18.5	1.25	0.40	0.01
16	SS8 (15-30cm)	6.45	2.50	65.6	32.1	1.12	0.39	0.01
17	SS9 (0-15cm)	5.40	0.40	68.2	24.2	0.15	1.18	0.30
18	SS9(15-30cm)	5.25	0.48	58.0	32.1	0.20	2.10	0.04
19	SS10 (0-15cm)	4.10	2.10	54.2	18.2	0.33	2.85	0.01
20	SS10(15-30cm)	4.10	3.42	54.4	20.4	0.42	1.56	0.01
21	SS11 (0-15cm)	5.32	1.30	65.1	35.2	0.15	1.18	0.10
22	SS11(15-30cm)	5.22	0.48	62.0	32.0	0.20	2.10	0.02
23	SS12(0-15cm)	4.45	2.40	58.3	33.8	0.31	1.88	0.01
24	SS12(15-30cm)	4.10	2.10	55.0	32.4	0.35	1.47	0.01



**APPENDIX 3: PHYSICO-CHEMICAL LABORATORY ANALYSIS RESULT FOR GROUND WATER (WELLS AND BOREHOLE) SAMPLES**

<b>SIN</b>	<b>PARAMETERS</b>	<b>WELL 1</b>	<b>WELL 2</b>	<b>BOREHOLE</b>	<b>DPR</b>	<b>FME</b>
1	pH	4.80	5.10	5.82	8.5	6-9
2	Colour (Pt -Co)	5.85	5.40	12	NS	NS
3	Conductivity, pScml	1210	2850	1150		2100
4	Salinity.(‰)	ND	ND	ND		NS
5	Odour	Odourless	Odourless	Trace		NS
6	Cl mg/l	12	10	14		600
7	COD, mg/L	15.8	28.4	9.41	80	80
8	BOD mg/l	4.80	12.1	28		30
9	TDS mg/l	810	1210	575		2000
10	TSS, mg/l	25.1	22.8	28.2		30
11	Nitrate, mg/L	104	15.1	12.4	50	25
12	Phosphate, mg/L	1.10	1.25	0.155		5
13	Sulphate, mg/L	184	210	110		500
14	Dissolved oxygen, mg/L	3.10	4.30	2.80		>2
15	Ammonia (mg/L)	ND	0.01	0.01		NS
16	NO <sub>3</sub> (mg/L)	ND	ND	ND		0.2
17	Phenols (mg/L)	0.1	ND	0.001	0.2	0.2
18	Oil & Grease (mg/l)	3.10	0.001	0.001	10	10

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19	Alkalinity (ppm)	15.0	21.2	18.1		NS
20	CN, mg/L	<0001	ND	ND		0
21	THC, mg/L	2.90	0.05	0.01		10
22	Detergent, mg/L	ND	1.0	0.05	10	15
23	Ba (mg/l)	ND	ND	ND	50	
24	Cd (mg/L)	0.001	ND	ND	0.4	
25	Cu (mg/l)	Trace	ND	ND	15	
26	Fe (mg/l)	0.01	0.001	0.01		3.0
27	Mn (mg/l)	0.1	0.22	0.18		
28	Ni (mg/l)	0.001	0.001	Trace	15	
29	Pb (mg/l)	0.001	ND	ND	15	
30	Cr (mg/l)	0.01	ND	0.001	1	
31	V (mg/l)	ND	ND	ND		
32	Zn (mg/l)	ND	ND	1.05	6.5	

**APPENDIX 4 A: LIST OF SOME COMMON IMPORTANT PLANT SPECIES IDENTIFIED IN THE STUDY AREA**

Family	Scientific Names	Family	Scientific Names
Palmae	Elacis guinensis	Anacardiaceae	Spondianthus preusii
	Raphia vinifera	Anonaceae	Cleistopholis Pottens
	Raphia hookeri	Apocynaceae	Funtumia elastica
Zingberaceae	Aframomum sceptrum	Moraceae	Musanga sacropoides
	Costus afar	Ochinaceae	Lophyra alata
	Costus Lucanusianus	Rutaceae	Fagara macro phylla
Violaceae	Rinorea subintegrifolia	Euphorbiaceae	Zanthoxylum gillettii
	Rinorea brachy petala		Antidesma laciniatum
Irvingiaceae	Irvingia gabonensis		Macaranga spinosus
	Klainodoxia gabonensis		Macaranga vogelii
Palmae	Calamus deeratus		Aupaca guineensis
Piperaceae	Piper guineensis		Aupaca staudi
	piper umbelatum		<i>Piptadaniastrum africana</i>
Bombasaceae	Ceiba pentandra		<i>Cathomium sp</i>
Araceae	Cyrtosperma senegalensis		<i>Albizia adiantifolia</i>
Combretaceae	Terminalia ivorensis		<i>Albizia zygia</i>
Euphorbiaceae	Antidesma venosum	<i>Pentacleithra macrophylla</i>	
Anonaceae	Xylophia staudtii	<i>Tetrapleura tetraptera</i>	
Euphorbiaceae	Alchornia cordifolia	<i>Verbenaceae</i>	<i>Vitex grandifolia</i>
	Symphonia globulifera	<i>Papilionaceae</i>	<i>Pterocarpus santalinoides</i>
	Spondianthus preusii		<i>Mucuna flagelipes</i>
	Spondias mumbim	<i>Araceae</i>	<i>Pistia stratoides(River water)</i>
Moraceae	Trechilia africana	<i>Azolaceae</i>	<i>Azola Africana (River water)</i>
	Ficus grandifolia	<i>Salviniaceae</i>	<i>Salvinia nymphellula(River water)</i>
Maraceae	Ficus ovate	<i>Pontederaceae</i>	<i>Eichhornia crassipes</i>

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Moranthaceae	Thalia welcuiitchia		<i>Poeceae</i>	<i>Euchinocloa sp</i>
Loganiaceae	Anthocleista vogelii		<i>Nymphacaceae</i>	<i>Nympaea Lotus</i>
	Anthocleista djalonensis		<i>Rubiaceae</i>	<i>Nauclea latifolia</i>
<i>Rubiaceae</i>	<i>Mitragyna ciliate</i>			

#### APPENDIX 4B- BIRD SPECIES


<b>Common names</b>	<b>Scientific names</b>
Harrier hawk	<i>Polybroides redcatus</i>
Dark chanting goshawk	<i>Melierax metabates</i>
Hopper buzzard	<i>Butastus rufipennus</i>
Red neck buzzard	<i>Buteo angularies</i>
Crested hawk	<i>Lophaetus occipitalis</i>
Fish eagle	<i>Haliaetus vocifer</i>
Black kile	<i>Elanus caeruleus</i>
Red tailed bush fisher	<i>Mirafra nigricans</i>
Giant king fisher	<i>Megacerle maxima</i>
Pigmy king fisher	<i>Ceyx pictus</i>
Blue breasted king fisher	<i>Helycon malimbic</i>
Common swift	<i>Apus apus</i>
Little swift	<i>Apus affinis</i>
Cattle swift	<i>Ardeola sp.</i>
Allied hornbill	<i>Tockus fasciatus</i>
Longtailed nightjar	<i>Caprimulgus climatus</i>
Stork	<i>Ciconia sp.</i>
Pigon	<i>Streptopelia sp.</i>
Green fruit pigeon	<i>Treron australis</i>

African grey parrot	Sittacus erithacus
Love bird	Agaporius pullari

### APPENDIX 5 A: OYO STATE GOVERNMENT RECEIPT OF PAYMENTS


3/18/2020

OYSG/WEMA/XPS/200318/66396



**OYO STATE GOVERNMENT  
REVENUE RECEIPT**

**ORIGINAL COPY**  
No: 1584527524664  
Date: 18/03/2020



Payer ID: -N/A-  
*Approach the BIR for your Tax Identification Number*

Paid By: • **FREETOWN WASTE MANAGEMENT AND RECYCLE LIMITED**


Address: **IBADAN**

Amount: **NGN 50,000.00 « Fifty Thousand Naira Only »**

Being: **Payment for 4020143 - Appraisal of Technical reports(EIA and EAR report)(MINISTRY OF ENVIRONMENT AND WATER RESOURCES)  
« Paid at [WEMA BANK PLC -Ibadan Lagos By-pass, Oke-Bola , Deposit Slip Number 16856248 by Cash »**

Agency: **MINISTRY OF ENVIRONMENT AND WATER RESOURCES**

Rev. Office: **Headquarters Assessment, Secretariat**

  
Signature

*To authenticate this receipt, please visit the office of the State Accountant General Secretariat, Ibadan.*

**APPENDIX 5 B: OYO STATE GOVERNMENT RECEIPT OF PAYMENTS**

APPRAISAL OF TECHNICAL REPORTS  
EIA & EIA REPORT CODE: 402014

**CASH DEPOSIT SLIP**      16856248      4020143      WEMA BANK

Account Name: OYO STATE GOVERNMENT      Date: 18, 03, 2020

Account No: CODE: 4020143

Depositor's Name: FREETOWN WASTE MANAGEMENT & RECYCLE LTD

Phone No: 080374471267

1000	14,000
200	2,36,000
100	
50	
20	
10	
5	
<b>TOTAL</b>	<b>₦ 50,000</b>

Amount in Words: FIFTEEN THOUSAND NINE HUNDRED ONLY

FOR DEPOSIT OF ₦5000.00 and above  
See At signatory in deposit certificate

Depositor's State of Birth: \_\_\_\_\_  
Depositor's Occupation: \_\_\_\_\_  
Address: \_\_\_\_\_  
ID Type:  ID Card  Driver's Card  
IC No: \_\_\_\_\_  
Issue Date: \_\_\_\_\_  
Expiry Date: \_\_\_\_\_

**WEMA BANK PLC**  
**RECEIVED**  
**18 MAR 2020**  
**TELLER**  
**SECRETARIAT BRANCH**

DEPOSITOR: FREETOWN WASTE MANAGEMENT & RECYCLE LTD