

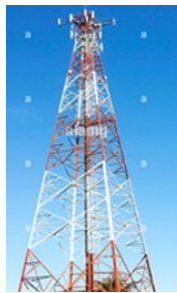
ENVIRONMENTAL MANAGEMENT PLAN

DRAFT REPORT

FOR

PROPOSED FIX FM RADIO STATION MAST

IN ENUGU



BY



FIX 103.3 FM

3A, CATHEDRAL ROAD, INDEPENDENCE LAYOUT, ENUGU

SUBMITTED TO

FEDERAL MINISTRY OF ENVIRONMENT HEADQUARTERS,

MABUSHI, ABUJA-FCT

TABLE OF CONTENTS

Contents	Page
Title Page	i
Table of Content	ii
List of Tables	ix
List of Plates	ix
List of Figures	x
List of Appendices	xii
Glossary of Abbreviations	xii
List of Preparers	xviii
Acknowledgements	xix
Executive Summary	xx

CHAPTER ONE

INTRODUCTION AND BACKGROUND INFORMATION

1.0	Introduction	1
1.1	Proponent's Background Information	1
1.2	EIA Objectives	2
1.3	Scope of Work	2
1.4	EIA Methodology	3
1.4.1	Preliminary Actions	3
1.4.2	Field Data Gathering, Analysis, and Interpretation	4
1.4.3	Consultation with Regulators, Stakeholders, and Experts	4
1.4.4	Impact Identification and Evaluation	4
1.4.5	Impact Mitigation	5
1.4.6	Reporting and Review	5
1.5	Legal and Regulatory Framework	5
1.5.1	National Regulations	5
1.5.2	International Regulations	20
1.5.3	FIX FM's Health, Safety and Environment (HSE) Strategy	24
1.5.3.1	Policy Statements and Objectives	24
1.6	Structure of the EIA Report	24

CHAPTER TWO
PROJECT JUSTIFICATION

2.0	Introduction	26
2.1	Need for the Project	27
2.2	Envisaged Sustainability	28
2.2.1	Economic Sustainability	28
2.2.2	Environmental Sustainability	30
2.2.3	Social Sustainability	31
2.2.4	Technical Sustainability	32
2.3	Value of the Project	33
2.4	Project Alternatives	33
2.4.1.	Online Cloud-Based Radio (Internet Radio)	33
2.4.2.	DAB+ (Digital Audio Broadcasting)	34
2.4.3.	LP-FM (Low Power FM) / Community Radio	34
2.4.4.	"Podcast-First" Broadcasting	34
2.4.5.	Hybrid Model (The "Smart" Radio)	34
2.4.6.	Energy Alternatives	34
2.4.7.	Site Selection Criteria	36
2.4.8.	Alternatives Appraisal	36

CHAPTER THREE
PROJECT DESCRIPTION

3.0	Introduction	37
3.1	Station Design	37
3.1.1	Site Selection & Physical Construction	37
3.1.2	Studio Location and Construction	37
3.1.3	Studio Technical Design	37
3.1.4	Studio-to-Transmitter Link (STL)	37
3.2	Transmission System Engineering	38
3.2.1	The Transmitter (TX)	38
3.2.2	The RF Path	38
3.2.3	Power and Grounding	38
3.3	Regulatory Compliance	38

3.4 Operation process	39
3.4.1 Audio Production (The Studio)	39
3.4.2 Signal Processing & Encoding	39
3.4.3 The Exciter and Modulation	40
3.5 Power Amplification	40
3.5.1 The Antenna System	40
3.5.2 Operational Protocols	40
3.6 Power Redundancy	40
3.6.1 Remote Monitoring & Control	40
3.6.2 Reception	41
3.7 Mast Operability	41
3.8 Structural & Mechanical Integrity	46
3.8.1 RF Operability (The Antenna System)	46
3.8.2 Safety and Signaling Operability	46
3.8.3 Maintenance and Monitoring Metrics	47
3.8.4 Failure Modes (Loss of Operability)	47

CHAPTER FOUR

DESCRIPTION OF THE PROJECT ENVIRONMENT

4.0 Introduction	48
4.1 Study Approach/Methodology	48
4.1.1 Literature Review	49
4.1.2 Field Study Methods	49
4.1.2.1 Air Sampling for Particulate Matter	49
4.1.2.2 Air Sampling for Gaseous Pollutants	50
4.1.2.3 Noise Level	52
4.1.2.4 Soil Quality	52
4.1.2.4 Radio frequencies (RF) Measurement	53
4.2 Biodiversity Studies	54
4.3 Land Use Pattern	54
4.4 Waste Management	54
4.5 Socio-Economics	54
4.5.1 Scope of Socio-Economics Study	54
4.5.2 Community Participation	54

4.5.3 Data Collection Methodology	54
4.5.3.1 Questionnaire Administration	55
4.6 Description of Bio-Geophysical Environment	55
4.6.1 Climate and Meteorology	55
4.6.1.1 Rainfall	57
4.6.1.2 Temperature	57
4.6.1.3 Wind Speed and Direction	58
4.6.1.4 Relative Humidity	60
4.6.1.5 Sunshine Pattern	61
4.7 Air Quality, Noise Level and Radio Frequency Measurement	62
4.7.1 Air Quality Study	62
4.7.2 Noise Level/ Radio Frequency-Electromagnetic Field	62
4.8 Geology of Enugu State	63
4.8.1 Soil Types in the study area	64
4.8.2 Chemical Characteristics of Soil Samples	65
4.8.3 Groundwater Quality in the Study Area.	67
4.9 Land Use	69
4.10 Socio-economics study	69
4.10.1 Historical Background of Enugu State	69
4.10.2 Governance in the Study Areas	69
4.10.2.1 Social Organizations	69
4.10.2.2 Governance and Political Administration in Study Area	69
4.10.2 Governance in the Study Areas	70
4.10.2.1 Social Organizations	70
4.10.2.2 Governance and Political Administration in Study Area	70
4.10.2.3 The Formal Government	70
4.10.2.4 Traditional Governance in the Study Area	71
4.10.3 Demographic Study of the Project Area	72
4.10.4 Household Composition, Structure and Size	72
4.10.5 Age and Sex Distribution of Respondents	74
4.10.6 Religion Practice in the Study Areas	74
4.10.7 Tourism and Festival in the Study Areas	75
4.10.8 Livelihoods and Micro-Economy	75

4.10.9	Employment Situation in Households	78
4.10.10	Income Levels of Sampled Population in Study Area	79
4.10.11	Adult Literacy Level and Education of the Study Area	81
4.10.12	Quality of Life in Study Area	82
4.10.13	Source of Energy Available to Household	83
4.10.14	Infrastructure in the Study Area	85
4.10.15	Information, Communication and Technology	85
4.10.16	Transportation and Road Network	86
4.10.17	Banking and Financial Institution	87
4.11	Health Assessment	87
4.11.1	Household Survey and Impact of Project on Health	87
4.11.2	Health Facilities and Services	87
4.11.3	Disease Prevalence	88
4.11.4	Water Supply in the Study Area	89
4.11.5	Sanitation of the Living Environment	90
4.11.5.1	Refuse Disposal	90
4.11.5.2	Sewage Disposal	91
4.12	Community Consultation	92
4.13	FIX FM Station Corporate Social Responsibility	93

CHAPTER FIVE

ASSOCIATED AND POTENTIAL ENVIRONMENTAL IMPACTS

5.1	Introduction	94
5.2	Impact Assessment Methodology	94
5.2.1	Identification of Impacts and Activities Interactions	96
5.2.2	Preliminary Identification and Screening of Environmental Impacts	99
5.2.3	Detailed Assessment of Impacts	104
5.3	Impact Evaluation	108
5.4	Characterization of Associated and Potential Impacts	109
5.5	Description of Impacts	115
5.5.1	Positive Impacts	115
5.5.1.1	Impacts on Economy	115
5.5.1.2	Job Creation Opportunities both Locally and Internationally	116
5.5.2	Negative Impacts	116
5.5.2.1	Construction Impacts	116
5.5.2.2	Operational Impacts	119
5.5.2.3	Accidental Occurrences	121
5.6	Hazard and Risk Assessment	122
5.6.1	Hazard Identification	123
5.6.2	Risk Assessment	123
5.7	Cumulative Impacts	125

5.7.1	Air Quality	125
5.7.2	Noise	125
5.7.3	Soil and Geology	126
5.7.4	Waste	126
5.7.5	Employment and Economy	126
5.8	Summary	126

CHAPTER SIX

MITIGATION MEASURES

6.1	Introduction	127
6.2	Mitigation Objectives and Hierarchy	127
6.3	Mitigation Measures	128

CHAPTER SEVEN

ENVIRONMENTAL MANAGEMENT PLAN

7.1	Introduction	139
7.2	Proposed Environmental Management Plan and Objectives	139
7.3	Elements of the Environmental Management Plan	140
7.3.1	Environmental Management Organogram	140
7.4	Project Management and Responsibilities	140
7.4.1	Training and Awareness	142
7.4.2	Documentation	143
7.4.3	Stakeholders Communication	143
7.4.4	Emergency Preparedness and Response	143
7.4.5	Uncertainty and Change Management	144
7.4.6	Environmental and Social Management Action Plan	145

CHAPTER EIGHT

DECOMMISSIONING AND ABANDONMENT PLAN

8.1	Introduction	146
8.2	Stakeholders Consultation	147
8.3	Wind-Down Operations	147
8.4	Decommissioning of Facilities	147
8.5	Re-use / Recycling of Equipment	148
8.6	Residual Wastes Handling	148
8.7	Reporting	148
8.8	Site Remediation Plan After Closure / Decommissioning	149
8.9	Other Considerations	149
8.9.1	Emergency Response Plan	149
8.9.2	Communication Notification	150

CHAPTER NINE

CONCLUSION AND RECOMMENDATIONS

9.1 Introduction	151
9.2 General Recommendations	151
References	152

List of Tables

Table 2.1: Energy Alternative Options.....	36
Table 3.1: Technical Specifications Summary.....	39
Table 4.1: Monthly Weather Average for Enugu State (1987-2024).....	56
Table 4.2: Mean Air Pollution Indicators measured in the study Area.....	62
Table 4.3: Noise Level Measurement.....	63
Table 4.4: Radio Frequency Measurement.....	63
Table 4.5: Physico-Chemical and Heavy Metal Results of Soil in the study area.....	66
Table 4.6: Physicochemical Properties of Groundwater Resources in the Study Areas.....	68
Table 5.1: Components of Environmental Aspects prone to Project Activities.....	96
Table 5.2: Environmental Components and their Impact Indicators.....	96
Table 5.3: Impact Ranking Matrix.....	98
Table 5.4: Modified Leopold Matrix – Preliminary Impact Identification and Screening Results. .	100
Table 5.5: Checklist of Associated and Potential Impacts for Greenfield Sites.....	102
Table 5.6: Impact Severity Criteria.....	105
Table 5.7: Risk Assessment for Environmental Consequences.....	109
Table 5.8: Potential Impacts Identification, Qualification and Rating.....	109
Table 5.9: Management of selected Health Risk/Impacts using the Bow Tie for the project.....	123
Table 6.1: Associated and Potential Impacts and Mitigation Measures for Pre-Construction Phase.....	128
Table 6.2: Associated and Potential Impacts and Mitigation Measures for Construction Phase.....	131
Table 6.3: Associated and Potential Impacts and Mitigation Measures for Operational Phase.....	133
Table 6.4: Associated and Potential Impacts and Mitigation Measures for Decommissioning Phase.....	136
Table 7.1: Roles and Responsibilities.....	140

List of Figures

Figure 1.1: Flow Chart of the FMEnv EIA Procedure.....	9
Figure 3.1 Radio Wave Transmission.....	40
Figure 3.2: Foundation Plan for the proposed FIX FM Radio Mast.....	42
Figure 3.3: Foundation Plan for the proposed FIX FM Radio Mast.....	43
Figure 3.4: Retaining Column Details of Foundation Plan for the proposed FIX FM Radio Station.....	44
Figure 3.5: Retaining Column Details of Foundation Plan for the proposed project.....	45
Figure 3.6: Diagram for Details of 70m of Angle Tower	46
Figure 3.1: Transmission System Diagram.....	40

Figure 3.2: Site Layout Plan for FIX FM Radio Mast.....	42
Figure 3.3: Site Plan – Electrical Piping Layout for the Mast for the proposed FIX FM Radio Station.....	43
Figure 3.4: Diagram for Details of 35m of Angle Tower.....	45
Figure 3.12: Site Plan (Electrical Layout Scheme) for the proposed project.....	44
Figure 4.1: Average Rainfall Pattern in Enugu State (1987-2024).....	57
Figure 4.2: Ambient Temperature in Enugu State (1987-2024).....	58
Figure 4.3: Average Wind Speed in Enugu State.....	59
Figure 4.4: Wind Rose for the Study Area.....	60
Figure 4.5: Relative Humidity pattern in Enugu State (1987-2024).....	61
Figure 4.6: Sunshine Hours in Enugu State (1987-2024).....	62
Figure 4.7: Geomorphological Map of Enugu State.....	64
Figure 4.8: South-Eastern Nigeria Governance Structure.....	71
Figure 4.9: Marital Status of Respondents in the Study Areas.....	72
Figure 4.10: Family Size in the Study Areas.....	73
Figure 4.11: Religion Adherence in the Study Area.....	74
Figure 4.12: Sources of Livelihood in Study Area.....	75
Figure 4.13: Occupation Distribution pattern of residents in the study Area.....	76
Figure 4.14: Employment Distribution in the Study Area.....	77
Figure 4.15: Household Income Level in Study Area.....	79
Figure 4.16: Household Expenditure Pattern in Study Area.....	79
Figure 4.17: Occupiers Status in Living Quarters in the Study Area.....	81
Figure 4.18: Housing Attributes in the study area.....	82
Figure 4.19: Source of Energy for cooking in the Study Area.....	83
Figure 4.20: Source of Energy for lighting in the Study Area.....	83
Figure 4.21: Type of medical facility used by Households in the Study Area.....	87
Figure 4.22: Disease Prevalence in the Study Area.....	88
Figure 4.23: Source of Drinking Water in the Study Area.....	89
Figure 4.24: Refuse Disposal Methods in the Study Area.....	90
Figure 4.25: Sewage Disposal Methods in the Study Area.....	90
Figure 5.1: Schematic of the Impact Assessment Methodology.....	95
Figure 6.1: Impact Mitigation Hierarchy.....	126
Figure 7.1: Emergency Response Procedure.....	143

List of Plates

Plate 4.1: Particulate Matter Measurement.....	50
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Plate 4.2: Gaseous Pollutants Measurement.....	51
Plate 4.3: Noise Level Measurement.....	52
Plate 4.4: Soil Sampling at the proposed Radio FM Station Site.....	53
Plate 4.5: Radio Frequency Measurement.....	53
Plate 4.6: Religion Houses in the Study Areas.....	74
Plate 4.10: Street Trading in the Study Area.....	78
Plate 4.11: Educational Facilities in the Study Areas.....	81
Plate 4.12: House Types in the Study Areas.....	82
Plate 4.13: Filling Station in the Study Area.....	84
Plate 4.14: Power Transmission Lines and Transformer in the Study Area.....	84
Plate 4.15: Telecommunication Infrastructure in the Study Area.....	85
Plate 4.16: Means of Transportation in the Study Area.....	85
Plate 4.17: Road Network in the Study Area.....	86
Plate 4.18: Financial Institution in the Study Area.....	86
Plate 4.19: Consultation with Residents Around the Study Area.....	91

LIST OF APPENDICES

Appendix I	Sample of Questionnaire
Appendix II	Fix FM Infrastructure Emergency Planning and Response
Appendix III	HSE Waste Management Plan
Appendix IV	Attendance List for Consultation

GLOSSARY OF ABBREVIATIONS

AAS	Atomic Absorption Spectrophotometer
AC	Alternating Current
APHA	American Public Health Association
ASTM	American Society for Testing and Materials
BOD ₅	Biochemical Oxygen Demand
Ca	Calcium
CBD	Convention on Biological Diversity
DCD	Development Control Department
CE	Civil Engineer
cfu/g	Colony forming units per gramme
CFC	chlorofluorocarbons
Cl ⁻	Chloride ion
CL	Low to medium plasticity soil
cm	Centimeter
CO	Carbon Monoxide
CO ₂	Carbon dioxide
CO _x	Oxides of carbon
COD	Chemical Oxygen Demand
Cond.	Conductivity
Cr	Chromium
CRI	Critical Rescue International
CSR	Corporate Social Responsibility
Cu	Copper
dB(A)	decibel (Scale A)
DC	Direct Current

DSO	Digital Signal 0
EA	Environnemental Audit
EHS	Environmental Health and Safety
EIS	Environmental Impact Statement
EMF	Electromagnetic Field
EMP	Environnemental Management Plan
EMS	Environmental Management System
EOL	end-of-life
ESI	Environmental Sensitivity Index
Fe	Iron
FEPA	Federal Environmental Protection Agency
FME _{env}	Federal Ministry of Environment
Ft	Feet
GC	Gas chromatography
GE	General Engineering
g	Gramme
GEF	Global Environmental Facility
GHz	Giga Hetz
GHG	Green house gases
GLC	Gas Liquid Chromatography
GPS	Global Positioning System
GSM	Global System Mobile Telephony
Ha	Hectare
HC	Hydrocarbon
HNO ₃	Nitric acid
Hg	Mercury
HSE	Health Safety and Environment
h	Hour
Hz	Hertz
ICPC	International Cable Protection Committee
ICT	Information and Communication Technology

IEE	Initial Environmental Evaluation
IFC	International Finance Corporation
ISAS	Instrument and Service Air Systems
ITU	International Telecommunication Union
IRPA	International Radiation Protection Association
INIRC	International Non-Ionizing Radiation Committee
ISO	International Standard Organization
ITCZ	Inter Tropical Convergence Zone
ITD	Inter Tropical Discontinuity
ITU	International Telecommunication Union
IUCN	International Union for Conservation of Nature
KCL	Potassium Chloride
KHz	Kilo Hertz
KOH	Potassium hydroxide
K	Potassium
Kg/h	kilogram per hour
Kh	Kilo Hetz
KW	Kilowatt
KVA	Kilovolts Ampere
LCA	Life Cycle Analysis
LCI	Life Cycle Inventory
LGA	Local Government Area
LGC	Local Government Council
LUA	Landuse Act
m	Meter
MARPOL	Marine Pollution Convention
MEL	MacBenuzEnviros Ltd
MCC	Motor Control Center
MHz	Mega Hertz
MIPS	Material Input per Service Unit
MI	Material Input

MMF	Multi-mode fibers
MSC	Main Switching Center
MSDS	material safety data sheet
MTC	Mobile Telecommunication Coy
MD	Measured depth
Mg	Mega gram 10^6 gram
ms^{-1}	Meters per seconds
mg	Milligram or 10^{-3} gram
Mg	Magnesium
mg/kg	Milligram per kilogram
mg/l	Milligram per litre
ml	Millilitre
mm	Millimeter
m/s	Meter per second
Mpa	Megapascal
MW	Megawatts
MVA	Megavolts Ampere
NA	Not Applicable
Na	Sodium
NCC	Nigerian Communications Commission
NCA	National Civil Aviation Authority
NNRA	Nigerian Nuclear Regulatory Authority
NCF	Nigerian Conservation Foundation
ND	Not detected
NESREA	National Environmental Standards and Regulations Enforcement Agency
Ni	Nickel
NIPOST	Postal Division was reconstituted into Nigerian Postal Service
NITEL	Nigerian Telecommunications Limited
NO_3	Nitrate ion
NO_x	Oxides of Nitrogen
NPE	National Policy on the Environment

NS	Not Specified
OH	Organic Clay of Medium to High Plasticity
Pb	Lead
pg	Page
PO ³⁻ ₄	Phosphate ion
ppm	Part per Million
PCF	Prototype Carbon Fund
PCM	Pulse-Code Modulation
PDCA	Plan-Do-Check-Act Cycle
pH	Hydrogen ion concentration
p.s.i	pounds per square inch
P&T	Department of Post and Telecommunications
PTS	Permit to survey
QAQC	Quality Assurance/Quality Control
QoS	Quality of Service
RH	Relative Humidity
ROW	Right of Way
SEPA	State Environmental Protection Agencies
SETAC	Society of Environmental Toxicology and Chemistry
SMF	Single-Mode Fibers
SMS	Short Message Services
SO ₂	Sulphur dioxide
SO ²⁻ ₄	Sulphate ion
SO _x	Oxides of Sulphur
Sq.km	Square Kilometer
SPM	Suspended Particulate Matter
SS	Suspended Solids
T	Tonne
TDS	Total Dissolve Solids
TD	Total depth
TC	Tropical Continental

TM	Tropical Maritime
T/h	Tonne per hour
TSP	Total Suspended Particulates
T.Alk.	Total Alkalinity
TH	Total Hardness
THC	Total Hydrocarbon Content
TOC	Total Organic Carbon
TOR	Terms of Reference
TTT	Telecommunication Transmission Towers
μS/cm	Micro Siemens per Centimeter
μohmS/cm	Micro ohms per Centimeter
UN	United Nation
UNCBD	Unite Nations Convention on Biological Diversity
UNCCD	United Nations Convention to Combat Desertification
UNCLOS	United Nation Convention on the Law of the Sea
UNFCCC	United Nations Framework Convention on Climate Change
USCS	Unified Soil Classification System
USEPA	United States Environmental Protection Agency
WDM	Wavelength-division multiplexing
WHO	World Health Organization

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We also appreciate the support of the residents of the project area and other stakeholders who actively participated in the EIA process.

EXECUTIVE SUMMARY

1.0 The Proponent

FIX FM 103.3 is a newly registered company and was incorporated on 23rd February, 2026 to pursue improved quality in broadcasting service in Enugu State in particular and Nigeria as a whole. The background of this development involves three core physical components that interact with the environment:

Fix FM 103.3 intends to construct a mast for an FM Radio station to be located at 3A, Cathedral Avenue, Independence Layout, Enugu North Local Government Aea in Enugu State of Nigeria, to further improve the quality of broadcasting service to the people across the city as well as the State.

In line with the environmental statutory and regulatory requirements of the Federal Republic of Nigeria, State Governments, International Finance Corporation /World Bank as well as **FIX FM's** corporate policy on environmental protection and sustainable development, the company decided to conduct an EIA of the proposed Mast in line with the regulatory requirements and following the conditions of the EIA Act. In this regard, **FIX FM 103.3** commissioned **MacBenuz Enviros Limited**, Environmental, Health, and Safety consultants (accredited by FMEnv, NESREA) to prepare the Environmental Impact Assessment (EIA) of its proposed Mast project at 3A, Cathedral Avenue, Independence Layout, Enugu North Local Government Aea in Enugu State

Environmental Impact Assessment (EIA) is one of the management tools used worldwide to guarantee sustainable development and/or to ensure compliance with local, regional and international regulations relating to environmental protection and conservation. The EIA study involved well-planned site visits, field survey and samples collection, laboratory analyses, and secondary data acquisition from existing reports and publications, as well as the derivation of spatially referenced data using GIS and remote sensing technologies.

The Environmental Impact Assessment (EIA) covers the design, construction, operation, and decommissioning phases of each project component, identifying the key environmental issues across the project and providing strategies and plans for managing them effectively. It also defines the legal requirements for the project and identifies the regulatory permits and licenses required for construction activities.

This EIA seeks to manage and keep to a minimum the negative impacts of the proposed Fix FM Station project and at the same time, enhance the positive and beneficial impacts.

2.0 EIA Objectives

This EIA study was implemented with the following objectives:

- ✦ Identify the environmental regulations that are relevant to the proposed construction and operations of its project;
- ✦ Establish existing environmental conditions of the project location thereby identifying the resources that may be affected by the proposed project activities.
- ✦ Understand the proposed project facilities and activities thereby identifying the potential and associated effects of any hazards that may arise from the project activities;
- ✦ Evaluate the extent of possible impacts (negative/adverse and beneficial/positive), if any, of project activities on the ecology and socio-economic and health of the area;
- ✦ Assess the impacts in terms of their magnitude, duration, aerial extent, severity, and significance;
- ✦ Determine the significant adverse environmental effects of the proposed activities;
- ✦ Make recommendations on appropriate preventative, reduction, and control measures for identified potential and associated adverse impacts of the project activities;
- ✦ Develop an Environmental Impact Assessment (EIA) aimed at sustaining the environment in line with the recommended remedial actions above;
- ✦ Provide the basis for consultation with regulatory authorities, the public, and other stakeholders and support subsequent applications for associated Environmental Permits;

3.0 Legal Frame work

All the applicable legislation and guidelines relating to the proposed Fix FM Station Project have been reviewed. The legislation and guidelines covered are derived from Federal Government laws and regulations, State Government laws, international conventions or agreements, as well as FIX FM 103.3 policy. It was also stressed that the EIA is being carried out not only to comply with statutory requirements but also to demonstrate FIX FM 103.3 standards, policies, good practices, and commitment to preserving the environment in her operations.

Some of the legislation reviewed in the course of the EIA include

National Legislations:

- ✦ EIA Act Cap E12 LFN 2004

- ✦ NCC Act No. 19 of 2003
- ✦ Forestry Act CAP 51 LFN 1994
- ✦ Criminal Code Act Cap C38 LFN, 2004
- ✦ Panel Code Act Cap C345 LFN, 2004
- ✦ Endangered Species Act (Cap 108), 2016
- ✦ Nigerian Airspace Management Agent (NAMA) Act 1999
- ✦ Land Use L5 LFN, 2004
- ✦ The Nigeria National Health Act 2014
- ✦ Nigeria Civil Aviation Authority (NCAA) Act 2006
- ✦ NESERA Act No 27 of 2007
- ✦ Nuclear Safety and Radiation Protection Act, Cap N142, LFN 2004
- ✦ The National Agency for the Control of AIDS
- ✦ Electricity Power Sector Reform Act (EPSC) 2005
- ✦ National Environmental Protection (Management of Solid and Hazardous Wastes) Regulations, 1991
- ✦ National Environmental (Sanitation and Wastes Control) Regulations, 2009
- ✦ National Environmental (Noise Standards and Control) Regulations, 2009
- ✦ Harmful Wastes (Special Criminal Provisions etc.) Act CAP HI LFN 2004.
- ✦ National Environmental Protection (Pollution Abatement in Industries and Facilities Generating Wastes) Regulations, 1991
- ✦ National Broadcasting Corporation Act No. 55of 1999
- ✦ National Environmental (Standards for Telecommunications and Broadcasting Facilities) Regulations, 2011, S.I, NO.11
- ✦ Public Health Legislation and Regulations.
- ✦ Natural Resource Conservation Act CAP 286 LFN 1990
- ✦ Nigeria's Cultural Policy;1996
- ✦ The Labour Act,1990
- ✦ Public Health Law Cap 103 LFN 1990
- ✦ The Labour Act, CAP L1 LFN, 2004
- ✦ Employee's Compensation Act, 2010.

- ✦ *Enugu State Ministry of Environment and Climate Change*
 - *Enugu State Waste Management Authority (ESWAMA)*

International Regulations

- ✦ World Broadcasting Union (WBU)
- ✦ United Nations Guiding Principles on the Human Environment
- ✦ The Rio Declaration on Environment and Development
- ✦ Vienna Convention for the Protection of the Ozone Layer, 1985 and the Montreal Protocol on Substances that Deplete the Ozone Layer, 1987
- ✦ Convention on Biological Diversity (1992)
- ✦ United Nations Framework Convention on Climate Change (UNFCCC), 1992 and Kyoto Protocol on Climate Change, 1997
- ✦ Basel Convention on the Control of Trans-boundary Movements of Hazardous Wastes and their Disposal (1987)
- ✦ International Convention on Civil Liability for Oil Pollution Damage, 1969 amended in 1984
- ✦ African Convention on the Conservation of Nature and Natural Resources, 1968
- ✦ International Commission on Non-Ionizing Radiation Protection standard

4.0 Project Justification

Radio broadcasting is crucial as the most accessible mass medium, providing immediate news, education, and entertainment to global audiences, especially in remote or underserved communities. It is a vital, low-cost tool for emergency communication, promoting social engagement, and supporting education, often overcoming barriers like illiteracy, poor internet, or lack of electricity.

Need of the Project

A project of this magnitude offers a unique blend of high-impact social reach and commercial potential. In an era dominated by digital algorithms, radio remains one of the most resilient and trusted mediums due to its accessibility and local relevance

The benefit of the Project

The benefits of the proposed project include, but are not limited to the following:

- High Accessibility and Reach
- Community and Social Impact.
- Financial and commercial viability

- Cultural Preservation and Talent Development
- Technical Reliability

Envisaged Sustainability

Traditional advertising remains the backbone of the industry, but its delivery has evolved. Economic viability of modern stations depends on the ability to capture "digital dollars." Sustainability is as much about controlling costs as it is about making money. A station's economic health is tied to its "Brand Equity." The most significant environmental impact of an FM station. The construction of towers and studios must adhere to best practices in environmental management. The lifecycle of broadcasting equipment presents a significant hazardous waste challenge. For a communication project, social sustainability is measured by how the station manages its "Social License to Operate"—the ongoing acceptance of the project by local stakeholders. The most sensitive social issue for any radio station is the public perception of Electromagnetic Fields (EMF) and a socially sustainable station reflects the diversity of its listeners.

Value of the project

It has been estimated that about fifteen million naira (N15, 000, 000) will be required for the implementation of the proposed Radio FM mast. The proposed project cost includes site acquisition from the local people, construction of the mast including the purchase of raw materials such as sand, gravel, cement, iron rods, water etc from the local contractors, erection of the tower and installation of all equipment, payment of wages for construction workers. The total value of the project that will be brought to the local economy can be regarded as the sum of this investment and other derived values associated with the benefits.

PROJECT ALTERNATIVES

If the traditional FM radio model (High-power transmitter + NBC license + Physical tower) feels too capital-intensive or restricted, there are several modern Project Alternatives. These range from "digital-first" models to lower-cost local solutions.

Online Cloud-Based Radio (Internet Radio)

This is the most common alternative in 2026. Instead of a physical transmitter, you stream your signal over the web to listeners using apps, smart speakers, and car dashboards.

DAB+ (Digital Audio Broadcasting)

DAB+ is the digital successor to FM. It allows multiple stations to share a single frequency (multiplexing).

LP-FM (Low Power FM) / Community Radio

Instead of a commercial 5kW transmitter that covers a whole state, a 10W to 100W setup can be engaged and it is easier to get for non-profits or educational institutions.

"Podcast-First" Broadcasting

Rather than a 24/7 "live" stream, a high-quality on-demand audio content can be preferred

Hybrid Model (The "Smart" Radio)

Many new projects start as an **Online Station** with a **Podcast wing** to build an audience first. Once a proven listener base is established, one can apply for an FM license.

Energy Alternatives

Running an FM radio station is energy-intensive, primarily because the transmitter must remain powered 24/7 to maintain license and listener base. In 2026, with rising diesel costs and grid instability, shifting to alternative energy is a strategic move for operational survival

Energy Alternative Options

<i>Options</i>	<i>Selected options</i>
<p><u>Energy Source</u></p> <p>Petrol Powered Generator Diesel Powered Generator Grid Electricity</p>	<p>Diesel Powered Generator</p> <p>Diesel engines have very low ignition potential (flash point 52-950°C) which reduces the potential or explosion. They also emit lesser greenhouse gases relative to petrol. In addition to this, diesel engines have a higher compression ratio than petrol which means that less diesel fuel is required to generate same power as petrol. Grid electricity is generally unstable and would not be reliable in-service delivery.</p>
<p><u>Generator Capacity</u></p> <p>20KV_a DG <20KV_a DG</p>	<p>20KV_a DG</p> <p>This option was chosen to match anticipated project demands.</p>
<p><u>Generator Fuel Tank size</u></p> <p>1000 liters <1000 liters</p>	<p>1000 liters</p> <p>A Generator Fuel Tank of 1000 liters will be provided locally with a Fuel level gauge and lockable filling nozzle. This option was chosen to match anticipated project demands.</p>

5.0 Site Selection Criteria

Some of the considerations for a site to be suitable and selected for the project are;

- ✚ The NBC setback rules
- ✚ Environmental sensitivity of the area.
- ✚ The costs of acquisition for each of the alternative sites are weighed against other criteria stated above before the final decision is taken.

Furthermore, the studies conducted showed that the host community is happy and willing to support the project. Moreover, substantial amount of money had already been spent on the feasibility, acquisition, planning and logistics for the project. The alternative site/location was therefore not considered a viable option and was therefore rejected.

Alternatives Appraisal

Given the demerits of the above applicable alternatives to the proposed project, the planned approach by FIX FM 103.3 MHz Station for the construction and operation is considered most suitable. The proposed action is for FIX FM 103.3 MHz to carry out the construction and operation a radio transmission mast in Independence Layout, Enugu State

6.0 PROJECT DESCRIPTION

FIX FM 103.3 intends to build a radio station operating on the FM band with the aim of facilitating further improvement in the quality of electronic media/broadcasting services to the people across Enugu and its environs in particular and the country as a whole. This gives a description of the project and the processes for the radio broadcasting.

Station Design

A comprehensive design documentation outlines the architectural and technical requirements for a professional FM radio station, moving from the physical site selection to the final radiated signal.

Site Selection & Physical Construction

The design of a radio station is split between the Studio Center (the creative hub) and the

Transmitter Site: Also referred to as the broadcast hub.

Studio Location and Construction

- **Site Criteria:** Studios should be located away from heavy industrial vibration (train tracks, highways) and high-power electrical interference.
- **Sound Isolation (The "Box-in-a-Box" Method):** Professional studios use floating floors and decoupled walls to prevent structural noise from entering the microphone.

- **HVAC Design:** Standard air conditioning is too loud. The design must utilize "Low-Velocity" HVAC systems with oversized ducts and sound baffles to minimize airflow noise.
- **Physical Security:** A central "Master Control" area should be physically protected, as it serves as the node for all incoming and outgoing signals.

Studio Technical Design

The studio is the point of origin. Design documentation must specify both the physical layout and the signal flow.

- **Acoustic Treatment:** Specifications for Sound Transmission Class (STC) ratings for walls and the use of bass traps and diffusers to achieve a "flat" acoustic response.
- **The Air Studio (On-Air):** Centered around a Broadcast Console. Design includes "Talkback" systems for communication between the DJ and the producer, and "On-Air" light tallies that trigger when microphones are live.
- **Production Suite:** A secondary studio used for recording promos and editing. It often mirrors the Air Studio's tech stack for redundancy.
- **Central Technical Room (Rack Room):** The "brain" of the station where servers, satellite receivers, and audio switchers are housed in a climate-controlled environment.

Studio-to-Transmitter Link (STL)

Most stations have studios in a city center but transmitters on a distant mountain or tall building. The STL is the bridge between them.

- **Microwave STL:** Uses a point-to-point microwave dish (often in the 950 MHz or 2.5 GHz bands) to send the audio signal.
- **IP-Based STL:** Uses high-speed fiber or dedicated wireless internet to stream uncompressed audio via codecs (like AAC or OPUS).
- **Backup Links:** Documentation should include a "Failover" protocol, such as a secondary 4G/5G cellular link or a local hardware player at the transmitter site in case the main link drops.

Transmission System Engineering

This section details how the signal is physically broadcasted to the public.

The Transmitter (TX)

- **Dual/Main-Standby Configuration:** Professional designs often use two transmitters. If the main fails, the standby automatically takes over.

- **Cooling Systems:** Large transmitters generate significant heat; documentation must specify HVAC requirements or liquid cooling paths.

The RF Path

- **Stereo Generator & RDS Encoder:** Devices that add the "Stereo" pilot tone and the digital text data (Song ID/Station Name) to the audio.
- **Transmission Line:** Specialized coaxial cable (often "Heliax") designed to carry high-power RF without melting or leaking signal.
- **The Antenna Array:** The design specifies the number of "bays" (elements). More bays increase the **Effective Radiated Power (ERP)** by concentrating the signal toward the horizon rather than wasting energy pointing toward the sky or ground.

Power and Grounding

Radio stations are prime targets for lightning and power surges.

- **Uninterruptible Power Supply (UPS):** Provides immediate battery power to keep the studio and link active during a flick.
- **Automatic Transfer Switch (ATS):** Triggers a diesel or gas generator for long-term outages.
- **Single-Point Grounding:** A technical requirement to ensure all equipment is grounded to a common copper bus bar to prevent "ground loops" (humming) and protect against lightning strikes on the tower.

Regulatory Compliance

Documentation is incomplete without the legal parameters set by national authorities (Nigerian Broadcasting Corporation, NBC):

- **Assigned Frequency:** (103.3 MHz).
- **Bandwidth Mask:** Ensuring the signal doesn't "bleed" into neighboring stations.
- **Maximum ERP:** The legal limit on how much power the station can radiate.

Technical Specifications Summary

Component	Typical Specification
Frequency Range	87.5 MHz to 108.0 MHz
Audio Processing	31 μ s to 75 μ s pre-emphasis (region dependent)
STL Frequency	950 MHz (Microwave) or IP-based
Antenna Type	Multi-bay Circularly Polarized
Cooling	Forced-air or liquid-cooled (for high power transmitter)

Operation process

Operating an FM radio station is a technical choreography that converts sound waves into electromagnetic waves capable of traveling through the air to reach a receiver. The process can be broken down into three primary stages: **Production**, **Processing**, and **Transmission**.

Audio Production (The Studio)

Everything begins in the studio, where sound is captured or played back.

- **Input Sources:** Microphones capture live voices (DJs, guests), while digital playout systems handle recorded music, advertisements, and news clips.
- **Mixing:** All these sources feed into a **Mixing Console** (or digital workstation). Here, the audio engineer balances levels and ensures a smooth transition between different audio elements.
- **The Baseband Signal:** The final output of the console is a high-quality stereo audio signal, often referred to as the "baseband" signal.

Signal Processing & Encoding

Before the audio can be sent to the antenna, it must be conditioned to meet regulatory standards and optimize sound quality.

- **Audio Compression/Limiting:** To prevent "clipping" (distortion) and to ensure the station sounds consistently loud, the signal passes through a processor that manages dynamic range.
- **Stereo Generation:** The signal is encoded into a "composite signal." This includes the Left and Right audio channels, a **pilot tone** (which tells your radio to switch to stereo mode), and often **RDS (Radio Data System)** data, which displays the song title and artist on car's screen.

7.0 Baseline conditions of the Study Area

The various considerations that have gone into the formulation of a proper strategy for conducting the baseline studies are described below.

Field Studies Methods

To record the detailed information on the bio-geophysical and socio-economic parameters within the study area, the area within the 500m of each project site was chosen; the area represents the hub of the major activities and is therefore likely to receive the maximum impacts of the project related activities. Most of the changes in the landscape are also expected to occur in this zone. Field investigations were carried out within the study area on 17th April 2026. and the parameters studied during this field study includes; air quality (NO₂, CO, VOCs, TSP, SO₂, NH₃, H₂S), Noise Level, Radio Frequency and Socio-Economic Data.

Measurement of environmental quality parameters for providing baseline scenario and trends prior to the initiation of a development project is an essential step in determining the post project environmental changes and their impacts. Field investigations were carried out within the study area on 17th April 2026 and the selection of environmental parameters for baseline studies is based on the objectives of the study and Terms of Reference (ToR).

The following environmental components were focused for this study:

- ✚ Air Environment (Meteorology, Ambient Air Quality, Noise Level, Traffic Pattern etc.)
- ✚ Land Environment (Geology, Landuse and Solid Waste generation)
- ✚ Biological Environment (Terrestrial Flora and Fauna)
- ✚ Socio-Economic Environment (Demographic Profile, Education, Employment, Income etc.)

Soil and water quality information were supported with reference from the EIA studies approved by FMEnv within the states. Noise level and radio-frequency measurement were collected from three sampling points (inclusive control points) around the project area. All quality control/assurance measures were applied and the samples

The baseline status collated from analysis of secondary and primary data is summarized below:

Climate and Meteorology

The study area is located in South Eastern region of Nigeria. The climate in Southern region of Nigeria is characterized by a rainy season from May to September, and a dry season from October to April. The areas

covered by this study have highest daily rainfall in the months of July through September. The climate in northern Nigeria is characterized by a rainy season from May to September, and a dry season from October to April. The rainfall during November--March is nil and the humidity is often below 20% for extended periods.\

The mean annual rainfall in the proposed project area ranges between 370mm and below while the monthly mean temperature ranges from 28.49°C during night time to 39.84°C at daytime. The weather is cold and dry during the period coupled with hazy atmosphere and dust particles flowing around. The vegetation of the southern region of Nigeria is dominantly forested ranging from mangrove at the coast to evergreen, deciduous tall tree in the rain forest.

The annual mean wind speeds in the study areas ranged from about 3.0 to 7.4 m/ph and the annual power density range between 0.067 and 0.1066 kW/m².

The relative humidity is highest at the peak of the rainy season and lowest at peak of the dry season. It could be as high as 87.7% between night and morning during the wet season and as low as 40.95% at mid-day during the dry season. Generally, the drier months between December and February have lower values.

The proposed project areas receive sunshine of 7.19 – 11.51 hours per day with an average of 8.75hours. Between October and March, it receives its longest sunshine period with November as the longest while the shortest sunshine duration is from July to September. The general short sunshine period in the raining season could be attributed to the greater cloudiness characteristic of the period

Air Quality

The TSP concentration ranged from 50.4 to 59.8(µgm-3) while average TSP concentration of 55.2 (µgm-3) was recorded while NO₂, SO₂, H₂S, VOC was found to be below the detection limit of the equipment. The CO values ranged from 0.06ppm to 0.44pmm with mean of 0.295ppm.

Noise Level

The noise levels reorded range from 52.5 to 57.1dB (A) while the mean noise level in the project areas was reported to be 46.30dB (A) and within FMEnv and WHO limits.

Soil Quality

Soil survey was carried out at all the proposed sites to characterize the soil's baseline physico-chemical characteristics and determine any existing contamination. Soil quality was generally found to be good within the proposed project area, with low levels of heavy metals and hydrocarbons.

Radio Frequency

The result of Radio frequency measurements at proposed sites gives the value range between 0.000 and 0.003($\mu\text{W}/\text{cm}^2$). This value is within the recommended limits set by international regulatory agencies {such as International Commission on Non-Ionizing Radiation Protection (ICNIRP), World Health Organization (WHO) and Nigerian Communications Commission (NCC).

Groundwater Quality

The measured pH and temperature values in the groundwater samples fall within the FMEnv recommended limits of 6. – 8.5 for pH for potable water.

Electrical conductivity, a measure of the ability of the water to pass an electrical current, was recorded as 100 $\mu\text{S}/\text{cm}$. The conductivity values obtained in the groundwater samples were within the WHO limit of 1000 $\mu\text{S}/\text{cm}$.

Similarly, the Total Dissolved Solids (TDS) value obtained was 64mg/l which fall below the WHO and FMEnv limits of 500 mg/l for potable water. Both conductivity and TDS are indicators of how much ions are dissolved in the water samples.

Na was 2.31mg/l, SO_4^{2-} was 2.03mg/l, NO_3^- 1.24, PO_4^{3-} was 0.13mg/l amongst other cations analyzed'

Oil & grease and Hydrocarbon contents were not detected in the water samples. Therefore, the ground water samples within the proposed sites are free from hydrocarbon contents contamination.

Heavy metals in the groundwater samples were analyzed using Atomic Absorption Spectrophotometer (AAS). Nickel, Lead, Mercury, Cadmium, and Chromium were not detected in the samples. Similarly, the concentrations of oil and grease measured in the groundwater samples

were below the detection limit of 0.001mg/l, indicating that the groundwater samples are not polluted with hydrocarbons.

The percentage of hydrocarbon utilizing bacteria (HUB) recorded was less than 1 % of the total heterotrophic bacteria, indicating that the groundwater is not polluted with hydrocarbon compounds that could serve as substrates for the HUB to thrive well. Microbes are naturally found in groundwater resources. Predominant species of microorganisms isolated in the groundwater samples from the Project area are *Aspergillus niger*, *Bacillus* spp., and *Mucor* spp.

Major Environmental Issues

Before impact assessment of different environmental components is undertaken, it is pertinent to highlight the major issues of concern emerging from the analysis of prevailing baseline environmental conditions and all project activities planned during construction and operational phase stage. The major project activities were broadly categorized under construction and operational phase of the project implementation. The major issues related to this project are summarized below:

Air Quality

During construction phase, the major air pollution of prime concern is SPM as impact of other emissions such as SO₂, HC, NO₂ and CO will not be significant because the nature of sources is such that the emissions are distributed spatially and as well as temporal. The prevailing SPM concentration is low; however, the construction activity of the project will slightly increase the SPM in the project site areas.

During operational phase, SO₂, NO₂ and CO emissions from generator set (power back-up units), vehicular traffic, HC emissions from tank overflow/leakage will be sources of pollution. NO₂ and SO₂ emissions from generator sets shall require optimal cost-effective mitigation measures among established generator set, use of good fuel and use of natural dilution by raising stack height to about 2.7m above ground level

Noise

The ambient noise levels in the neighborhood of project sites in general were found to be within permissible limit. The use of low noise level equipment on sites shall mitigate the noise emission from construction equipment.

During operational period the major noise pollution source will be from generator set. In order to prevent adverse noise exposure in the environment, optimal mix of mitigation measures such as low noise generation units, acoustic enclosures. Renewable energy will be also used to eliminate both noise and air pollution

Water Quality

During construction phase, access of construction vehicles and construction personnel onto the site can result in the onset of erosion. The clearance of vegetation and increase in impermeable surfaces will reduce the capacity of the land surface to retard the flow of surface water, thus decreasing infiltration, and increasing both the quantity and velocity of surface water runoff. The possible spillage of fuel and oil as well as the clearance of vegetation (should this occur) will alter the affected environment Since there is no water bodies within the range of 1km radius of the proposed site, impact on surface water will be limited to the site and its duration will be relevant through to the end of the construction phase and is therefore determined as negative to minor term.

There is a possibility of impacting the ground water during then operational phase if there is spillage of fuel. Diesel spillage usually occurs as a result of vandals attempting to steal diesel or faulty generators. Thus, the impact is rated low since the likelihood of occurrence is remote and measures to contain spillage shall be put in place.

Waste Management

The sources of solid waste will be from operation and maintenance. FIX FM 103.3 is committed to achieving less waste; hence waste bin to segregate waste will be provided in the station and around the mast site. The waste management will focus on segregation of waste at source, collecting and allowing municipality to carry it for further processing.

Environmental Assessment

Environmental Impacts due to the construction and operation stages of the Radio FM project were identified and evaluated using Leopold matrix including engineering judgment and best practices.

Construction and operation of the proposed Radio FM project would result in impacts to soils, groundwater, air as well as noise quality. The primary issues associated with the proposed project are related to impacts to flora, fauna and soil.

Specifically, construction activities would result in impacts to air quality. Because construction activities are temporary in nature, most of the impacts resulting from construction would also be temporary.

Mitigation Measures Considered

For each of the identified potential impact, mitigation measures were recommended which FIX FM 103.3 shall adopt. Highlights are that FIX FM 103.3 shall

- ❖ FIX FM 103.3 shall ensure that all design and construction are in line with acceptable engineering standard.
- ❖ Regular inspection shall be carried out to ascertain the integrity of the towers.
- ❖ FIX FM 103.3 shall ensure proper consultation with the host communities and youth organizations on recruitment of labour.
- ❖ FIX FM 103.3 shall put in place safety measures to safeguard the health of the workers
- ❖ Waste receptacles shall be created to ensure proper disposal of waste on sites.
- ❖ The generators shall be confined within an enclosed concrete sound proof structure shall be serviced promptly
- ❖ FIX FM 103.3 should ensure that all generators are placed on reinforced concrete plinths and installed with effective vibration dampers to minimize vibration
- ❖ Public Power supply shall be used as much as possible
- ❖ Bund walls shall be erected around all fuel storage.
- ❖ All spent oil generated from maintenance of generators shall be collected in an appropriate receptacle and given out for recycling by a competent facility.

Environmental Management Plan

Adequate environmental management measures have been recommended to be incorporated during the entire planning, construction and operation stages of the Fix FM Station project to minimize any adverse environmental impact and assure sustainable development of the area. A monitoring plan was provided for the project and the required institutional arrangement for implementation of the management and monitoring plan.

Summary of the plan is provided in chapter seven of this report including safety procedure.

At the end of the project facilities' utility, all equipment shall be decommissioned and abandoned in conformity with a plan that meet local and international regulatory requirement and standards. A plan that will ensure a safe, environment friendly and efficient decommissioning programme shall be formulated.

The plan shall cover:

- ❖ Facilities to be decommissioned or recovered
- ❖ Environmental aspect of the decommissioning activity
- ❖ Methods for facility re-use, recycling, disposal or removal
- ❖ Proper consultation with all stakeholders (community, other land users and regulators)
- ❖ Efforts to integrate negative environmental impacts and appropriately rehabilitate the sites
- ❖ Programmes for restoring the environment in accordance with national and international best practices and regulatory requirement.
- ❖ Scope of work to assess possible residual impacts of the Fix FM Staton on the environment.

Conclusion

Based on the environmental assessment, the associated potential adverse environmental impacts can be mitigated to an acceptable level by adequate implementation of the measures in the mitigation measures and EIA in the report.

It can be concluded that the project will not have significant impact that cannot be mitigated but would help in improving the socio-economic condition of the project area and Nigeria in general. We are therefore of the opinion that the project be allowed to proceed as proposed by FIX FM 103.3, provided the Environmental Impact Assessment recommended for the entire life of the project, is put in place and strictly followed.

CHAPTER ONE

INTRODUCTION AND BACKGROUND INFORMATION

1.0 Introduction

Fix FM 103.3 is a newly registered electronic Media/broadcasting organisation aiming to provide high-quality local content, including up-to-date news, educational programming, and entertainment, while serving as a resilient medium during emergencies. Additionally, it will also target local advertising and community building.

Fix FM 103.3 intends to construct a mast for an FM Radio station to be located at 3A, Cathedral Avenue, Independence Layout, Enugu North Local Government Area in Enugu State of Nigeria, to further improve the quality of broadcasting service to the people across the city as well as the State.

In line with the environmental statutory and regulatory requirements of the Federal Republic of Nigeria, State Governments, International Finance Corporation/World Bank as well as **FIX FM's** corporate policy on environmental protection and sustainable development, the company decided to conduct an EIA of the proposed Mast in line with the regulatory requirements and following the conditions of the EIA Act. In this regard, **FIX FM 103.3** commissioned **MacBenuz Enviros Limited**, Environmental, Health, and Safety consultants (accredited by FMEnv, NESREA) to prepare the Environmental Impact Assessment (EIA) of its proposed Mast project at 3A, Cathedral Avenue, Independence Layout, Enugu North Local Government Area in Enugu State.

The Environmental Management Plan (EMP) covers the design, construction, operation, and decommissioning phases of each project component, identifying key environmental issues across the project and providing strategies and plans to manage them effectively. It also defines the legal requirements for the project and identifies the regulatory permits and licenses required for construction activities.

1.1 Proponent's Background Information

FIX FM 103.3 is a newly registered company and was incorporated on 23rd February, 2026 to pursue improved quality in broadcasting service in Enugu State in particular and Nigeria as a whole.

The background of this development involves three core physical components that interact with the environment:

- **The Studio/Administrative Building:** A permanent structure requiring standard construction permits.
- **The Antenna Mast:** A 70m ground-based self-supporting steel tower.
- **Power Station:** A dual-source system comprising a connection to the national grid and a high-capacity diesel generator/solar hybrid system for redundancy.

As a responsible, caring, corporate citizen, the company believes that business and society are interdependent and through mutual understanding and responsible behavior, the role of business in building a better future should be recognized and encouraged.

1.2 EIA Objectives

This EIA study was implemented with the following objectives:

- Identify the environmental regulations that are relevant to the proposed construction and operations of the Radio FM 103.3 project;
- Establish existing environmental conditions of the project location thereby identifying the resources that may be affected by the proposed project activities;
- Understand the proposed project facilities and activities thereby identifying the potential and associated effects of any hazards that may arise from the project activities;
- Evaluate the extent of possible impacts (negative/adverse and beneficial/positive), if any, of project activities on the ecology and socio-economic and health of the area;
- Assess the impacts in terms of their magnitude, duration, aerial extent, severity, and significance;
- Determine the significant adverse environmental effects of the proposed activities;
- Make recommendations on appropriate preventative, reduction, and control measures for identified potential and associated adverse impacts of the Radio FM station project activities;
- Develop an Environmental Management Plan (EMP) aimed at sustaining the environment in line with the recommended remedial actions above; and
- Provide the basis for consultation with regulatory authorities, the public, and other stakeholders and support subsequent applications for associated Environmental Permits.

1.3 Scope of Work

The Scope of Work for this EIA includes, but is not limited to, the following:

- Review of Relevant Literature;
- Field studies comprising one season field data gathering and consultation with all relevant stakeholders and the host communities;
- Statistical analyses of field data and presentation in relevant format for reporting;
- Assessment of potential and associated impacts, carried out by superimposition of the technical details of the proposed project on the baseline environmental characteristics as well as evaluating the safety protocols of all equipment to be used;

- Identification of appropriate mitigation measures for all identified negative impacts from the project;
- Development of an Environmental Management Plan (EMP) which ensures proper implementation of all mitigation measures and contingency plans are put in place and systematically implemented; and
- Development of best conceivable plans for restoring the environment after decommissioning of the proposed project.

Based on a thorough screening of the project to understand its potential impacts on the baseline environmental and social characteristics of the project area, field data gathering focused on the following characteristics:

- Climate/Meteorology
- Air Quality and Noise
- Soil Quality
- Geology/Hydrogeology
- Wildlife and Vegetation
- Land Use
- Socio-economic and Cultural Characteristics
- Demography and Population Indices
- Waste Management System

1.4 EIA Methodology

The EIA study pathway involved preliminary actions (i.e. initial planning and review activities), field data gathering campaign, data analysis/interpretation, reporting, and experts/stakeholders review.

1.4.1 Preliminary Actions

The first step in the EIA study was the development and submission of the project proposal/EIA Terms of Reference (ToR) by FIX FM 103.3 to the Federal Ministry of Environment (FMEnv). This is in line with the Nigerian EIA Procedural Guidelines. The project proposal contained a synopsis of the proposed Radio FM station project while the ToR document outlined the general scope of the EIA study, the regulatory framework for conducting the study, objectives, baseline data requirements, and assessment tools and methods for the EIA. Further, the ToR highlighted some key issues/activities of environmental concern in the proposed project planning and implementation.

The desktop study, which generally involved consulting relevant textbooks, research publications, articles, reports on previous environmental surveys of proximal/similar environments as well as technical presentations relevant to the study area, was carried out before the field data gathering campaign to obtain relevant background information on the biophysical and social environment of the study area. The results from the desktop study were used to identify information gaps on the baseline status of the study area and hence the definition of the extent of field investigation/data collection. Further research was also conducted at the end of the field data gathering exercise to compare literature information with generated field data and for additional information on the study area.

1.4.2 Field Data Gathering, Analysis, and Interpretation

Information gathered from the desktop study was used to categorize the major aquatic and terrestrial habitats in the area and thus define their respective sampling requirements. This enabled the effective collection of qualitative and quantitative data on the flora and fauna of the project area. The fieldwork, which was carried out on the 17th of April, 2026, covered all relevant elements of the ecological environment to complement information obtained from the literature. Field data gathering covered meteorology/ambient air, groundwater, vegetation, wildlife, and socio-economic/health characteristics of the study area. Field samples were subsequently analyzed and interpreted and used to describe the existing environment as documented in Chapter Four of this report.

1.4.3 Consultation with Regulators, Stakeholders, and Experts

Consultation is an integral part of every phase in the EIA implementation. This involved information dissemination and interactions/dialogues with the various stakeholders in the proposed project area including professionals in relevant fields of engineering, science, health, and environmental issues. This was used to intimate them of the proposed project and associated activities, and solicit/articulate their views, concerns, and expectations on pertinent issues of environmental, social, and health concerns for integration into the impact prediction, assessment, evaluation, and mitigation. Stakeholders (including regulators) consulted include the Federal Ministry of Environment (FMEnv), Enugu State Ministry, Enugu North Local Government Area as well as the traditional authority of the host community.

1.4.4 Impact Identification and Evaluation

At this stage of the EIA study, the potential adverse or beneficial impacts of the proposed project activities on the existing environment were identified by considering the interactions of the environmental aspects with the existing environment at the pre-construction/mobilization, construction, operation, and decommissioning phases of the project. Evaluation of the identified impacts was carried out using such criteria as legal/regulatory requirements in respect of planned activities, the magnitude of impact, the risk posed by impact, public perception, and the importance of the affected environmental component.

1.4.5 Impact Mitigation

In proffering mitigation measures designed to prevent, reduce, or control the adverse impacts of the environmental aspects of the proposed project, professional judgment (based on scientific deductions), project experience, knowledge of the ecosystem in which the proposed project would be located, and consensus of opinions among experts was used as tools. Other resource materials also consulted include the FMEnv EIA Sectoral Guidelines for Manufacturing Industries (FEPA, 1995), IFC's Sustainability Framework, etc. Enhancement measures were also proffered to ensure optimization of the beneficial impacts of the proposed project.

1.4.6 Reporting and Review

The findings of the proposed project EIA study were subsequently documented as contained in this draft report. The final version of this shall incorporate all pertinent issues and comments arising from the review meetings as shall be directed by the Federal Ministry of Environment.

1.5 Legal and Regulatory Framework

Several National and International conventions and regulations guiding Radio broadcasting activities in Nigeria. The relevant national and international regulations applicable to the proposed project are presented below.

1.5.1 National Regulations

(i) Policy, Legal and Administrative Framework

Nigeria is committed to a National Policy that ensures sustainable development based on proper management of the environment to meet the needs of the present and future generations.

In enunciating this national policy on the environment, cognizance has been taken of the various institutional settings and professional groupings, as well as the complex historical, social, cultural, and legal considerations which have been and continue to be involved, in the identification and implementation of measures designed to solve national environmental problems.

- ***The National Policy on the Environment, 1999***, which was first formulated in 1991 and later revised in 1999, was considered in this report. The policy seeks to define a new holistic framework to guide the management of the environment and natural resources of the country. As a framework document, it prescribes sectoral and cross-sectoral strategic policy statements and actions for the management of the country's environment for sustainable development. This Policy derives its strength from the fundamental obligation for the protection of the environment as stated in Section 20 of the Constitution of the Federal Republic of Nigeria 1999, which provides that the "State shall protect and improve the environment and safeguard the water, air, and land, forest and wildlife of

Nigeria”. In addition, Nigeria is a party to several international treaties and conventions governing environmental issues.

- ***The National Policy on Climate Change (NPCC), 2013*** sets out Nigeria’s response strategy to climate change as well as measures for the adoption of climate-smart practices aimed at fostering sustainable development. It describes adaptation and mitigation measures for responding to the threat of climate change in the country.
- ***National Energy Policy*** recognizes the multi-dimensional nature of energy and therefore addresses diverse issues such as research and development, energy pricing and financing, legislation, energy efficiency, environment, etc. The overall thrust of the energy policy is the optimal utilization of the nation’s energy resources for sustainable development.
- ***The Renewable Energy Master Plan (REMP)*** aims to increase the contributions of renewable energy to account for 10% of Nigerian total energy consumption by 2025. This policy was produced in 2006.
- ***Nigeria National Biodiversity Strategy and Action Plan, 2003***: Nigeria houses a cornucopia of both plant and animal species which makes it very rich in biodiversity. The considerable levels of endemism and species richness in the country are due to a complex topography, favorable climate, and wide range of habitats. According to the IUCN Red List 2013, Nigeria has a total of 309 threatened species. This document gave information on the status of biodiversity and its contribution to varied sectors of the Nigerian economy. The revised NBSAP was developed within the framework of a stakeholder’s participatory approach involving a series of plenary multi-stakeholders workshops and peer reviews.
- ***Nigeria’s Nationally Determined Contribution (NDC), 2015 – Revised 2021***, shows Nigeria’s global commitment to embracing sustainable development measures that limit the rate of global warming and the negative impacts of climate change. The NDC is a voluntary climate action based on national circumstances and priorities. Some components have legally binding obligations such as regularly communicating and maintaining the NDC, pursuing domestic mitigation measures, and regularly providing information on the country’s national inventory of emissions.

(ii) *EIA Act Cap E12 LFN 2004*

This Act sets out the general principles, procedures, and methods of environmental impact assessment in various sectors. The Act stipulates among other things the objectives of an EIA, a list of project activities for which an EIA is mandatory, the minimum content of an EIA, regulatory authorities of FMEnv, offenses, and penalties.

Specifically, Section 1 of the Act states that the objectives of any environmental impact assessment shall be:

- To establish, before a decision is taken by any person, authority, corporate body, or unincorporated body including the government of the federation, state, or local government intending to undertake or authorize the undertaking of any activity that may likely or to a significant extent affect the environment, the extent of the effects of these activities on the environment;
- To promote the implementation of appropriate policy in all federal lands, states, and local government areas, consistent with all laws and decision-making processes through which the goals and objectives in the preceding sub-section may be realized; and
- To encourage the development of procedures for information exchange, notification, and consultation between organs and persons when proposed activities are likely to have significant environmental effects on the boundary or the environment of border towns or villages.

To achieve these objectives, the Act stipulates that no public or private sector of the economy shall undertake or embark on any project without first carrying out an Environmental Impact Assessment study. However, Section 15(1) of the Act highlights some classes of projects to which an EIA study might be exempted, including:

- Projects considered likely to have minimal impact on the environment by the President, Commander-in-Chief of the Armed Forces, or the Council of the FMEEnv;
- All projects to be carried out during a national emergency for which the Government has put temporary measures in place; and
- All projects to be carried out in response to circumstances that are beneficial to the populace.

The Act equally specifies that an EIA report should be made up of at least the following:

- Description of the proposed project's activities;
- Description of the current status of the environment that may be affected by the project, with ample information provided to facilitate the identification and assessment of the potential environmental effects of the proposed project;
- An assessment of the potential environmental impacts of the proposed activity and the alternatives, including direct or indirect, cumulative, short-term, and long-term effects;
- An identification and description of measures available to mitigate adverse environmental impacts of the proposed activity and assessment of those measures;
- An indication of gaps in knowledge and uncertainty that may be encountered in computing the required information; and

- An indication of whether the environment of any other state or local government area or areas outside Nigeria is likely to be affected by the proposed activity or its alternatives.

(iii) National Environmental Impact Assessment Procedure

In response to the promulgation of the EIA Act discussed above, the Federal Ministry of Environment (FMEnv) developed a National EIA Procedure in 1995. The procedure provides steps to be followed from project conception to commissioning to ensure that the project is implemented with maximum consideration for the environment.

The procedure for EIA involves the project proposal stage where the project proponent notifies the FMEnv of the proposed project in writing. The project proposal is to contain all relevant information on the project and a land-use map. This stage is followed by the screening phase when the Ministry will carry out an Initial Environmental Examination (IEE) and assign the project into categories based on the following criteria: magnitude, extent or scope, duration and frequency, risks, significance, and mitigation measures available for associated and potential environmental impacts. The location of the project in Environmentally Sensitive Areas (ESAs) is also an important criterion in project categorization.

There are three categories of projects that have been identified as follows:

Category I: Projects are subjected to full-scale EIA, consisting among others of petroleum projects such as oil and gas fields' development, construction of offshore pipelines above 50 kilometres in length, construction of oil and gas separation, processing, handling and storage facilities, and large-scale construction of depots for storage of petroleum products.

Category II: Projects that may not require a full-scale EIA except when located in an Environmentally Sensitive Area (ESA), in which case the project will be assigned to Category I. The requirement for Category II projects is a partial EIA. Mitigation measures or changes in project design (depending on the nature and magnitude of the environmental impacts), as well as further actions, may be required from the proponent. Category II projects include reforestation/afforestation projects, land and soil management, small-scale irrigation and drainage, mini hydro-power development, small-scale development of petroleum or related activities, etc.

Category III: Projects expected to essentially have beneficial impacts on the environment. For projects in this category, the Ministry will issue an Environmental Impact Statement (EIS). Projects in this category include family planning programs, institutional development, environmental awareness projects, etc.

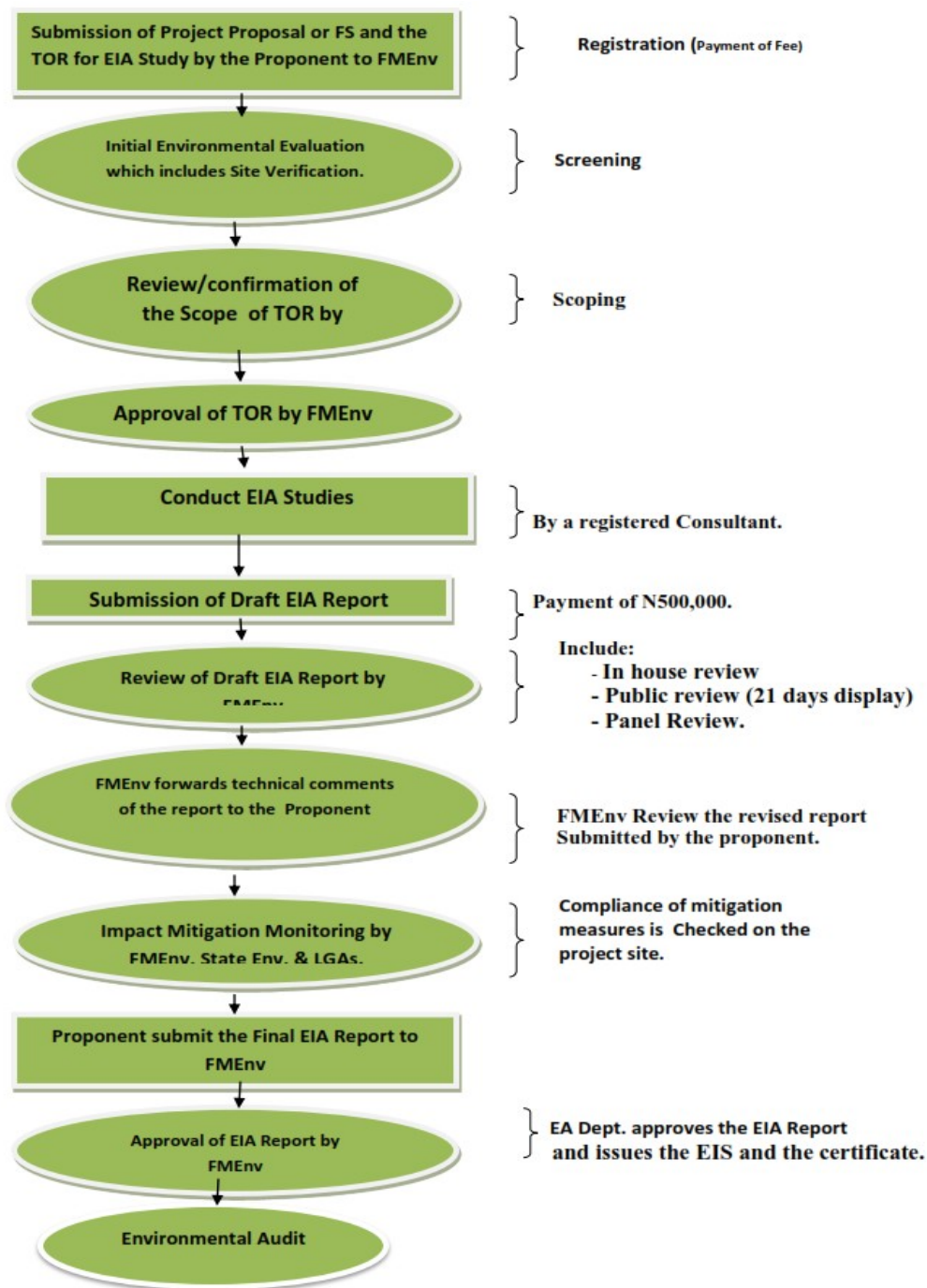


Figure 1.1: Flow Chart of the FMEnv EIA Procedure

Source: <https://ead.gov.ng/>

(iv) National Environmental Standards and Regulations Enforcement Agency (NESREA) Act

NESREA Act 27 of 2007 established the National Environmental Standards and Regulations Enforcement Agency (NESREA), which works under the Federal Ministry of Environment. NESREA is saddled with the

responsibility of the protection and development of the environment, biodiversity conservation, and sustainable development of Nigeria's natural resources in general and environmental technology, including coordination and liaison with relevant stakeholders within and outside Nigeria on matters of enforcement of environmental standards, regulations, rules, laws, policies, and guidelines. The functions of the Agency include:

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

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

(v) ***Federal Ministry of Environment (FMEnv) Guidelines***

The FMEnv has put in place statutory documents to aid the control and abatement of industrial wastes and indiscriminate pollution of the environment. Such responsibilities include the provision of anti-pollution equipment, adequate treatment of effluent before discharge into the environment, etc. Statutory documents prepared towards this end include:

- ***National Environmental Protection (Management of Solid and Hazardous Wastes) Regulations, 1991:*** These Regulations address the handling and management of solid, radioactive, and hazardous waste. They define the objectives of management of solid and hazardous waste, the functions of appropriate Government agencies, and the obligations of industries.
- ***National Environmental (Sanitation and Wastes Control) Regulations, 2009:*** The Regulations provide the legal framework for the adoption of sustainable and environment-friendly practices in sanitation and control of solid wastes, hazardous wastes, and effluent discharges to minimize pollution.
- ***National Environmental (Noise Standards and Control) Regulations, 2009:*** The purpose of these Regulations is to ensure the maintenance of a healthy environment for all people in Nigeria, the tranquillity of their surroundings, and their psychological wellbeing by regulating noise levels.
- ***National Environmental (Surface and Groundwater Quality Control) Regulations, 2011:*** The purpose of these Regulations is to restore, enhance, and preserve the physical, chemical, and biological integrity of the nation's surface waters and to maintain existing water uses. The Regulations also seek to protect groundwater sources by regulating the discharge of hazardous wastes, fossil fuel energy, and any other substances having the potential to contaminate groundwater.
- ***Harmful Wastes (Special Criminal Provisions etc.) Act CAPHI LFN 2004:*** An Act to prohibit the carrying, depositing, and dumping of harmful waste on any land, territorial waters, and matters relating thereto. Section 6 spells out the penalty for offenses to include life imprisonment for the individual and appropriate punishment for corporate bodies.
- ***National Environmental Protection (Pollution Abatement in Industries and Facilities Generating Wastes) Regulations, 1991:*** The Regulations spell out the requirements for the identification of solid, toxic, and extremely hazardous substances to public health and provide necessary measures to facilitate the disposal of hazardous waste.

(vi) *National Broadcasting Commission (NBC)*

The National Broadcasting Commission is the broadcast regulator of the Federal Republic of Nigeria. The commission was set up on August 24, 1992, by Decree 38 of 1992, later amended as an Act of the National Assembly by Act 55 of 1999, and now known as National Broadcasting Commission Laws of the Federation 2004, CAP N11, to among other responsibilities regulate and control the broadcasting industry in Nigeria.

Key functions of the NBC include:

- **Licensing and Regulatory Oversight:** Receiving, processing, and recommending applications for radio, television, and internet protocol television (IPTV) licenses to the President.
- **Enforcing the Broadcasting Code:** Establishing technical and ethical standards for public, private, and commercial broadcast stations to ensure quality broadcasting.
- **Monitoring Content:** Ensuring broadcast content aligns with national interest, morality, and social harmony.
- **Regulating Competition:** Enforcing rules to ensure fair competition, including mandatory sub-licensing of sports and news content to other broadcasters.
- **Handling Complaints:** Receiving and addressing public complaints regarding broadcast services.
- **Advisory Role:** Advising the Federal Government on mass communication policy implementation.

(vii) *National Environmental (Standards for Telecommunications and Broadcasting Facilities) Regulations, 2011, S.I, No. 11*

To protect the environmental and human health, ensure safety and general welfare, and eliminate or minimize public and private losses due to activities of the telecommunication and broadcasting industry.

(viii) *Nuclear Safety and Radiation Protection Act, Cap N142, LFN 2004*

The Act is concerned with the regulation of the use of radioactive substances and equipment emitting and generating ionizing radiation. In particular:

- **Section 4** provides authority to make regulations for the protection of the environment from the harmful effects of ionizing radiation.
- **Sections 15 and 16** make the registration of premises and the restriction of ionizing radiation sources to those premises mandatory.
- **Section 37(1)(b)** allows an inspector to verify records of activities that pertain to the environment.
- **Section 40** clarifies that the same regulations guiding the transportation of dangerous goods by air, land, or water should also apply to the transportation of radioactive substances.

(ix) Electricity Power Sector Reform Act (EPSC) 2005

The Nigeria Electric Power Sector over the years witnessed a slow and steady decline leading to a near-complete failure of the system. The Government embarked on an Electric Power Sector Reform Program, which led to the establishment of the Nigerian Electricity Regulatory Commission (NERC) in 2005 and the Sector Reform Act.

This Act provides for the formation of initial and successor companies for the transfer of assets and liabilities of the National Electric Power Authority (NEPA), development of a competitive electricity market, and the establishment, functions, and powers of the Nigerian Electricity Regulatory Commission (NERC). Sections/parts of the Electricity Act relevant to the project are:

- **Part III:** Establishment of the Nigerian Electricity Regulatory Commission — objects and functions of the Commission.
- **Part IV:** Licensing requirement (for generation, transmission, system operation, distribution, and trading), tariffs, fines, and penalties.
- **Part V:** Acquisition of land and access rights.
- **Part VI:** Consumer protection — Regulation 80 stipulates that the commission shall develop customer services standards, complaint handling procedures, and related materials.
- **Part VII:** Regulations about competition and market power.
- **Part VIII:** Regulations about the establishment of the power consumers' assistance fund.

Recently, the reform has led to the corporatization and unbundling of the state-owned monopoly, now known as the Power Holding Company of Nigeria (PHCN), establishing 18 successor companies comprising six generation companies, one transmission company, and 11 distribution companies.

(x) The Forestry Act, CAP 51 LFN 1994

The principal legislation in force for the regulation of the forest sector is the Forestry Act 1958. The Forestry Act CAP 51 LFN of 1994 prohibits any activity that may lead to the destruction of or cause injury to any forest produce, forest growth, or forest property. The project area does not fall within any protected or reserved forest.

(xi) Penal Code (Northern States) Federal Provisions Act, Cap 345 LFN 1990

The Nigerian Provisional Penal Code Act CAP 345 LFN 1990 makes it an offense punishable with up to 6 months' imprisonment for any person who violates the atmosphere in any place to make it noxious to the health of persons in general, dwelling or carry on business in the neighbourhood, or passing along a public way, or does any act likely to spread the infection of any disease dangerous to life, whether human or animal.

(xii) Public Health Legislations and Regulations

Several countries have legislations that stipulate the administrative framework for conducting a health impact assessment for a development project, whether as part of an EIA or a standalone study. Prominent among these countries are Canada, New Zealand, Australia, England, and Wales. In addition, several international agencies have endorsed this process, such as the World Bank, Asian Development Commission, and the World Health Organization.

In Nigeria, the Public Health Law (L.N 47 of 1955, Cap 103) justifies the execution of developmental projects under guidelines that promote health by protecting the environment and safeguarding the health of humans. The Public Health Laws empower Medical Officers of Health (operating at the Local Government Council, under supervision of the State and Federal Ministries) to require, by implication, that individuals and groups ensure that their activities promote an environment that fosters good health (Subsections 6 and 7(m)).

Although these laws do not require that an EIA include an assessment of the impact of an activity on public health, Nigeria, through the Federal Ministries of Health and Environment, is signatory to a number of international charters and legislations that require that Health Impact Assessment (HIA) applies to all activities which by law require EIA, and that HIA is fully integrated with EIA processes.

(xiii) Abandonment Guidelines, 1995

The guidelines help to ensure the environment is returned to, as much as reasonably practicable, its original/baseline conditions.

(xiv) The Nigeria Climate Change Act, 2021

The Act provides a framework for Nigeria to achieve low greenhouse gas emissions (GHG) through inclusive green growth and sustainable economic development and the implementation of Nigeria's commitment to net zero emissions declared at COP26 in 2021. It establishes the National Council on Climate Change, which will be tasked with implementing the country's Climate Action Plan. The Act provides a framework for achieving low GHG emissions and sustainable economic development by:

- Ensuring that Nigeria formulates programmes for achieving its long-term goals on climate change and adaptation;
- Facilitating the coordination of climate change actions needed to achieve long-term objectives;
- Mainstreaming climate change actions in line with national development priorities;
- Facilitating the mobilization of finance and other resources necessary to ensure effective action on climate change;
- Ensuring that climate change policies and action are integrated with other related policies for promoting socio-economic development and environmental integrity;

- Setting a target for year 2050–2070 for the attainment of a net-zero GHG emission, in line with Nigeria’s international climate change obligations;
- Identifying risks and vulnerabilities, building resilience, and strengthening existing adaptive capacities to the impacts of climate change;
- Implementing mitigation measures that promote low carbon economy and sustainable livelihood; and
- Ensuring that private and public entities comply with stated climate change strategies, targets, and the National Climate Change Action Plan.

(xv) *National Energy Policy, 2003*

The provisions of this Policy relevant to the proposed project are:

- The Nation shall aggressively pursue the integration of solar energy into the energy mix;
- The Nation shall keep abreast with worldwide developments in solar energy technology; and
- Development of the market for solar energy technologies.

(xvi) *The Renewable Energy Master Plan (REMP)*

The Renewable Energy Master Plan (REMP) seeks to increase the supply of renewable electricity from 13% of total electricity generation in 2015 to 23% in 2025 and 36% by 2030. Renewable electricity would then account for 10% of Nigerian total energy consumption by 2025. The Plan also encompasses installed capacity targets for a set of suitable renewable energies, as follows:

- Small-hydro: 600 MW in 2015 and 2,000 MW by 2025;
- Solar PV: 500 MW by 2025;
- Biomass-based power plants: 50 MW in 2015 and 400 MW by 2025; and
- Wind energy: 40 MW by 2025.

The REMP also implements a set of fiscal and market incentives to support RE deployment, including a moratorium on import duties for renewable energy technologies in the short term, as well as tax credits, capital incentives, and preferential loan opportunities for renewable energy projects in the longer run. Simultaneously, the REMP targets higher electrification rates, from 42% in 2005 to 60% in 2015 and 75% by 2025.

(xvii) *National Policy on Occupational Safety and Health, 2006*

The National Policy on Occupational Safety and Health developed in 2006 has been a veritable driving tool for the advancement of Occupational Safety and Health in Nigeria. Occupational Safety and Health (OSH) is the multidisciplinary field involved in the prevention of departures from health arising out of or in the

course of employment; the protection, promotion and maintenance of the health, safety, and well-being of workers; and the adaptation of work to man and man to work.

The objectives of this Policy are:

- To provide a general framework for the improvement of working conditions and the working environment;
- To promote safety, health, and well-being of workers in all workplaces by minimizing accidents and departures from health arising out of or in the course of work, including emerging risks and concerns;
- To reduce occurrences and incidences of accidents, work-related diseases/illnesses, injuries, and fatalities;
- To ensure the provision of high-quality Occupational Safety and Health (OSH) services that are independent, impartial, and accessible to all;
- To provide Occupational Safety and Health services in all sectors that will enhance workers' productivity and economic growth;
- To provide suitable Occupational Safety and Health preventive programs and services including timely rehabilitation services; and
- To set standards for processes, procedures, and evaluating compliance with standards.

(xviii) Territorial Laws

(a) Federal Capital Territory Act CAP 128 LFN 1990

The area contained in the Federal Capital Territory shall, as from the commencement of this Act, cease to be a portion of the States concerned and shall thenceforth be governed and administered by or under the control of the Government of the Federation. This Act establishes a Federal Capital Territory and provides for the constitution of a Federal Capital Territory Authority (FCDA).

(b) Abuja Environmental Protection Board (AEPB) Act No. 10 of 1997

The Abuja Environmental Protection Board, established through this Act, is saddled with the following functions:

- Enforcement of all environmental legislation and abatement of all forms of environmental degradation and nuisance;
- Minimization of impact of physical development on the ecosystem;
- Preservation, conservation, and restoration to pre-impact status all ecological processes essential for the preservation of biological diversity;

- Protection and improvement in air, water, land, forest, and wildlife in the ecology of the FCT; and
- Municipal Liquid and Solid Waste Collection and Disposal/Sanitation Management service.

(xix) *The Endangered Species Act, CAP 108, LFN 2016*

This Act focuses on the protection and management of Nigeria's wildlife and some of their species in danger of extinction as a result of overexploitation. These sections are noteworthy:

- **Section 1** prohibits, except under a valid license, the hunting, capture, or trade in animal species, either presently or likely to be in danger of extinction.
- **Section 5** defines the liability of any offender under this Act.
- **Section 7** provides for regulations to be made necessary for environmental prevention and control as regards the purposes of this Act.

(xx) *Nigerian Airspace Management Agency (NAMA) Act, 1999*

NAMA is an Air Navigation Service Provider with a mandate to manage the Nigerian Airspace to a level consistent with the requirements of the ICAO SARPs. The main objectives of NAMA are to continue to provide safe and functional air navigation services that will meet international standards as well as to increase Air Traffic Management (ATM) capacity in order to manage increasing air traffic volume and simultaneously reduce delays.

(xxi) *Nigeria Civil Aviation Authority (NCAA) Act, 2006*

The agency is charged with the responsibility for the formulation of policies and strategies for the promotion and encouragement of civil aviation in Nigeria and the fostering of sound economic policies that assure the provision of efficient and safe services by air carriers and other aviation and allied service providers, as well as greater access to air transport in a sustainable manner.

(xxii) *Land Use Act CAP L5 LFN 2004*

The Land Use Act places the ownership, management, and control of land in each state of the federation in the Governor. Land is therefore allocated with his authority for commercial, agricultural, and other purposes.

(xxiii) *The Nigeria National Health Act, 2014*

The aim of the Act is to establish a national framework for the Regulation, Development, and Management of a National Health System, to set standards for rendering health services in Nigeria. Other key provisions include establishment of the National Health System, exemption from payment for health services in public health establishments, and establishment of the Basic Health Care Provision Fund.

(xxiv) Workmen's Compensation Act, 1987

The Workmen's Compensation Act No. 2 of 1987 provides for compensation for injuries and death suffered by workmen in the course of their employment. An employer shall pay compensation to any of his employees who suffers injury from any accident arising out of and in the course of his employment, as well as to the estate of any employee who dies as a result of any such accident.

(xxv) Natural Resource Conservation Act CAP 286 LFN 1990

This Act established the Natural Resource Conservation Council to be responsible for the conservation of natural resources in Nigeria and formulate national policy for natural conservation. Section 3 of the Act provides that the functions of the Council shall be to:

- Co-ordinate matters concerning the conservation of natural resources in Nigeria;
- Formulate a national policy for natural resources conservation; and
- Carry out such other activities calculated to facilitate the effectiveness of the performance of the functions of the Council.

The Act also measures, in collaboration with other agencies, to control coastal zone development to minimize erosion on the national coastline and designates sites and species of conservation interest.

(xxvi) Nigeria's Cultural Policy, 1996

The national cultural policy is generally regarded as an instrument of promotion of national identity and Nigerian unity, as well as of communication and cooperation among different Nigerian and/or African cultures. It is intended to be a guide to proper decision making and implementation regarding Nigeria's culture.

(xxvii) The Labour Act, CAP L1 LFN, 2004

Nigeria has ratified all eight core International Labour Organization Conventions. The Labour Act (2004) is the primary law protecting the employment rights of individual workers. The Act covers protection of wages, contracts, employment terms and conditions, recruitment, and classifies workers and special worker types.

(xxviii) Public Health Law CAP 103 LFN 1990

Public Health Law examines the authority of the government at various jurisdictional levels to improve the health of the general population within societal limits and norms. The State is empowered to protect and improve the environment and safeguard the water, air, land, forest, and wildlife of Nigeria. The law prohibits the public or private sector of the economy from undertaking or embarking on projects or activities without prior consideration of the effect on the environment.

(xxix) Employee's Compensation Act, 2010

The Act provides for an open and fair system of guaranteed and adequate compensation for all employees or their dependants for any death, injury, disease, or disability arising out of or in the course of employment. The Act also makes provision for rehabilitation of employees with work-related disabilities and establishment of a solvent compensation fund managed in the interest of employees and employers. This Act will be applicable to the construction and rehabilitation component of the program as labourers and other workers will be involved.

(xxx) The Nigerian Urban and Regional Planning Act CAP N138, LFN 2004

The Urban and Regional Planning Act is aimed at overseeing a realistic, purposeful planning of the country to avoid overcrowding and poor environmental conditions. In this regard, the following sections become instructive:

- **Section 30(3)** requires a building plan to be drawn by a registered architect or town planner.
- **Section 39(7)** establishes that an application for land development would be rejected if such development would harm the environment or constitute a nuisance to the community.
- **Section 59** makes it an offence to disobey a stop-work order, with a fine not exceeding ₦10,000 for individuals and ₦50,000 for companies.
- **Section 72** provides for the preservation and planting of trees for environmental conservation.

The project shall be implemented in line with requirements of this Act, including obtaining development permits from the Enugu State Government.

(xxxi) The Fire Service Act CAP F29, LFN 2004

An Act to make provision for the organization, discipline, powers, and duties of the Federal Fire Service, and for matters incidental thereto or connected therewith. The objectives of the Act are to:

- Prevent uncontrolled fires in our environment, especially in markets, public and private buildings and structures, and reduce the incidence of loss of lives and property;
- Enhance response capabilities of the Fire Service and strengthen the regulatory and revenue potentials of government as it relates to the distribution and maintenance of fire equipment; and
- Promote inter-agency collaboration in the distribution and maintenance of fire protection equipment in order to minimize fire incidences.

(xxxii) State Laws, Regulations and Legislations

Enugu State Ministry of Environment and Climate Change

The Enugu State Ministry of Environment has the responsibility of environmental protection within the state. The functions of the Ministry include:

- Liaise routinely and ensure effective harmonization within FMEnv to achieve the National Policy on Environment and cooperation in the promotion of environmental education in the citizenry;
- Responsible for monitoring compliance with waste management standards;
- Responsible for general environmental matters in the state including the negative effects of soil degradation due to flooding and erosion, deforestation, physical planning, sewage matters, water quality, and pollution control; and
- Monitor the implementation of the EIA and the Environmental Audit Report (EAR) guidelines and procedures on all development policies and projects within the state.

Enugu State Waste Management Authority (ESWAMA)

ESWAMA was established in 2004 to replace the defunct Enugu State Environmental Protection Agency (ENSEPA), which failed to meet the challenges of modern-day waste management. The agency was established to develop and implement policies on the management of solid and liquid wastes that would promote the health and well-being of the people. ESWAMA has the responsibility to ensure effective and efficient collection, removal, treatment, and disposal of all kinds of waste, and is further empowered to prosecute defaulters of sanitation laws.

1.5.2 International Regulations

The major international regulations and conventions applicable to the proposed project are as follows:

(i) World Broadcasting Union (WBU)

The World Broadcasting Union (WBU) is the primary global coordinating body for broadcasting, representing broadcaster networks across the world. Established in 1992, the WBU acts as the supreme umbrella organization for regional broadcasting unions, providing a platform to address key industry issues and technical standards. The Secretariat is managed by the North American Broadcasters Association (NABA).

Membership of the WBU consists of the following regional unions:

- Asia-Pacific Broadcasting Union (ABU)
- African Union of Broadcasting (AUB)
- Arab States Broadcasting Union (ASBU)
- Caribbean Broadcasting Union (CBU)
- European Broadcasting Union (EBU)

- International Association of Broadcasting (IAB/AIR)
- Latin American Information Alliance (AIL)
- North American Broadcasters Association (NABA)

(ii) *United Nations Guiding Principles on the Human Environment, 1972*

The United Nations (UN) published two major concept documents: Guiding Principles on the Human Environment, 1972 and the Rio Declaration on Environment and Development. The principles most relevant to the proposed project are:

- ***Principle Two:*** The natural resources of the earth, including the air, water, land, flora, and fauna and especially representative samples of natural ecosystems, must be safeguarded for the benefit of present and future generations through careful planning or management.
- ***Principle Four:*** Man has a special responsibility to safeguard and wisely manage the heritage of wildlife and its habitat. Nature conservation, including wildlife, must therefore receive importance in planning for economic development.
- ***Principle Six:*** The discharge of toxic substances or of other substances and the release of heat, in such quantities or concentrations as to exceed the capacity of the environment to render them harmless, must be halted in order to ensure that serious or irreversible damage is not inflicted upon the ecosystems.

(iii) *Public Exposure to Radio Waves*

The use of radio waves is a common part of everyday lives. The use of radio waves has been the subject of scientific research spanning more than 50 years. This large and growing body of research has been constantly reviewed by numerous independent scientific expert panels, government agencies, standard-setting organizations, and health authorities from around the world. All have reached the same general scientific conclusion: that there is no established evidence of any adverse health effects from exposure to radio waves within the limits applied to mobile communications systems.

Safety limits have been established to provide protection for all members of society, endorsed by the World Health Organization (WHO) and other authorities around the world, based on extensive reviews of all available scientific evidence and including substantial margins of safety.

(iv) *The Rio Declaration on Environment and Development, 1992*

The UN Conference on Environment and Development (Rio de Janeiro, 1992) reaffirmed the 1972 declaration on the Human Environment and sought to build upon it with the goal of establishing a new and equitable global partnership. The more relevant additional principles are:

- ***Principle One:*** Human beings are at the centre of concerns for sustainable development. They are entitled to a healthy and productive life in harmony with nature.

- **Principle Ten:** Environmental issues are best handled with the participation of all concerned citizens, at the relevant level. Each individual shall have appropriate access to information concerning the environment held by public authorities and the opportunity to participate in decision-making processes.
- **Principle Seventeen:** Environmental impact assessment, as a national instrument, shall be undertaken for proposed activities that are likely to have a significant adverse impact on the environment and are subject to a decision of a competent national authority.

(v) Vienna Convention for the Protection of the Ozone Layer, 1985 and the Montreal Protocol, 1987

The release of chlorofluorocarbons (CFCs) into the atmosphere acts to deplete ozone in the stratosphere, thus increasing the amount of damaging ultraviolet radiation (DUV) reaching the ground from the sun. The Convention and its Protocol made recommendations and programmes for the control of any substance, practice, process, or activity which may affect the ozone layer in the stratosphere.

(vi) Convention on Biological Diversity, 1992

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

(vii) United Nations Framework Convention on Climate Change (UNFCCC), 1992 and Kyoto Protocol, 1997

Greenhouse Gas (GHG) emissions, particularly of carbon dioxide (CO₂), are implicated in global warming of the atmosphere causing adverse climatic/meteorological changes such as sea level rise, excessive heat, flooding, desertification, reduced agricultural productivity, human ill health, and death of grazing mammals. The Convention and its Protocol called for the protection of the climate system for the benefit of present and future generations of humankind, and the reduction or prevention of anthropogenic GHG emissions across all sectors.

The Kyoto Protocol was adopted on 11 December 1997 and entered into force on 16 February 2005. It applies to the six greenhouse gases: Carbon dioxide (CO₂), Methane (CH₄), Nitrous oxide (N₂O), Hydrofluorocarbons (HFCs), Perfluorocarbons (PFCs), and Sulphur hexafluoride (SF₆).

(viii) Basel Convention on the Control of Trans-boundary Movements of Hazardous Wastes and their Disposal, 1987

The Basel Convention addresses the risks posed by the generation and disposal of hazardous wastes. This Convention defines the wastes to be regulated and controls the trans-boundary movement of hazardous wastes and other wastes to protect human health and the environment against their adverse effects.

(ix) *Convention Concerning the Protection of the World Cultural and Natural Heritage (World Heritage Convention), 1972*

The World Heritage Convention (1972) seeks to set aside areas of cultural and natural heritage, the latter defined as areas with outstanding universal value from the aesthetic, scientific, and conservation points of view.

(x) *African Convention on the Conservation of Nature and Natural Resources, 1968*

African countries shall take all necessary measures to ensure that conservation and management of natural resources are treated as an integral part of development planning at all levels.

(xi) *Nagoya Protocol, 2010 (Ratified by Nigeria on 12 October 2014)*

The Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization to the Convention on Biological Diversity (ABS) is a 2010 supplementary agreement to the 1992 Convention on Biological Diversity (CBD). Its aim is the fair and equitable sharing of benefits arising out of the utilization of genetic resources. The protocol was adopted on 29 October 2010 in Nagoya, Japan, and entered into force on 12 October 2014. Domestic-level access measures aim to create legal certainty, clarity, and transparency; provide fair and non-arbitrary rules and procedures; and establish clear rules for prior informed consent and mutually agreed-on terms.

(xii) *Environmental and Social Framework (ESF), 2016*

The Environmental and Social Framework (ESF) enables the World Bank and Borrowers to better manage the environmental and social risks of projects and to improve development outcomes. It was launched on October 1, 2018. The ESF offers broad and systematic coverage of environmental and social risks and makes important advances in areas such as transparency, non-discrimination, public participation, and accountability, including expanded roles for grievance mechanisms.

(xiii) *International Commission on Non-Ionizing Radiation Protection (ICNIRP) Standards*

For radiation safety, the guidelines most widely accepted in industry for the assessment of radiation compliance are set and maintained by the International Commission on Non-Ionizing Radiation Protection (ICNIRP). The ICNIRP has set guidelines for human exposure to electromagnetic fields (EMF), including a substantial safety margin to assure that no adverse health effects are experienced when EMF levels are within the established limits. The overall objective of the consideration of the foregoing legal instruments is to buttress the fact that FIX FM 103.3 MHz will give high recognition to the legal instruments and is committed to pursuing the goals of sustainable development as further shown in its Health, Safety and Environment commitments outlined below.

1.5.3 *FIX FM's Health, Safety and Environment (HSE) Strategy*

1.5.3.1 *Policy Statements and Objectives*

FIX FM is committed to ensuring that through the scope of its operations all employees work in a safe and healthy environment where precautions are taken to minimise risk and in return reduce accidental injury, damage, and losses.

Management is committed to ensuring that *FIX FM's* safety standards are adhered to and adequate supervision, training, and equipment are available to all employees and contractors to ensure a safe and healthy working environment.

It is the responsibility of all employees and contractors to comply with *FIX FM* policies, standards, and processes to protect themselves and others and to actively strive towards the consistent prevention of accidental injury, damage to property, damage to the environment, and other losses, with the aim of reducing risk and ensuring safe and healthy working conditions for all.

1.6 *Structure of the EIA Report*

This report is presented in nine chapters as summarised below:

- **Chapter One** is an introduction with the EIA scope of work, relevant background information about FIX FM 103.3 (the Applicant), and the Legal/Administrative Framework for EIA in Nigeria.
- **Chapter Two** discusses the project justification and presents the need/value, benefit of the project, and project development options.
- **Chapter Three** describes the proposed project, location, project activities, excavation, tower erection, waste management, commissioning, decommissioning/abandonment, and the project schedule.
- **Chapter Four** describes baseline conditions, description of the proposed Radio FM physical environment, information on socioeconomic and health status of the study area. The chapter also contains information on consultation activities with stakeholders, Government Agencies, the public, and the host communities.
- **Chapter Five** discusses the associated and potential impacts of the proposed Mast project.
- **Chapter Six** discusses the Mitigation Measures for identified adverse impacts.
- **Chapter Seven** presents a cost-effective Environmental Management Plan to adopt throughout the project cycle. It also recommends an environmental monitoring and waste management programme.
- **Chapter Eight** outlines the plans for site restoration and remediation after closure and abandonment.
- **Chapter Nine** gives the conclusions and offers advice on project implementation.

References and Appendices are also included in this report.

CHAPTER TWO

PROJECT JUSTIFICATION

2.0 INTRODUCTION

HISTORICAL PERSPECTIVES OF FM RADIO BROADCASTING IN NIGERIA

The history of FM radio in Nigeria is a journey from rigid government control to a vibrant, deregulated landscape. While radio broadcasting in Nigeria began in 1932 with the Radio Diffusion System (RDS), it was primarily AM (Amplitude Modulation) for decades. The shift to FM (Frequency Modulation) represented a leap in audio quality and local community engagement.

FM broadcasting in Nigeria was initially the exclusive preserve of the federal and state governments.

- **The Pioneer:** The first FM station in Nigeria was **Radio Nigeria 2 (RN2)**, established in Lagos by the Federal Radio Corporation of Nigeria (FRCN) in the late 1970s. It was designed to provide high-fidelity music and entertainment, contrasting with the more "serious" news and talk format of the AM stations.
- **State Expansion:** Following the federal lead, state-owned broadcasting corporations began establishing their own FM services (often called "Radio 2" or "FM Stereo") to cater to the growing urban youth population and to generate revenue through high-quality commercial spots.

The most significant milestone in Nigerian FM history was the **Deregulation of the Broadcast Industry** in 1992 under the Ibrahim Babangida military regime.

- **Decree No. 38 of 1992:** This created the **National Broadcasting Commission (NBC)**, the body tasked with receiving and processing applications for the ownership of radio and television stations by private individuals and corporate bodies.
- **Ray Power 100.5 FM:** In June 1994, **Ray Power FM**, owned by DAAR Communications (Chief Raymond Dokpesi), became the first private independent radio station to begin broadcasting in Nigeria. Its 24-hour broadcast schedule and urban-centric programming revolutionized the industry.

As the number of private stations exploded in the early 2000s (e.g., Rhythm FM, Cool FM, Beat FM), the technology behind the scenes shifted.

- **Automation:** Stations moved away from manual playback (CDs and vinyl) to computer-based automation systems.
- **Audio over IP (AoIP):** Nigerian stations began adopting digital consoles and networking, allowing for clearer signals and the ability to link multiple studios across different cities (networking).
- **Niche Broadcasting:** This era saw the rise of specialized stations, such as **Wazobia FM**, which pioneered broadcasting entirely in Nigerian Pidgin, making FM radio more inclusive for the masses.

Today, FM broadcasting in Nigeria is no longer limited to terrestrial signals.

Visual Radio: Many Nigerian FM stations now utilize cameras in the studio, streaming live video on platforms like YouTube and Facebook, blurring the line between radio and TV.

Podcasting and Streaming: FM stations now archive their live shows as podcasts and use dedicated mobile apps to reach the Nigerian diaspora globally.

Community Radio: The government has also expanded licensing to include campus radio (like UNILAG FM) and community-based stations to serve rural and specialized interests.

2.1 NEED FOR THE PROJECT

A project of this magnitude offers a unique blend of high-impact social reach and commercial potential. In an era dominated by digital algorithms, radio remains one of the most resilient and trusted mediums due to its accessibility and local relevance.

Here are the primary benefits of launching an FM radio project:

High Accessibility and Reach: Unlike streaming services or social media, FM radio does not require a data subscription or high-end hardware. Listeners only need a basic receiver, which is built into almost every mobile phone and vehicle.

It reaches populations that may be digitally illiterate or live in areas with poor internet connectivity. People can listen while driving, working, or doing household chores, allowing for high "time spent listening."

Community and Social Impact: Radio is often referred to as the "original social media" because of its ability to foster community. Useful information can be provided on recent happenings, weather, and traffic updates tailored specifically to a local city or region. It serves as a powerful tool for public health campaigns, environmental education, and civic engagement. During emergencies or natural disasters, FM radio is the most reliable way to broadcast real-time safety information when cellular networks may fail.

Financial and Commercial Viability: From a business perspective, a well-run FM station can be a highly profitable asset. Local businesses value radio because it allows them to target a specific geographic audience more effectively than broad online ads. Beyond traditional 30-second spots, revenue can be generated through sponsored segments, live event hosting, and digital "simulcasting" (streaming your FM feed online with its own ads). Compared to television, radio content is significantly cheaper to produce while maintaining a high level of engagement.

Cultural Preservation and Talent Development: FM stations are essential for breaking new local musicians, poets, and storytellers who might get lost in global streaming platforms. Stations can broadcast in

local dialects or languages, helping to preserve cultural heritage and ensure every segment of society feels represented.

Technical Reliability: FM (Frequency Modulation) provides superior sound quality and is less prone to the static and interference that plagued older AM stations. The station for FM is well-established, making it easier to find experienced engineers and standardized equipment for maintenance.

FIX FM 103.3 intends to operate an FM Radio station with human authenticity, hyper-local relevance, clean signal and sound processing, minimal clutter, and multi-platform integration.

FIX FM 103.3 in recognition of its corporate and civic responsibility is committed to rendering these *Radio FM station* solutions to the broadcasting industry. Time, effort and resources are committed to ensuring that its operations are people and environment friendly.

2.2 ENVISAGED SUSTAINABILITY

2.2.1 *Economic Sustainability*

Traditional advertising remains the backbone of the industry, but its delivery has evolved.

- **Spot Advertising:** The sale of 15, 30, or 60-second commercials. Sustainability depends on high-quality audience data (ratings) to justify premium pricing.
- **Program Sponsorship:** Long-form branding where a corporate entity "owns" a specific segment (e.g., the Morning Drive or a Sports Hour).
- **Live Mentions (Hype):** On-air personalities endorse products live, leveraging the high level of listener trust they've built.

To remain economically viable, modern stations must capture "digital dollars."

- **Social Media Monetization:** Leveraging large followings on platforms like Instagram and TikTok to offer cross-platform advertising packages.
- **Podcasting and On-Demand:** Re-purposing live shows into podcasts allows for "programmatic" audio ads, reaching listeners outside the terrestrial broadcast range.
- **Website Display Ads:** Selling banner space on the station's streaming portal or news blog.

Sustainability is as much about controlling costs as it is about making money.

- **Energy Efficiency:** For FM stations, electricity for the transmitter is often the largest recurring expense. Investing in high-efficiency solid-state transmitters and solar-hybrid power systems at the transmitter site significantly reduces overhead.
- **Syndication vs. Local Talent:** Balancing expensive local celebrity DJs with syndicated national programs can optimize payroll without losing listeners.
- **AoIP (Audio over IP):** Moving to digital networking reduces the need for expensive, specialized copper wiring and simplifies maintenance.

A station's economic health is tied to its "Brand Equity."

- **Niche Targeting:** Stations that target a specific demographic (e.g., business professionals, youth, or speakers of a specific local language) can charge higher rates to advertisers who want to reach that specific "high-intent" audience.
- **Event Marketing:** Hosting concerts, award shows, or town halls creates a surge in revenue through ticket sales and event-specific sponsorships.

2.2.2 *Environmental Sustainability*

The most significant environmental impact of an FM station is its high electricity consumption, primarily from the transmitter.

- **High-Efficiency Transmitters:** Modern LDMOS (Laterally Diffused Metal Oxide Semiconductor) transmitters can reach efficiency levels above 70%. Older vacuum-tube technology wasted a massive percentage of energy as heat.
- **Renewable Energy Integration:** Stations are increasingly moving toward **Solar-Hybrid systems**. By using photovoltaic arrays and lithium-ion storage at the transmitter site, stations can run on clean energy during peak sunlight hours, reducing reliance on diesel generators and the national grid.
- **Smart Cooling:** Traditional HVAC for transmitter rooms is energy-intensive. Sustainable designs use "free cooling" systems that circulate filtered outside air when temperatures are low enough, rather than relying on constant refrigeration.

Electromagnetic Radiation & Social Safeguards

While non-ionizing radiation from FM signals doesn't have the same impact as ionizing radiation, sustainability requires strictly managing exposure levels for the surrounding population.

- **Compliance with ICNIRP Standards:** Sustainability involves continuous monitoring of the **Specific Absorption Rate (SAR)** to ensure radiation levels at ground level remain within the limits set by the International Commission on Non-Ionizing Radiation Protection.
- **Antenna Pattern Optimization:** Using directional antennas or "down-tilting" allows the signal to be concentrated toward the audience while reducing the RF "overshoot" into sensitive areas like hospitals or residential high-rises.

Physical Infrastructure & Land Use

The construction of towers and studios must adhere to best practices in environmental management.

- **Erosion Control:** Many transmitters are located on hilltops. Sustainable site design includes retaining walls and specialized drainage systems to prevent the "scarring" of the landscape and soil erosion during the rainy season.
- **Bird Protection:** High-rise masts can interfere with migratory bird paths. Sustainable operability includes the use of bird diverters and avoiding high-intensity strobe lighting that can disorient avian species at night.

Waste Management (E-Waste)

The lifecycle of broadcasting equipment presents a significant hazardous waste challenge.

- **Decommissioning Protocols:** When upgrading from analog to digital, the "End-of-Life" (EoL) plan for old transmitters, lead-acid batteries, and PCB-containing components is critical.

- **Procurement Policy:** Favoring manufacturers with "Take-Back" programs ensures that specialized electronic components are recycled or disposed of in accordance with international e-waste standards (like the Basel Convention).

2.2.3 *Social Sustainability*

For a communication project, social sustainability is measured by how the station manages its "Social License to Operate"—the ongoing acceptance of the project by local stakeholders.

Public Health and Safety (EMF Management)

The most sensitive social issue for any radio station is the public perception of **Electromagnetic Fields (EMF)**.

- **Non-Ionizing Radiation Safety:** Ensuring that the transmission levels strictly adhere to international safety margins (ICNIRP) protects the long-term health of nearby residents.
- **Physical Safety:** Masts must be designed with "Fall Zones" in mind. In the event of a structural failure (due to extreme weather or seismic activity), the tower should not pose a threat to residential buildings or public roads.
- **Hazard Signaling:** Clear signage and fencing around the transmitter base prevent accidental exposure to high-voltage equipment and high-intensity RF zones.

Community Engagement and Inclusion

A socially sustainable station reflects the diversity of its listeners.

- **Local Language Broadcasting:** By providing content in indigenous languages or local dialects (e.g., Pidgin in Nigeria), the station ensures that marginalized or non-English speaking populations have access to vital information.
- **Public Participation:** Sustainable stations create feedback loops, such as town hall meetings or "call-in" segments, allowing the community to influence the station's programming and hold local authorities accountable.
- **Emergency Broadcasting:** During natural disasters or public health crises, the station acts as a lifeline, providing real-time instructions that save lives—a core tenet of social responsibility.

Labor Practices and Human Rights

Sustainability begins within the organization's own walls.

- **Fair Employment:** Implementing non-discriminatory hiring practices and ensuring gender balance in both the studio (on-air talent) and technical departments.

- **Occupational Health and Safety (OHS):** Providing rigorous training and specialized safety gear (climbing harnesses, RF monitors) for engineers who maintain the mast.
- **Professional Ethics:** Maintaining editorial independence to prevent the spread of misinformation or hate speech, which can destabilize the social fabric of the community.

Land Use and Heritage Protection

- **Land Acquisition:** Ensuring that the land for the studio and mast was acquired through fair compensation and transparent legal processes, avoiding "land grabbing" or displacement of local families.
- **Cultural Sensitivity:** Masts should not be placed on or near sites of archaeological, religious, or historical significance. A "Chance Find" protocol shall be in place during construction to protect any unearthed heritage.

2.2.4 Technical Sustainability

Resilience and Redundancy

A technically sustainable station must be designed to withstand component failure without going off-air.

- **Modular Hardware:** Modern transmitters use multiple power amplifier (PA) modules. If one module fails, the transmitter continues to operate at reduced power rather than shutting down completely.
- **Dual-Path Connectivity:** Implementing redundant Studio-to-Transmitter Links (STL). If the primary microwave link is obstructed (e.g., by heavy rain or new construction), a secondary IP-based fiber or cellular link takes over automatically.
- **N+1 Redundancy:** Keeping a "hot standby" transmitter that is configured and ready to take the full load immediately if the main unit fails.

Station Longevity & Maintenance

Sustainability is achieved by extending the lifecycle of expensive capital assets through rigorous maintenance.

- **Environmental Hardening:** Protecting the "Mast Operability" by using pressurized transmission lines to prevent internal corrosion and utilizing surge suppression to protect against lightning-induced transients.
- **Preventative Maintenance Schedules:** Moving from "reactive" repairs to "predictive" maintenance. This involves using telemetry data to track temperature and VSWR trends, allowing engineers to replace a cooling fan or a connector *before* it fails.
- **Standardization:** Using industry-standard protocols (like AES67 for audio) ensures that new equipment from different manufacturers can "talk" to existing gear, preventing the entire studio from becoming obsolete when one brand is discontinued.

The Digital Transition Path (Future-Proofing)

Technical sustainability requires a "Bridge Strategy" between current FM standards and emerging digital technologies.

- **AoIP (Audio over IP) Infrastructure:** Moving away from bulky copper wiring to Ethernet-based audio networking. AoIP allows for near-infinite scalability; adding a new studio or guest position becomes a software configuration rather than a massive rewiring project.
- **HD Radio and DAB+ Readiness:** Purchasing transmitters that are "Digital Ready." This allows a station to toggle from analog FM to hybrid or full digital broadcasting via a software upgrade rather than replacing the physical transmitter.
- **Cloud Integration:** Offloading non-critical services (like playout logs, archival, and remote contributions) to the cloud to reduce the physical hardware footprint and power load within the local studio.

Spectrum Efficiency and Signal Integrity

Sustainability also means being a "good neighbor" in the RF spectrum.

- **Tight Filtering:** Using high-quality bandpass filters to ensure the station's signal stays strictly within its assigned 200 kHz channel. This prevents "splatter" into adjacent frequencies, which is a common cause of regulatory fines and technical interference.
- **MPX Power Management:** Managing the "composite" signal to maximize loudness without over-modulating, which maintains high audio quality for the listener while protecting the transmitter from stress.

2.3 Value of the Project

It has been estimated that about fifteen million naira (N15, 000, 000) will be required for the implementation of the proposed Radio FM mast. The proposed project cost includes site acquisition from the local people, construction of the mast including the purchase of raw materials such as sand, gravel, cement, iron rods, water etc from the local contractors, erection of the tower and installation of all equipment, payment of wages for construction workers. The total value of the project that will be brought to the local economy can be regarded as the sum of this investment and other derived values associated with the benefits.

2.4 Project Alternatives

If the traditional FM radio model (High-power transmitter + NBC license + Physical tower) feels too capital-intensive or restricted, there are several modern Project Alternatives. These range from "digital-first" models to lower-cost local solutions.

2.4.1. Online Cloud-Based Radio (Internet Radio)

This is the most common alternative in 2026. Instead of a physical transmitter, you stream your signal over the web to listeners using apps, smart speakers, and car dashboards.

- **Station:** No tower or expensive transmitter. You use a cloud server (e.g., RadioKing, Radio.co, or AzuraCast).
- **Pros:** Global reach, significantly lower setup costs (no multi-million Naira license fee), and detailed listener analytics.
- **Cons:** Listeners need data/internet; it lacks the "offline" reliability of traditional radio during emergencies.

2.4.2. DAB+ (Digital Audio Broadcasting)

DAB+ is the digital successor to FM. It allows multiple stations to share a single frequency (multiplexing).

- **Station:** A digital transmitter. While it still requires a license, the "cost per station" is lower because you share the transmission costs with other broadcasters in the same "ensemble."
- **Pros:** Crystal clear sound (CD quality), no static, and better efficiency.
- **Cons:** Only works if your target audience has DAB+ compatible receivers (growing in Nigeria, but still secondary to FM).

2.4.3. LP-FM (Low Power FM) / Community Radio

Instead of a commercial 5kW transmitter that covers a whole state, you use a 10W to 100W setup.

- **Station:** Smaller, localized transmitters that cover a 5–10km radius.
- **Pros:** Targeted at specific neighborhoods, campuses, or industrial zones. Licenses are often easier to get for non-profits or educational institutions.
- **Cons:** Very limited range and lower advertising revenue potential.

2.4.4. "Podcast-First" Broadcasting

Rather than a 24/7 "live" stream, this model prioritises high-quality, on-demand audio content.

- **Station:** Only requires a recording studio and a hosting platform (Spotify for Podcasters, Apple Podcasts).
- **Pros:** Zero transmission costs. Listeners can consume content at their convenience. High potential for "viral" growth.
- **Cons:** Lacks the "live" urgency and community connection of a real-time radio personality.

2.4.5. Hybrid Model (The "Smart" Radio)

Many new projects start as an **Online Station** with a **Podcast wing** to build an audience first. Once they have a proven listener base, they apply for an FM license.

- **Pros:** Minimizes initial financial risk. You enter the FM market with a "ready-made" audience, making it easier to sell advertising spots immediately.

2.4.6. Energy Alternatives

Running an FM radio station is energy-intensive, primarily because the transmitter must remain powered 24/7 to maintain license and listener base. In 2026, with rising diesel costs and grid instability, shifting to alternative energy is a strategic move for operational survival.

Table 2.1: Energy Alternative Options

<i>Options</i>	<i>Selected options</i>
<u>Energy Source</u> Petrol Powered Generator Diesel Powered Generator Grid Electricity	<i>Diesel Powered Generator</i> Diesel engines have very low ignition potential (flash point 52-950°C) which reduces the potential for explosion. They also emit fewer greenhouse gases relative to petrol. In addition to this, diesel engines have a higher compression ratio than petrol, which means that less diesel fuel is required to generate the same power as petrol. Grid electricity is generally unstable and would not be reliable in service delivery.
<u>Generator Capacity</u> 20KV _a DG <20KV _a DG	20KV_a DG This option was chosen to match anticipated project demands.
<u>Generator Fuel Tank size</u> 1000 liters <1000 liters	1000 liters A Generator Fuel Tank of 1000 liters will be provided locally with a Fuel level gauge and lockable filling nozzle. This option was chosen to match anticipated project demands.

2.4.7. Site Selection Criteria

Some of the considerations for a site to be suitable and selected for the project are;

- ✚ The NBC setback rules
- ✚ Environmental sensitivity of the area.
- ✚ The costs of acquisition for each of the alternative sites are weighed against other criteria stated above before the final decision is taken.

Furthermore, the studies conducted showed that the host community is happy and willing to support the project. Moreover, substantial amount of money had already been spent on the feasibility, acquisition, planning and logistics for the project. The alternative site/location was therefore not considered a viable option and was therefore rejected.

2.4.8. Alternatives Appraisal

Given the demerits of the above applicable alternatives to the proposed project, the planned approach by FIX FM 103.3 MHz Station for the construction and operation of the facility is considered most suitable. The proposed action is for FIX FM 103.3 MHz to carry out the construction and operation of a radio transmission mast in Independence Layout, Enugu State.

CHAPTER THREE

PROJECT DESCRIPTION

3.0 INTRODUCTION

FIX FM 103.3 intends to build a radio station operating on the FM band with the aim of facilitating further improvement in the quality of electronic media/broadcasting services to the people across Enugu and its environs in particular and the country as a whole. This gives a description of the project and the processes for the radio broadcasting.

3.1 Station Design

A comprehensive design documentation outlines the architectural and technical requirements for a professional FM radio station, moving from the physical site selection to the final radiated signal.

3.1.1 Site Selection & Physical Construction

The design of a radio station is split between the Studio Center (the creative hub) and the Transmitter Site - Also referred to as the broadcast hub.

3.1.2 Studio Location and Construction

- **Site Criteria:** Studios should be located away from heavy industrial vibration (train tracks, highways) and high-power electrical interference.
- **Sound Isolation (The "Box-in-a-Box" Method):** Professional studios use floating floors and decoupled walls to prevent structural noise from entering the microphone.
- **HVAC Design:** Standard air conditioning is too loud. The design must utilize "Low-Velocity" HVAC systems with oversized ducts and sound baffles to minimize airflow noise.
- **Physical Security:** A central "Master Control" area should be physically protected, as it serves as the node for all incoming and outgoing signals.

3.1.3 Studio Technical Design

The studio is the point of origin. Design documentation must specify both the physical layout and the signal flow.

- **Acoustic Treatment:** Specifications for Sound Transmission Class (STC) ratings for walls and the use of bass traps and diffusers to achieve a "flat" acoustic response.
- **The Air Studio (On-Air):** Centered around a Broadcast Console. Design includes "Talkback" systems for communication between the DJ and the producer, and "On-Air" light tallies that trigger when microphones are live.
- **Production Suite:** A secondary studio used for recording promos and editing. It often mirrors the Air Studio's tech stack for redundancy.
- **Central Technical Room (Rack Room):** The "brain" of the station where servers, satellite receivers, and audio switchers are housed in a climate-controlled environment.

3.1.4 Studio-to-Transmitter Link (STL)

Most stations have studios in a city center but transmitters on a distant mountain or tall building. The STL is the bridge between them.

- **Microwave STL:** Uses a point-to-point microwave dish (often in the 950 MHz or 2.5 GHz bands) to send the audio signal.
- **IP-Based STL:** Uses high-speed fiber or dedicated wireless internet to stream uncompressed audio via codecs (like AAC or OPUS).

- **Backup Links:** Documentation should include a "Failover" protocol, such as a secondary 4G/5G cellular link or a local hardware player at the transmitter site in case the main link drops.

3.2 Transmission System Engineering

This section details how the signal is physically broadcasted to the public.

3.2.1 The Transmitter (TX)

- **Dual/Main-Standby Configuration:** Professional designs often use two transmitters. If the main fails, the standby automatically takes over.
- **Cooling Systems:** Large transmitters generate significant heat; documentation must specify HVAC requirements or liquid cooling paths.

3.2.2 The RF Path

- **Stereo Generator & RDS Encoder:** Devices that add the "Stereo" pilot tone and the digital text data (Song ID/Station Name) to the audio.
- **Transmission Line:** Specialized coaxial cable (often "Helix") designed to carry high-power RF without melting or leaking signal.
- **The Antenna Array:** The design specifies the number of "bays" (elements). More bays increase the **Effective Radiated Power (ERP)** by concentrating the signal toward the horizon rather than wasting energy pointing toward the sky or ground.

3.2.3 Power and Grounding

Radio stations are prime targets for lightning and power surges.

- **Uninterruptible Power Supply (UPS):** Provides immediate battery power to keep the studio and link active during a flick.
- **Automatic Transfer Switch (ATS):** Triggers a diesel or gas generator for long-term outages.
- **Single-Point Grounding:** A technical requirement to ensure all equipment is grounded to a common copper bus bar to prevent "ground loops" (humming) and protect against lightning strikes on the tower.

3.3 Regulatory Compliance

Documentation is incomplete without the legal parameters set by national authorities (Nigerian Broadcasting Corporation, NBC):

- **Assigned Frequency:** (103.3 MHz).
- **Bandwidth Mask:** Ensuring the signal doesn't "bleed" into neighboring stations.
- **Maximum ERP:** The legal limit on how much power the station can radiate.

Table 3.1: Technical Specifications Summary

Component	Typical Specification
Frequency Range	87.5 MHz to 108.0 MHz
Audio Processing	31µs to 75µs pre-emphasis (region dependent)
STL Frequency	950 MHz (Microwave) or IP-based
Antenna Type	Multi-bay Circularly Polarized
Cooling	Forced-air or liquid-cooled (for high power transmitter)

3.4 Operation process

Operating an FM radio station is a technical choreography that converts sound waves into electromagnetic waves capable of traveling through the air to reach a receiver. The process can be broken down into three primary stages: **Production**, **Processing**, and **Transmission**.

3.4.1 Audio Production (The Studio)

Everything begins in the studio, where sound is captured or played back.

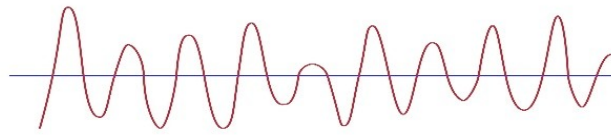
- **Input Sources:** Microphones capture live voices (DJs, guests), while digital playout systems handle recorded music, advertisements, and news clips.
- **Mixing:** All these sources feed into a **Mixing Console** (or digital workstation). Here, the audio engineer balances levels and ensures a smooth transition between different audio elements.
- **The Baseband Signal:** The final output of the console is a high-quality stereo audio signal, often referred to as the "baseband" signal.

3.4.2 Signal Processing & Encoding

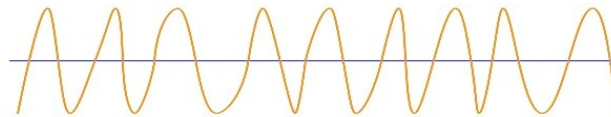
Before the audio can be sent to the antenna, it must be conditioned to meet regulatory standards and optimize sound quality.

- **Audio Compression/Limiting:** To prevent "clipping" (distortion) and to ensure the station sounds consistently loud, the signal passes through a processor that manages dynamic range.
- **Stereo Generation:** The signal is encoded into a "composite signal." This includes the Left and Right audio channels, a **pilot tone** (which tells your radio to switch to stereo mode), and often **RDS (Radio Data System)** data, which displays the song title and artist on car's screen.

Radio Waves



AM - Amplitude Modulation
530 - 1,600 kHz



FM - Frequency Modulation
88 - 108 MHz

Figure 3.1 Radio Wave Transmission

Transmission (The Transmitter & Antenna)

This is the "radio" part of the operation, where audio is turned into a high-frequency wave.

3.4.3 The Exciter and Modulation

The Exciter is the heart of the transmitter. It generates a steady Radio Frequency (RF) carrier wave at the station's assigned frequency.

- **Frequency Modulation (FM):** Unlike AM, which varies the strength (amplitude) of the wave, FM varies the instantaneous frequency of the carrier wave in direct proportion to the audio signal. If the music gets louder or higher in pitch, the frequency of the carrier wave shifts slightly up and down.

3.5 Power Amplification

The modulated signal from the exciter is very weak. A "Power Amplifier" boosts this signal to the station's authorized wattage—ranging from a few hundred watts for local stations to 100,000 watts for major regional broadcasters.

3.5.1 The Antenna System

The high-power RF signal travels through a specialized cable (transmission line) to the **Antenna**, usually mounted high on a tower.

- The antenna converts the electrical energy into **electromagnetic radiation**.
- Because FM signals travel in a "line of sight," the height of the antenna is critical for determining the station's coverage area and overcoming the curvature of the earth.

3.5.2 Operational Protocols

The design is only as good as the systems that keep it running 24/7.

3.6 Power Redundancy

- **UPS (Uninterruptible Power Supply):** Located at both the studio and the transmitter to provide "bridge power" during a blackout.
- **Standby Generator:** An automatic-start diesel generator capable of running the entire station for at least 48–72 hours.

3.6.1 Remote Monitoring & Control

- **Telemetry System:** Allows engineers to monitor the transmitter's health (temperature, power, SWR) via a web interface or mobile app.

- **EAS (Emergency Alert System):** A legally mandated receiver that interrupts the broadcast to air local or national emergency warnings.

3.6.2 Reception

Finally, radio antenna picks up these electromagnetic fluctuations. The receiver "tunes" to the specific carrier frequency, ignores all others, and uses a discriminator circuit to extract the original audio signal from the frequency shifts. This audio is then amplified and sent to the speakers.

3.7 Mast Operability

In the context of an FM radio station, **Mast Operability** (often referred to as Tower Operability) refers to the structural and technical readiness of the antenna support structure to maintain a continuous, legal, and high-quality broadcast signal.

Because the mast is the most exposed part of the station, its operability is governed by mechanical integrity, electrical efficiency, and regulatory safety.

The type of mast to be installed for this project is the Ground Tower.

Ground Tower Sites – these are base stations which comprise of equipment containers (containing BTS equipment), a mast/tower, generator(s) panel and other ancillary equipment e.g. transformer etc built on ground in a reinforced concrete enclosure. This model site covers 10 x 10 (100) square meters, as below.

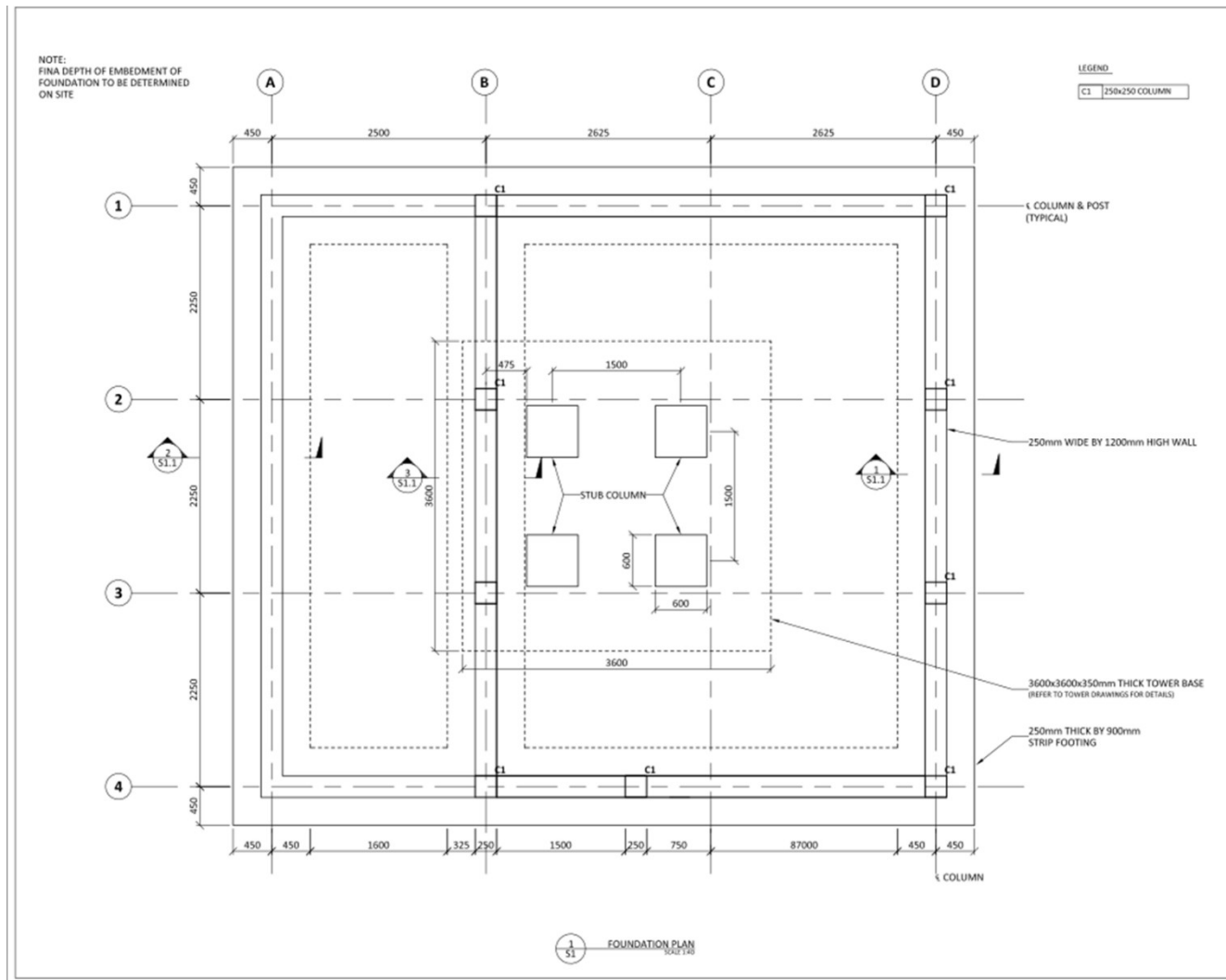


Figure 3.2: Foundation Plan for the proposed FIX FM Radio Mast

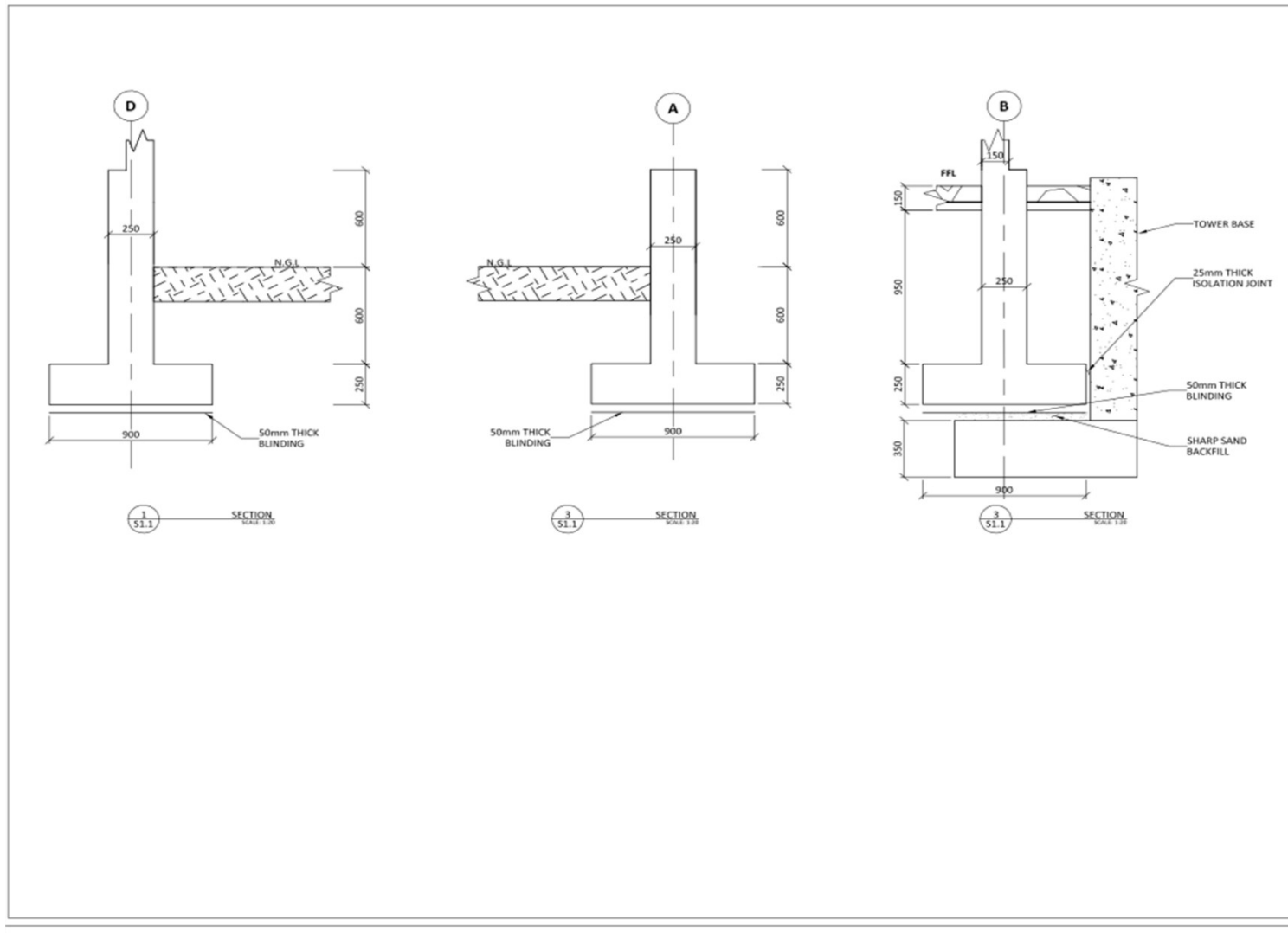


Figure 3.3: Foundation Plan for the proposed FIX FM Radio Mast

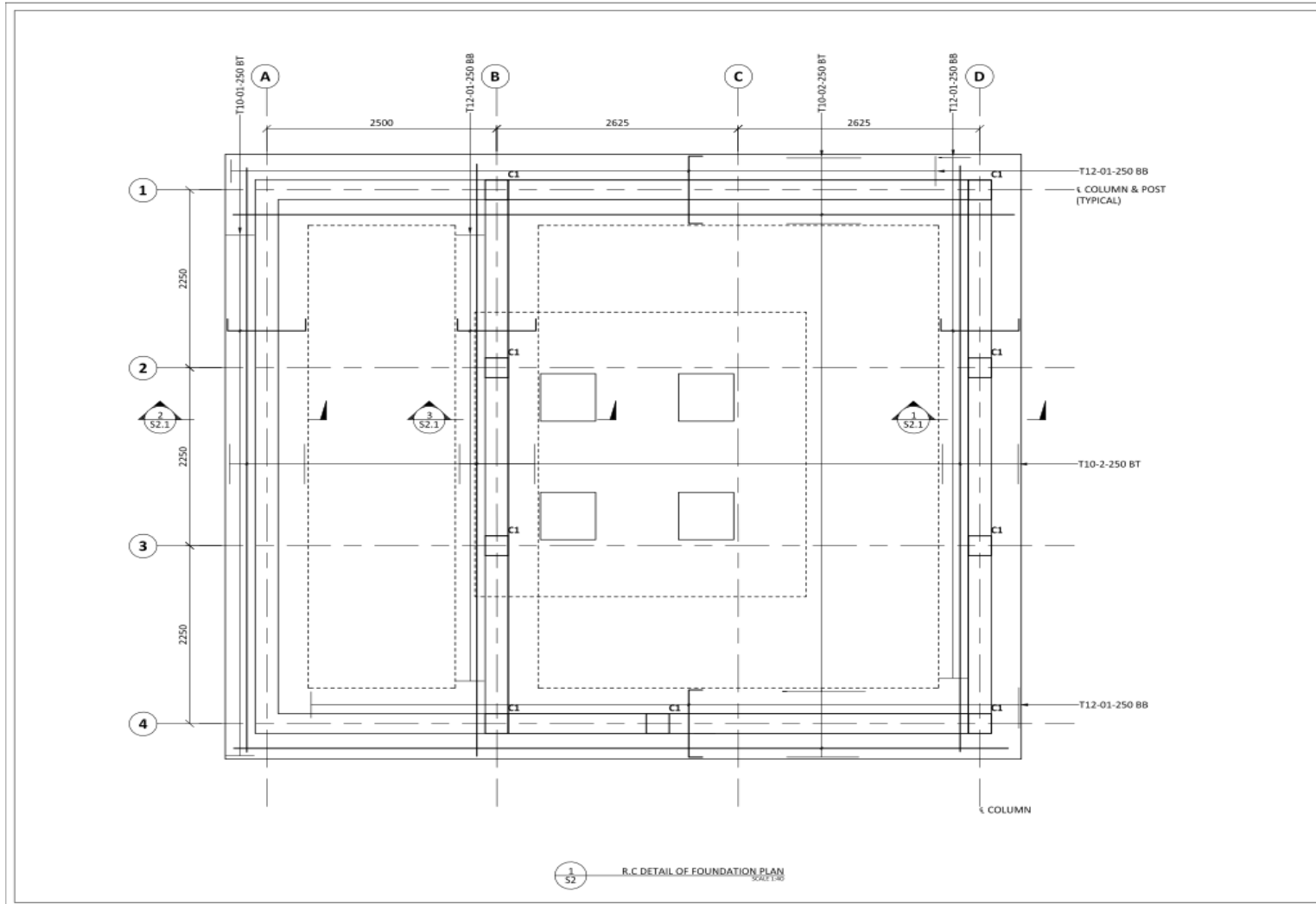


Figure 3.4: Retaining Column Details of Foundation Plan for the proposed FIX FM Radio Station

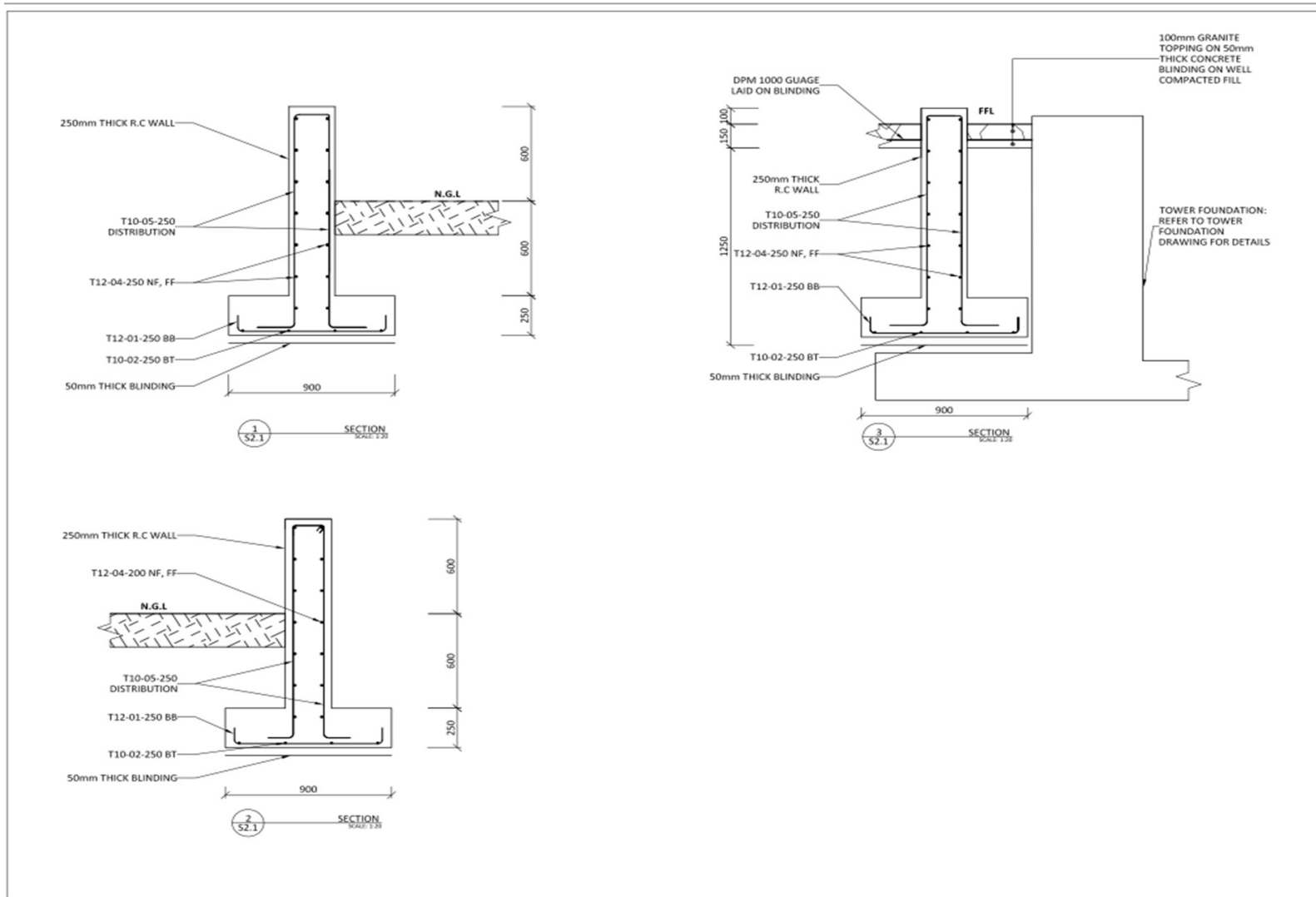


Figure 3.5: Retaining Column Details of Foundation Plan for the proposed project

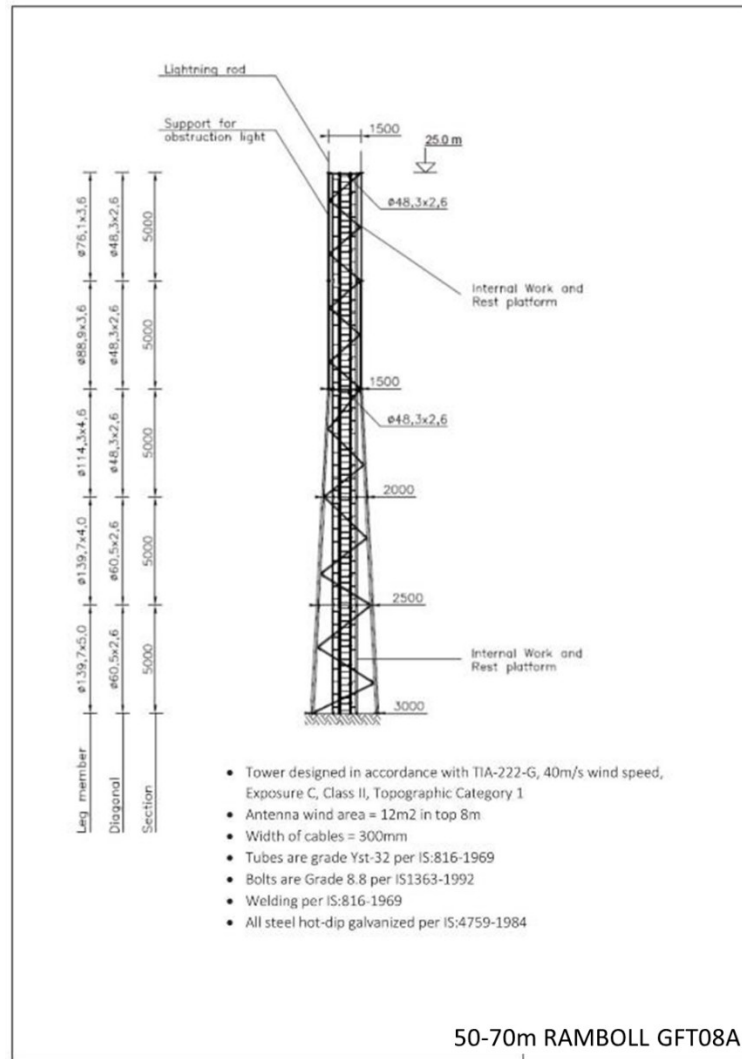


Figure 3.6: Diagram for Details of 70m of Angle Tower

3.8 Structural & Mechanical Integrity

The mast must physically support the weight and wind load of the antenna arrays and transmission lines under all weather conditions.

- **Verticality and Tension:** For guyed masts, operability depends on the precise tension of the guy wires. If the tension is uneven, the mast can sway excessively, causing "signal fading" or, in extreme cases, structural collapse.
- **Wind Loading:** High-gain FM antennas have a large surface area. The mast must be engineered to handle the "drag" created during storms without exceeding the structural yield point.
- **Ice Protection:** In cold climates, operability is maintained through **De-icing systems** (internal heaters in the antenna) or radomes (protective covers). Ice buildup increases weight and wind resistance, which can detune the antenna.

3.8.1 RF Operability (The Antenna System)

This is the ability of the mast-mounted equipment to radiate the signal effectively.

- **VSWR (Voltage Standing Wave Ratio):** This is the primary metric of operability. It measures how much power is being reflected back from the antenna to the transmitter.
 - **Healthy Range:** 1.1:1 to 1.5:1.
 - **Failure:** A high VSWR (above 2.0:1) indicates a problem on the mast—such as a loose connector, water ingress in the cable, or a damaged antenna element—which triggers the transmitter to "fold back" (reduce power) to prevent damage.
- **Pressurization:** Many transmission lines running up the mast are pressurized with **dry air or Nitrogen**. This prevents moisture from condensing inside the cable, which would cause electrical arcing and signal failure.

3.8.2 Safety and Signaling Operability

A mast is only "operable" if it meets the safety standards required to coexist with aviation and ground personnel.

- **Aviation Obstruction Lighting:** The mast must have functioning beacons (strobe by day, red by night). If these lights fail, the station is often legally required to notify aviation authorities (e.g., filing a NOTAM) immediately.
- **Lightning Protection:** The mast acts as a giant lightning rod. Operability requires a robust grounding system (a copper "ground ring" and radial wires) to direct strikes into the earth, bypassing the sensitive transmitter electronics.
- **RF Radiation Safety:** Operability includes maintaining a "Safe Distance" for workers. If technicians need to climb the mast, the station must have the ability to switch to a **dummy load** or reduce power to protect the climbers from RF burns.

3.8.3 Maintenance and Monitoring Metrics

To ensure 24/7 operability, engineers monitor several "Master" indicators:

Feature	Monitoring Method	Operability Requirement
Forward Power	Telemetry	Must stay within 90%–105% of licensed power.
Reflected Power	VSWR Meter	Must remain near zero to avoid transmitter "tripping."
Tower Lighting	Photoelectric Sensor	Must automatically trigger at dusk/low visibility.
Gas Pressure	Pressure Gauge	Dry air/Nitrogen must stay above ~3–5 PSI.

3.8.4 Failure Modes (Loss of Operability)

- **Galloping:** Low-frequency, high-amplitude vibrations of guy wires caused by wind, which can shake antenna connectors loose.
- **Arcing:** When the insulation in the transmission line fails, electricity "jumps" across the gap, often caused by lightning or water, leading to a total loss of signal.
- **Detuning:** Physical shifts in the antenna elements (due to wind or bird strikes) that change the frequency resonance of the system.

CHAPTER FOUR DESCRIPTION OF THE PROJECT ENVIRONMENT

4.0 INTRODUCTION

This chapter describes the existing environmental setting in the study area. The major purpose of describing the environmental setting of the study area includes:

- To understand environmental characteristics of the area
- To assess the existing environmental quality, as well as the environmental impacts (post, present and potential) of the project development.
- To identify environmentally significant factors or geographical areas that could preclude project development.

The various considerations that have gone into the formulation of a proper strategy for conducting the baseline studies are described below.

Measurement of environmental quality parameters for providing baseline scenario and trends prior to the initiation of a development project is an essential step in determining the post project environmental changes and their impacts. The selection of environmental parameters for baseline studies is based on the objectives of the study and Terms of Reference (ToR). This chapter describes the approach adopted in conducting baseline studies for the assessment of impacts of the proposed Project.

4.1 STUDY APPROACH/METHODOLOGY

The overall study approach for the environmental baseline study took cognizance of the fact that the EIA is an environmental characterization study that is commonly employed to fully establish in details the contemporary baseline status/conditions of the study area. The study approach for the baseline is following the Federal Ministry of Environment (FMEnv)'s Environmental Impact Assessment (EIA) procedural guideline.

The purpose is to be able to adequately predict the possible potential and associated impacts that may arise if the study areas are put into specific developmental use. It also enhances the determination of the impacts of an existing project or facility on the ecosystem of the project area, and on the socio-cultural, economic and health status of the communities around the project and or facility. With these considerations, an interdisciplinary approach was adopted to acquire relevant environmental data covering the physical, biotic and social components of the environment of the proposed sites.

Insitu measurements of baseline parameters such as air quality, noise, and radio frequency were taken and recorded while soil and water samples were collected from the proposed Radio FM. Furthermore, socioeconomic and health surveys were conducted within the identified host community in Enugu State.

The overall goal of the field exercise was to generate environmental baseline data that would be sufficient to characterize the ecological, socioeconomics and health status of the project areas and provide sound basis for the EMP of the proposed project.

The specific objectives and scope of the fieldwork ensured that all aspects of the environment within the project area were completely characterized. The information obtained from these studies include;

- Climate and Meteorology
- Air Quality
- Geological and Geophysical
- Water quality – groundwater
- Soil Quality
- Biological Environment Characterization

- Vegetation
- Wildlife
- Health Impact Assessment
- Noise
- Radiation (EMF)
- Land Use
- Socio-Economic Setting Characterization

4.1.1 Literature Review

The profile of the project obtained from FIX FM 103.3 formed an important source of information on the project scope. Detailed maps of the project area were used in the reconnaissance planning and studies.

Published and unpublished information collected from various sources and Government departments and agencies records; National Meteorological Agency, Federal and State Government Ministry of Lands & Survey and Local Government Councils, National Population commission were used to define scope of field work.

4.1.2 Field Studies Methods

To record the detailed information on the bio-geophysical and socio-economic parameters within the study areas, the area within 500 m of each project site was chosen; the area represents the hub of the major activities and is therefore likely to receive the maximum impacts of the project related activities. Most of the changes in the landscape are also expected to occur in this zone. Field investigations were carried out within the study area on 17th April 2026. and the parameters studied during this field study includes; air quality (NO₂, CO, VOCs, TSP, SO₂, NH₃, H₂S), Noise Level, Radio Frequency and Socio-Economic Data.

The sampling procedures adopted were designed to achieve scientific accuracy. The following methods were considered: -

Phasing of samples to identify the areas of interest.

Sample points identification/geo –referencing

Stratified random sampling

Samples storage and preservation

4.1.2.1 Air Sampling for Particulate Matter

Particulate Matter (PM) was measured with Haz-Dust EPAM-500; a highly sensitive real-time particulate monitor designed for the ambient environment and indoor air quality applications. It has an in-line concurrent filter samples for gravimetric analysis, high sensitivity of 1 ug/m³ – 2000 ug/m³, interchangeable size-selective sampling inlets, internal air sampling pump and easy to access to rechargeable battery and internal filter. It uses the principle of near-forward light scattering of an infrared radiation to immediately and continuously measure the concentration in ug/m³ of airborne dust particles.

Airborne particulate matter represents a complex mixture of organic and inorganic substances. Because of the complexity of particulate matter and the importance of particle size in determining exposure and human dose, multiple terms are used to describe particulate matter. Here, the unit measures four mass ranges of TSP: PM₁, PM_{2.5}, PM₁₀, and SPM with a concentration range of 0.001 – 20.0 mg/m³ (and precision of +/- 0.003mg/m³) but only SPM concentration were reported for the purpose of this audit. A sampling time of 2 minutes and sampling flow rate of 1.0 – 4.3 liters/minute. These have both physiological and sampling connotations. To measure, it is placed on a flat surface at ground level, switched on in the environment of interest and the measured concentration read directly on the screen after particle capturing, selecting different impactor jet, which corresponds to micron dust particulates.



Plate 4.1: Particulate Matter Measurement
(Source: FIX FM 103.3 Field Studies, April 2026)

4.1.2.2 Air Sampling for Gaseous Pollutants

Oxides of nitrogen (NO₂), sulphur dioxide (SO₂), carbon monoxide (CO), hydrogen sulphide (H₂S), ammonia and volatile organic compounds (VOCs) were measured during the study in the ambient environment of each **Fix** proposed Radio FM station site. The various methods of sampling adopted are described below.

NO_x Measurements: it was measured as NO₂ using an in situ single gas NO₂ monitor (MultiPro RAE Model PGM-1150). The monitors are 9.3 cm x 4.9 cm x 2.2 cm measuring instrument weighing about 0.1 kg with an instantaneous direct readout display through which current NO₂ concentration can be continuously monitored in ppm (parts per million) with a detection range of 0 – 20 ppm and 0.1 ppm resolution. They have facility for Short Term Exposure Limit (STEL) from which the NO₂ concentrations for the last 15 minutes can be determined; the Time Weighted Average (TWA) from which the accumulated reading of the gas concentrations since the monitors were turned on are divided by 8 hours; and the Peak Reading, which is the highest reading since the monitors were turned on. The monitors were calibrated on 18th July 2025 with Calibration and Test Certificate S/N 021-905130 from RAE Systems, 3775 North First Street, San Jose, California 95134, USA. For every field measurement, the “Auto-Zero at Start-up” calibration was carried out as required in the study.

SO₂ Measurements: To measure the SO₂ concentrations during the field study, an in situ single gas SO₂ monitor (Multi-Pro RAE Model PGM-1130) was used. The monitor is a 9.3 cm x 4.9 cm x 2.2 cm measuring instrument weighing about 0.1 kg with an instantaneous direct readout display through which current SO₂ concentrations can be continuously monitored in ppm (parts per million) with a detection range of 0 – 20 ppm and 0.1 ppm resolution. It has facility for Short Term Exposure Limit (STEL) from which the SO₂ concentration for the last 15 minutes can be determined; the Time Weighted Average (TWA) from which the accumulated reading of the gas concentration since the monitor was turned on is divided by 8 hours; and the Peak Reading, which is the highest reading since the monitor was turned on. The monitor was calibrated on 18th July 2025 with Calibration and Test Certificate S/N 023-900636 from RAE Systems, 3775 North First Street, San Jose, California 95134, USA. For every field measurement, the “Auto-Zero at Start-up” calibration was carried out.

CO Measurements: CO measurements were taken using an in situ non-integrated single gas carbon monoxide monitor (Multi-Pro RAE Model PGM-1110). The monitor is a 9.3 cm x 4.9 cm x 2.2 cm measuring instrument weighing about 0.1 kg with an instantaneous direct readout display through which current carbon monoxide concentrations can be continuously monitored in ppm (parts per million). It has facility for Short Term Exposure Limit (STEL) from which the carbon monoxide concentration for the last 15 minutes can be

determined; the Time Weighted Average (TWA) from which the accumulated reading of the gas concentration since the monitor was turned on is divided by 8 hours; and the Peak Reading, which is the highest reading since the monitor was turned on. It has detection range of 0 – 200 ppm with 1 ppm resolution. The monitor was calibrated on 18th July 2025 with Calibration and Test Certificate S/N 023-900636 from RAE Systems, 3775 North First Street, San Jose, California 95134, USA. For every field measurement, the “Auto-Zero at Start-up” calibration was carried out.

Ammonia (NH₃): Ammonia (NH₃) measurements were taken using an in situ non-integrated single gas ammonia monitor (Multi-Pro RAE Model PGM-1191). The monitor is a 9.3 cm x 4.9 cm x 2.2 cm measuring instrument weighing about 0.1 kg with an instantaneous direct readout display through which current ammonia concentrations can be continuously monitored in ppm (parts per million). It has facility for Short Term Exposure Limit (STEL) from which the ammonia concentration for the last 15 minutes can be determined; the Time Weighted Average (TWA) from which the accumulated reading of the gas concentration since the monitor was turned on is divided by 8 hours; and the Peak Reading. It has detection range of 0 – 20 ppm with 0.1 ppm resolution.

Hydrogen Sulphide (H₂S) and Volatile Organic Compounds (VOCs): These compounds were measured using an insitu Multi-Pro RAE gas monitor (Model PGM50-5P). It is a programmable multiple-gas monitor designed to provide continuous exposure monitoring of toxic organic and organic gases, oxygen and combustible gases for workers in hazardous environment. The monitor is a 9.3 cm x 4.9 cm x 2.2 cm measuring instrument weighing about 0.1 kg with an instantaneous direct readout display through which current VOCs concentrations can be continuously monitored in ppm (parts per million). It has facility for Short Term Exposure Limit (STEL) from which the H₂S and VOCs concentrations for the last 15 minutes can be determined; the Time Weighted Average (TWA) from which the accumulated reading of the gas concentration since the monitor was turned on is divided by 8 hours; and the Peak Reading, which is the highest since the monitor was turned on. It has detection range of 0 – 200 ppm with 0.1 ppm resolution. For every field measurement, the “Auto-Zero at Start-up” calibration is required and this was carried out during the measurements.

CO₂ Measurement: Carbon dioxide is essentially an asphyxiant gas with only mild toxic properties and no cumulative effects. The recommended exposure limit by Occupational Health and Safety Administration (OSHA) (The Health and Safety Executive Guidance Note EH 40 - Occupational Exposure Limits) for indoor air quality for carbon dioxide is 5,000 ppm (0.5%) by volume calculated as an eight hour time - weighted average concentration in air, or 15,000 ppm (1.5%) for a 15 minute period. It is important to note that individuals can react at different rates. Atmospheres containing less than 20% oxygen or more than 0.5% carbon dioxide should not be entered.



Plate 4.2: Gaseous Pollutants Measurement
(Source: FIX FM Field Studies, April 2026)

4.1.2.3 Noise Level

A pre-calibrated BK precision 732 sound level metre was used to measure the noise level at all the sampling locations. The equipment measures noise level via a microphone probe that generates signals approximately proportional to located sound waves. The noise meter has a measuring level range (detection limit) of 30-130dB with a frequency range of 31.5-Hz-8KHz and Accuracy: ± 1.5 dB (under reference conditions @ 94dB, 1KHz) Measurements were done by directing the probe towards the direction of the prevailing sound and the reading recorded from the digital meter in decibels dB (A).



Plate 4.3: Noise Level Measurement
(Source: FIX FM Field Studies, April 2026)

4.1.2.4 Soil Quality

Composite soil samples were collected at the surface or from within 0-15cm of the top soil and 15-30cm subsoil around the project site. Dutch auger of uniform cross section was used to ensure that uncontaminated and reproducible unit of soil samples were collected a trowel was used to recover surface soil samples.

Also, surface litter of undecomposed plant materials were removed to ensure that uncontaminated soil samples were collected. Soil profile sample was collected with permeability tube to represent the dominant soil type and characteristics of the project site.

Small and equal portions of soil samples were taken from the surface and below the surface. Samples were collected around the project area. The samples were transferred into laboratory cleaned labelled sample bottles preserved and transported to “EBIC Integrated Services Ltd, 23 Grofem Avenue, Off Igbo Etche road, Rumuokwurusi, Port Harcourt, a National Environmental Standards & Regulatory Enforcement Agency (NESREA) and FMEnv accredited laboratory in Rivers State in accordance with Standard Procedures of ASTM (Anon, 1994), FMEnv (1991) and APHA (1975).



Plate 4.4: Soil sampling at the proposed Radio FM station Site
(Source: FIX FM Field Studies, April 2026)

4.1.2.5 Radio frequencies (RF) Measurement

For the measurement of radio frequencies, imaginary quadrants/cells were formed within a distance of one hundred meters (100m) radius around the proposed base station locations using the sites as points of origin. Within these quadrants, measurements were taken randomly from around the site getting to some distance of 100m where there was no barrier/hindrance to getting to such distance. The equipment or meter used to measure the Radio frequencies (RF) is the HF35C, RF Analyzer. The HF35C – RF/HF analyzer is used for frequencies from 800MHz to 2.5GHz. Measurement Range: Power flux density: 0.1 - 1999 $\mu\text{W}/\text{m}$, Accuracy (CW): Basic accuracy including linearity tolerance: $\pm 6\text{dB}$ Zero offset and rollover ± 9 digits. This easy to use, high-Frequency meter allows an easy evaluation of the personal exposure to high frequency and radio frequency (HF/RF) electromagnetic radiation, according to the guidelines and recommended safe values of the "Standard of Building Biology Measuring Techniques". In addition to all characteristics of basic RF analyzer HF32D, it has very useful feature of an acoustic analysis for a reliable identification of various HF-sources: mobile radio (GSM, UMTS/G3), cordless telephones, WLAN (Bluetooth). The equipment is seen to be good enough and sufficient for the level of studies carried out to the extent of providing information to ascertaining the specific absorption rate. From the technical/user manual of the meter, the measurement procedure and instructions were adhered to.



Plate 4.5: Radio Frequency Measurement
(Source: FIX FM Field Studies, April 2026)

4.2 Biodiversity Studies

The project site is located in a well-developed urban and highly populated area in Independence layout, Enugu. There is no vegetation cover in the area except ornamental and few economic trees within individual compounds. Therefore, no vegetation or wildlife studies were carried out for this project.

4.3 Land Use Pattern

Land use map, satellite imageries, physical observation and interviews were devised to determine the land use pattern of the area.

4.4 Waste Management

Waste inventory of the area was carried out to identify the type and characteristics of waste generated in the area and disposal route and sites.

4.5 Socio-Economics

Baseline socio-economic information of the project area was collected in consultation with primary and secondary stakeholders and covers both existing conditions and their attitude toward the project. Consultation meetings were held with residents of the community and questionnaires administered.

4.5.1 Scope of Socio-Economics Study

The study was conducted in various host communities in the project area. The study covered the socio-cultural resources of the community, demographic issues including population size and growth, age and sex distribution, and adult literacy. Others were such indicators of the quality of life of the residents as quality of housing, access to potable water, availability of functional infrastructural amenities, livelihood activities and patterns, and income levels. Health facilities and their patronage, disease prevalence and disease vectors, water and sanitation, and nutrition were also studied. Additionally, the study discussed the perceptions, concerns and expectations of members and residents of this community.

4.5.2 Community Participation

Consultation is a major feature of the socio-economic component of the EIA process for any intended project, which in this case incorporates all individuals in the communities that may be directly or indirectly affected by the proposed project. Consultations were aimed at informing relevant stakeholders (Community Heads, Youth, and Women Leader etc) about the intentions / plans of project proponent. It also attempted to record the major concerns and views of all stakeholders and helps to minimize potential conflicts that could arise during project implementation.

Consultations, discussions and interviews (including questionnaire administration) were held with various stakeholders in the community. While evidences of such meetings and discussions are presented in the Appendix 5 (Attendance)

4.5.3 Data Collection Methodology

This study employed both primary and secondary data sources. The latter comprised government records, maps, and information published in journals and books, while the former included pre-coded questionnaires, key informants, focus groups, direct observation, direct measurement, specially prepared data collection formats and participatory research. Although the questionnaires largely contained closed-ended questions for easy recording of responses, some open-ended ones were included to allow respondents freedom in structuring their responses. This permitted the researchers to obtain clearer insights into questionnaire items.

4.5.3.1 Questionnaire Administration

An average of thirty (30) questionnaires per site were administered to men, women, elderly and youths of different age bracket by moving round the project area to identify the settlement pattern, sociology/anthropology, archeology etc. considering the population nature/density of the proposed project area ranging from sparse to moderate. A total of 660 questionnaires was distributed while 652 was retrieved representing 98.78 % of the total.

4.6 DESCRIPTION OF BIO-GEOPHYSICAL ENVIRONMENT

4.6.1 Climate and Meteorology

Nigeria is located between latitudes 4 and 11 degrees north. The term "tropical" generally refers to any region falling between the Tropic of Cancer and the Tropic of Capricorn. Therefore, Nigeria's climate is tropical. The country enjoys a climate characterized by the hot and wet conditions associated with the movement of the Inter-Tropical Convergence Zone (ITCZ) north and south of the equator. ITCZ is the convergence of two air masses which are the Tropical maritime (Tm) and the Tropical continental (Tc). The former is associated with the moisture-laden south-west winds (south westerlies) which blow from the Atlantic Ocean, while the latter is the dry and dusty north-east winds (easterlies) that blow from the Sahara Desert. When the zone of convergence of the two air masses, is to the south of the equator, the northeast winds prevail over Nigeria, thus producing the dry-season conditions (November – March).

The weather elements that make up climate include rainfall, temperature, humidity, wind, cloud, solar radiation, dust, and aerosol. Climate is not static and is often defined as “average weather” together with its variability from the average. Climate fluctuation or variability refers to variations in the mean state and other statistics (such as standard deviations, the occurrence of extremes, etc.) of the climate on all spatial and temporal scales beyond that of individual weather events. The overall changes in temperature, rainfall, and other meteorological parameters determine the annual changes in climate over a given region.

The study area is located in South Eastern region of Nigeria. The climate in Southern region of Nigeria is characterized by a rainy season from May to September, and a dry season from October to April. The areas covered by this study have highest daily rainfall in the months of July through September.

The climate in northern Nigeria is characterized by a rainy season from May to September, and a dry season from October to April. The rainfall during November--March is nil and the humidity is often below 20% for extended periods.

Table 4.1: Monthly Weather Average for Enugu State (1987-2024)

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Record high °C	40.0	42.0	41.0	40.0	37.0	34.0	32.0	32.0	33.0	37.0	35.0	38.0
Average high °C	35.14	35.77	34.98	33.72	31.53	29.25	27.69	27.48	28.09	32.33	29.75	33.8
Daily mean °C	30.14	31.27	31.27	30.28	28.57	26.62	25.32	25.03	25.57	28.79	26.84	29.56
Average low °C	22.57	24.59	25.77	25.45	24.47	23.04	22.29	22.04	22.52	23.72	23.07	22.89
Record low °C	17.0	20.0	23.0	22.0	22.0	16.0	21.0	19.0	17.0	20.0	21.0	20.0
Average precipitation mm	11.42	45.3	66.1	76.33	148.06	205.93	322.9	321.73	371.99	65.22	259.78	8.11
Average precipitation days (≥ 1.0 mm)	2.73	8.09	12.91	13.18	17.27	20.27	26.73	26.82	26.82	12.0	23.73	2.18
Average relative humidity (%)	40.95	53.55	61.96	68.44	77.52	84.25	87.46	87.7	87.83	71.12	84.07	45.99
Mean monthly sunshine hours	11.51	11.24	10.83	10.66	10.2	9.14	8.44	8.29	8.44	10.82	9.64	11.31

Source: Nimet

4.6.1.1 Rainfall

The study area covers latitudes 4°20' and 7°25' North of the Equator and longitudes 6°37' and 8°28' East of the Greenwich Meridian. The areas enjoy the tropical continental climate characterized by wet and dry seasons. Wet season is synonymous to planting season since agriculture in the area is rain-fed.

The mean annual rainfall in the proposed project area ranges between 370mm and below while the monthly mean temperature ranges from 28.49°C during night time to 39.84°C at daytime. The weather is cold and dry during the period coupled with hazy atmosphere and dust particles flowing around. The vegetation of the southern region of Nigeria is dominantly forested ranging from mangrove at the coast to evergreen, deciduous tall tree in the rain forest.

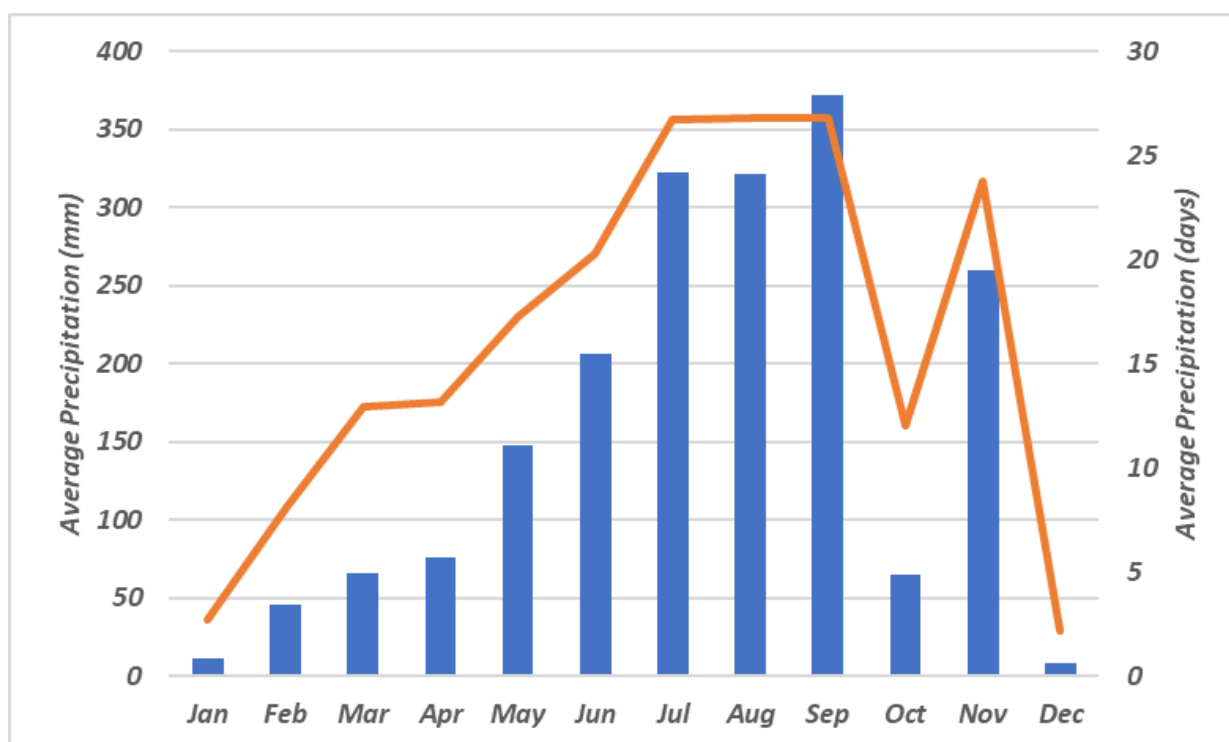


Figure 4.1: Average Rainfall Pattern in Enugu State (1987-2024)

Source: Nimet

4.6.1.2 Temperature

The temperature of the area is influenced primarily by the apparent movement of the sun, wind direction and speed as well as land configuration. The regional maximum and minimum temperature data were obtained from NIMET as given in **Figure 4.2**

Ambient Temperature (Air Temperature)

The northern region is located within tropical wet and dry climate. Hence, it has a high temperature and relative humidity. Temperature of the project area ranged from a minimum (monthly temperature) of 16.9°C in December to (maximum (monthly temperature) of 35.1°C. The average monthly temperature ranges from 29.3°C (August) to 28.5°C (April)

The southern region is located within tropical wet and dry climate, known as a tropical monsoon climate. Hence, it has a high temperature and relative humidity. Temperature of the project area ranges

from a minimum (monthly temperature) of 28.49°C in August to (maximum (monthly temperature) of 39.84°C. The average monthly temperature ranges from 28°C (August) to 39.84°C (March).

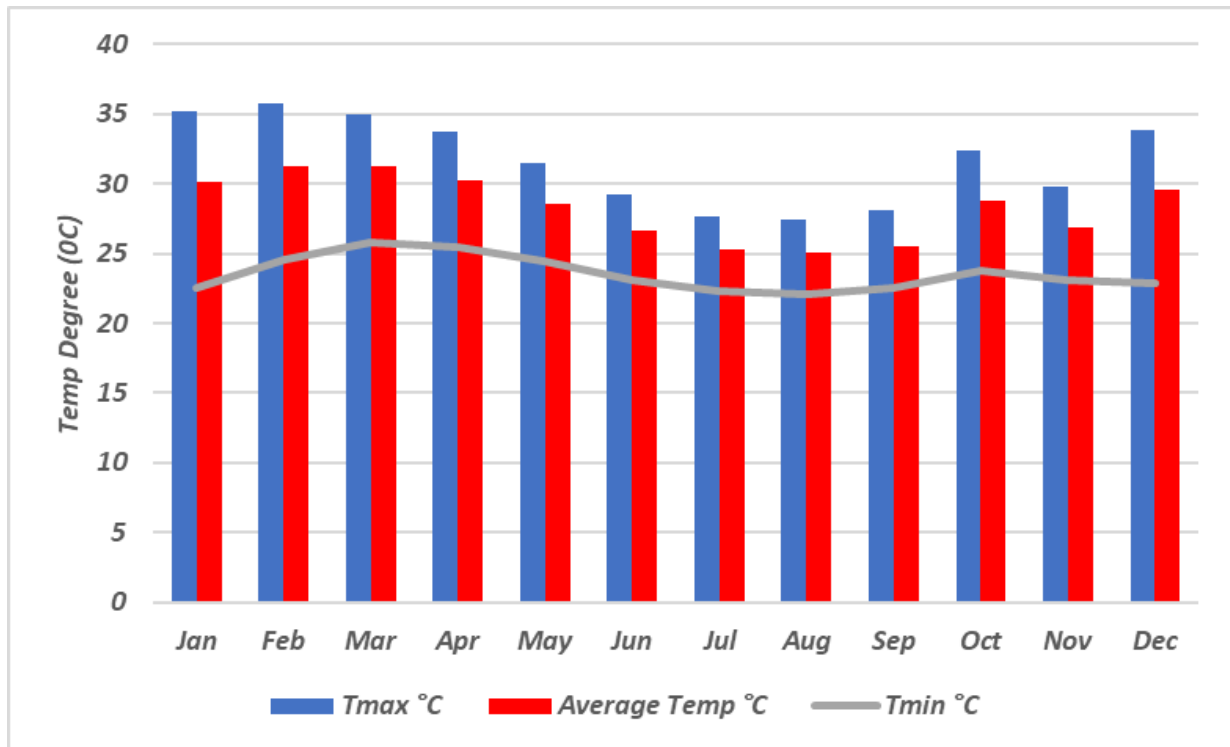


Figure 4.2: Ambient Temperature in Enugu State (1987-2024)

Source: Nimet

4.6.1.3 Wind Speed and Direction

The annual mean wind speeds in the study areas ranged from about 3.0 to 7.4 m/s and the annual power density range between 0.067 and 0.1066 kW/m². The trend shows that wind speeds are low in the south and gradually increase to relatively high speeds in the north. Generally, the wind in the study areas varies between the gentle breeze, moderate breeze, and high breeze. However, wind could aid the distribution of pollutants in the areas.

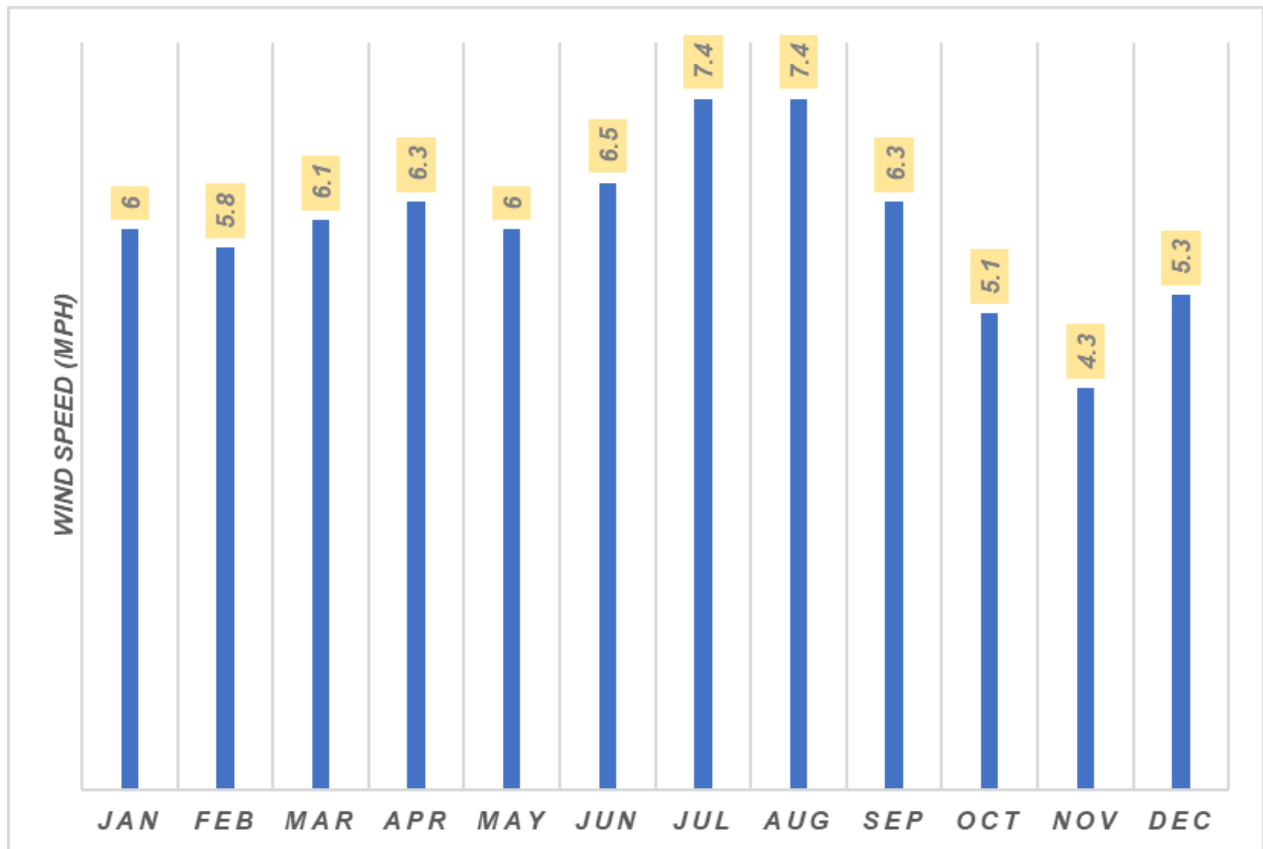


Figure 4.3: Average Wind Speed in Enugu State

Source: Nimet

The dominant wind direction was observed in the southwest direction. The graphical presentation of wind rose is shown in **Figure 4.4**.

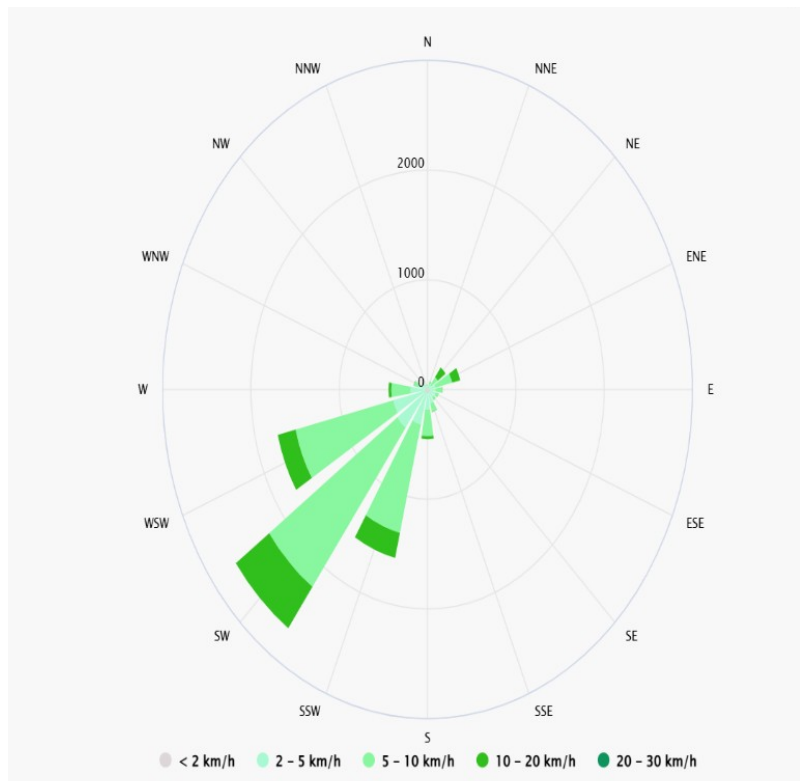


Figure 4.4: Wind Rose for the Study Area

4.6.1.4 Relative Humidity

The regional Relative Humidity data of the study areas are presented in **Figure 4.5** and it shows the pattern of variation at various periods of the year. The relative humidity is highest at the peak of the rainy season and lowest at peak of the dry season. It could be as high as 87.7% between night and morning during the wet season and as low as 40.95% at mid-day during the dry season. Generally, the drier months between December and February have lower values.

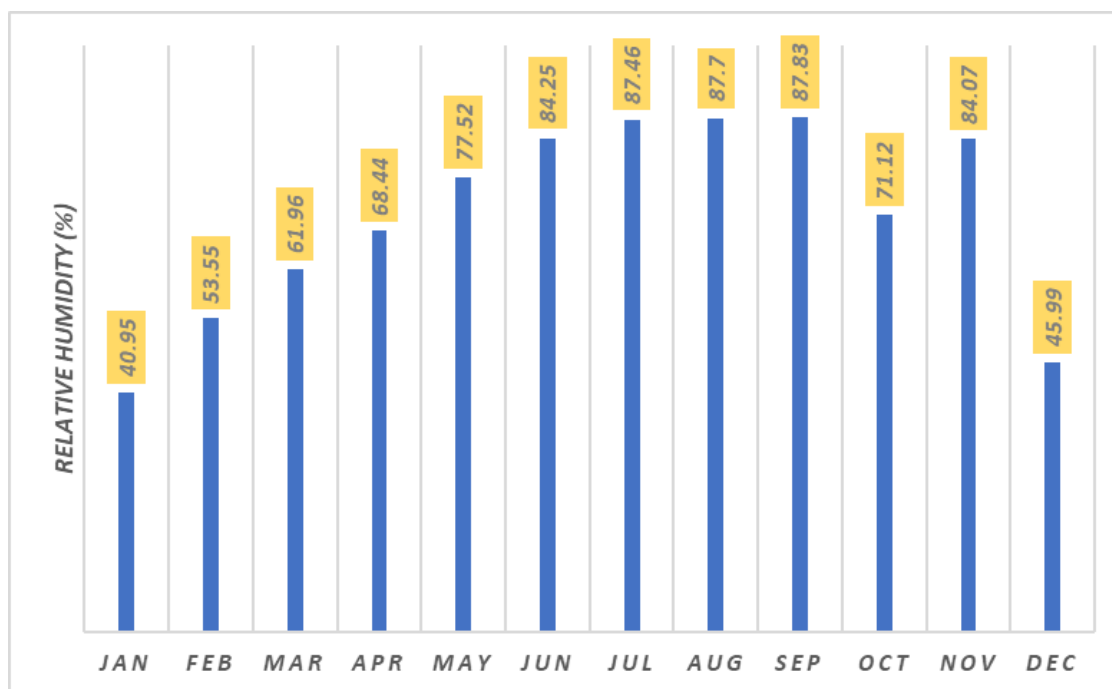


Figure 4.5: Relative Humidity pattern in Enugu State (1987-2024)

Source: Nimet

4.6.1.5 Sunshine Pattern

The proposed project areas receive sunshine of 7.19 – 11.51 hours per day with an average of 8.75 hours. (Figure 4.6) according to NIMET (2022). Between October and March, it receives its longest sunshine period with November as the longest while the shortest sunshine duration is from July to September. The general short sunshine period in the raining season could be attributed to the greater cloudiness characteristic of the period. Conversely, the higher November sunshine duration is due to the prevalent clear skies, which is characteristic of the period.

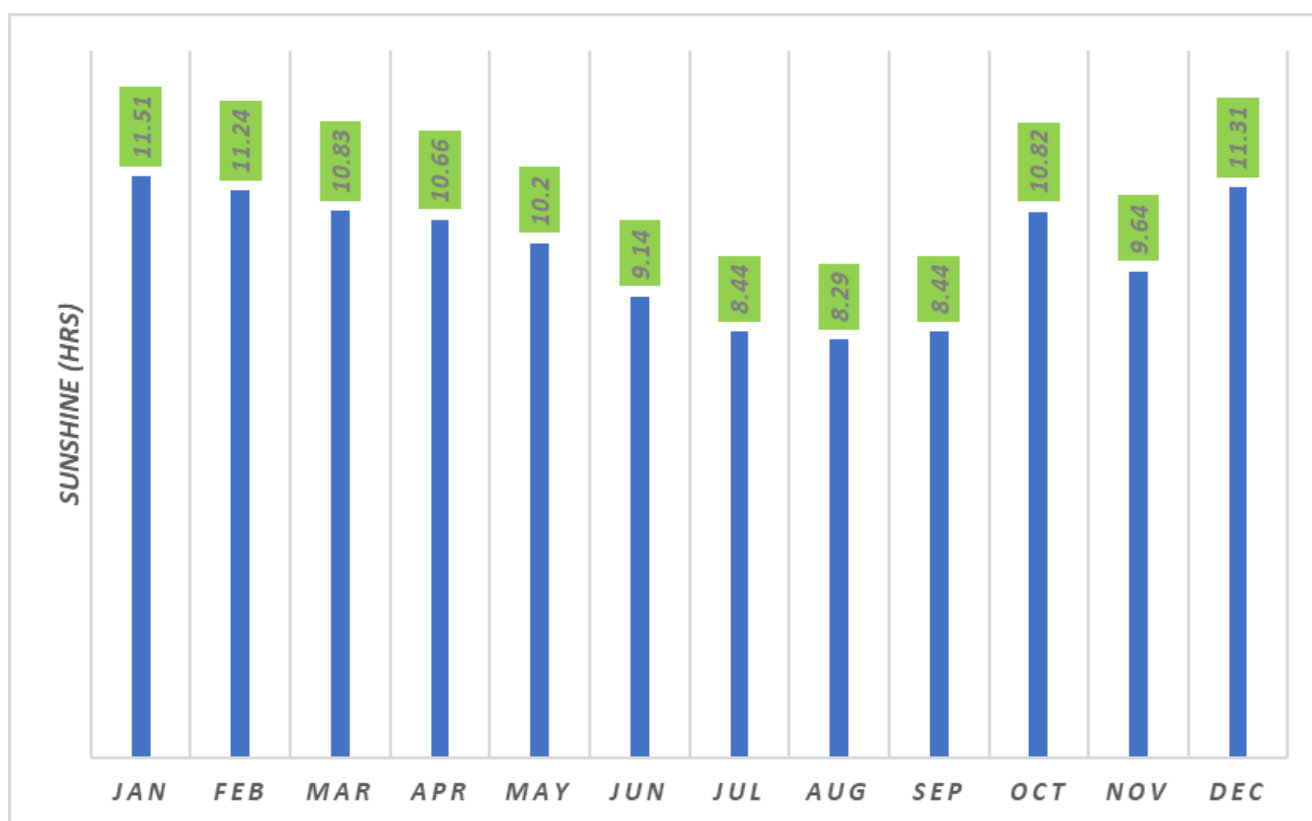


Figure 4.6: Sunshine Hours in Enugu State (1987-2024)

Source: Nimet

4.7 AIR QUALITY, NOISE LEVEL AND RADIO FREQUENCY MEASUREMENT

4.7.1 Air Quality Study

Ambient air quality in this study in the project area is presented in the **Table 4.2**. The results are within the Federal Ministry of Environment permissible limit for Nigeria air quality. The TSP concentration ranged from 50.4 to 59.8(μgm^{-3}) while average TSP concentration of 55.2 (μgm^{-3}) was recorded while NO_2 , SO_2 , H_2S , VOC was found to be below the detection limit of the equipment. The CO values ranged from 0.06ppm to 0.44 ppm with mean of 0.295ppm.

Table 4.2: Mean Air Pollution Indicators measured in the study Area

Sampling Points	TSP (μgm^{-3})	NO_2 (ppm)	CO (ppm)	SO_2 (ppm)	NH_3 (ppm)	H_2S (ppm)	VOC (ppm)
ENAQ1	59.8	< 0.01	0.06	< 0.01	< 1	< 0.1	< 0.1
ENAQ2	50.4	< 0.01	0.18	< 0.01	< 1	< 0.1	< 0.1
ENAQ3	56.1	< 0.01	0.12	< 0.01	< 1	< 0.1	< 0.1
ENAQ4	54.3	< 0.01	0.38	< 0.01	< 1	< 0.1	< 0.1
Control	50.4	< 0.01	0.44	< 0.01	< 1	< 0.1	< 0.1
FME _{env} Limit	250.0	0.04-0.06	10.0	0.1	NA	NA	0.1

Source: FIX FM 103.3 Studies April 2026 <d.l. = below detection limit. dl for NO_2 = 0.01 ppm, SO_2 = 0.01 ppm, NH_3 = 1 ppm, H_2S = 0.1 ppm, VOC = 0.1 ppm; NA = Not available

4.7.2 Noise Level/ Radio Frequency-Electromagnetic Field

However, insitu measurements were taken for Radio Frequency and noise level for the proposed project site. Noise level and Radio Frequency were measured at four (4nos) locations and one control point. The result of the noise level and radio frequency measurement in the proposed project site are presented in **Tables 4.3 and 4.4**

The noise levels recorded range from 52.5 to 57.1dB (A) while the mean noise level in the project areas was reported to be 46.30dB (A) and within FMEnv and WHO limits.

Table 4.3: Noise Level Measurement

	SAMPLE Location	Measured Noise Level (dB)
1	ENNO 1	52.5
2	ENNO 2	56.3
3	ENNO 3	54.3
4	ENNO 4	57.1
5	Control	56.5

(Source: FIX FM Field Studies, April 2026)

The result of Radiofrequency measurements gives the value range between 0.000 and 0.003 (W/m²). This value is within the recommended limits set by international regulatory agencies (such as the International Commission on Non-Ionizing Radiation Protection (ICNIRP), World Health Organization (WHO), and Nigerian Communications Commission (NCC)).

Table 4.4: Radio Frequency Measurement

S/N	SAMPLE ID	Measured RF (W/m ²)
1	ENRF 1	0.001 - 0.002
2	ENRF 2	0.0001 - 0.003
3	ENRF 3	0.000 - 0.001
4	ENRF 4	0.000 - 0.001
5	Control	0.000 - 0.000

(Source: FIX FM 103.3 Field Studies, April 2026)

4.8 Geology of Enugu State

The geology of the project area is typical of that of Enugu State which occupies most of the highlands of Awgu, Udi and Nsukka. The hills are flanked by the rolling lowlands of Oji River, Adada and Anambra Basins to the west, and the Ebonyi (Aboine) River Basin to the east. The area contains about nine geological formations. From east to west, and in terms of age and sequence of exposure, the formations are the Asu River Group of the Albian (Lower Cretaceous) Age, made up of shales, sandstones and siltstones.

The sediments later became folded, giving rise to the Abakaliki anticlinorium and the related Afikpo synclinorium both within the present Ebonyi State, as well as the synclinal basin lying between the

Niger and Eze Aku shales formation of the Turonian Age which contains shales, siltstones, of sandstones and limestones.

Awgu-Ndeaboh Shales formation of the Coniacian Santonian Age is in the southern part of the state comprises the Enugu Shales in the state, while the Awgu Sandstones is dominant as one moves southwards along the same axis. They were laid in the Campanian substage. Lower Coal Measures Formation (Mamu reformation) of the Maastrichtian Age.

This is the coal-bearing formation. False bedded Sandstones Formation (Ajali Sandstones) also of the Maastrichtian Age. The body of the sand stone is thick, friable and poorly sorted. The formation consists of coarse sandstones or with shale intercalations and fragments of iron stones and ferruginized shales and sandstones. It abounds extensively on the Udi-Nsukka Plateau where differential erosion has left the resistant portions standing out as rounded, conical, dome, is cuesta like, elongated and sometimes flat-topped hills, some hundreds of meters above the mean sea level.

The Upper Cretaceous Sediments were probably uplifted during the Tertiary formation, giving rise to the Enugu-Okigwe escarpment Imo Shale Clay Formation of the Pleistocene Age. It is about 1,000 meters in thick and overlies the Upper Coal Measures conformably. Alluvium Deposits belong to the Recent Age. In Enugu State, this formation occurs farthest to the northwest and belongs to the Niger Anambra flood plain.

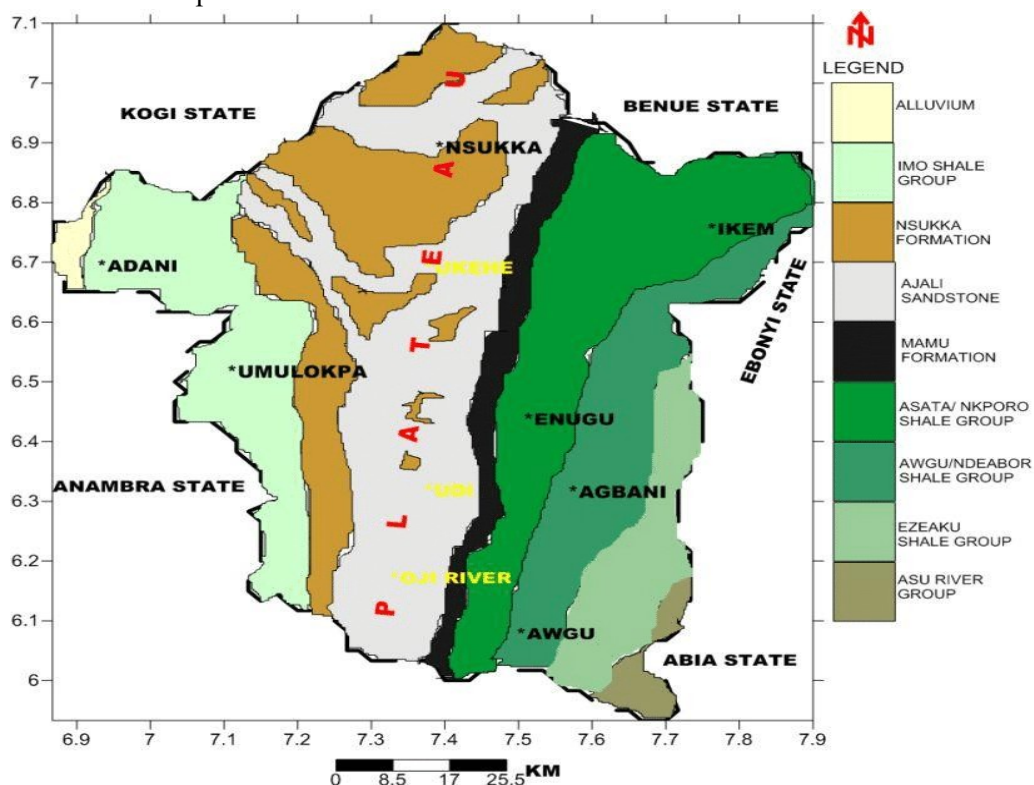


Figure 4.7: Geomorphological Map of Enugu state

(Source: <https://www.researchgate.net/figure/Geologic-Map-of-Enugu-State>)

4.8.1 Soil Types in the study area

The soil in Enugu is made up of shallow and stony lithosols found on the steep slopes of the cuesta and often left uncultivated, the ferrallitic soils, also called Red Earth or Acid Sands, found on the plateau, and the hydromorphic soils of the flood plains.

Soil erosion, both from physical and manmade causes, is rampant in several parts of the state. It shows in rills along roadside embankments, in sheet wash across compounds and farmlands, and in gullying, sometimes very dramatic, along definitive channels and zones. The vegetation on the highlands of Awgu and stretching through its rocky promontories to link with the undulating hills of Udi is of the semitropical rainforest type. It is characteristically green and is complemented in the Nsukka area by typical grassy vegetation. Fresh water swamp forests occur in the Niger-Anambra Basin.

4.8.2 Chemical Characteristics of Soil Samples

The soil in the project area (**Table 4.5**) showed a pH range of 6.33 to 7.66 in both surface layer (0-15cm) and sub-surface (15-30cm). The Total Organic Carbon (TOC) of 1.19 to 1.35% was obtained in both layers. The soil nitrate concentration ranged from 0.06 to 0.19mg/kg for both topsoil and subsoil. The phosphate concentration ranged from 0.05 to 0.09mg/kg, for topsoil and subsoil, while the Sulphate concentrations range from 2.0 to 5.0mg/kg for topsoil and subsoil. The chloride content in all the samples analyzed ranges from 2.3 to 3.6mg/kg for both topsoil and the subsoil. The conductivity values obtained for both topsoil and subsoil ranged from 100.0 to 125.0 μ Scm⁻². Ca, Mg and K showed a range of 68.0 to 75.5mg/kg, 13.7 to 36.4mg/kg and 1.40 to 2.30mg/kg in both topsoil and subsoil respectively. The levels of Na recorded for both topsoil and subsoil range from 4.00 to 16.6mg/kg. Heavy metals such as Cu, Pb, Zn, Mn, Cd, Fe and Ni were detected in all the samples analyzed with Zn and Fe recording the highest levels of 1.23 to 1.33mg/kg for topsoil and subsoil as well as 32.9 to 53.4mg/kg respectively. The THC levels for topsoil and subsoil ranged from 0.03 to 0.05mg/kg.

Table 4.5: Physico-Chemical and Heavy Metal Results of Soil in the study area

Sample Code	Soil Depth	pH	TOC (%)	NO ₃ ⁻ (mg/kg)	PO ₄ ³⁻ (mg/kg)	SO ₄ ²⁻ (mg/kg)	Cond. µS/cm ²	Cl ⁻ (mg/kg)	Mg ²⁺ (mg/kg)	K ⁺ (mg/kg)	Ca ²⁺ (mg/kg)	Na ⁺ (mg/kg)	Cu (mg/kg)	Pb (mg/kg)	Zn (mg/kg)	Mn (mg/kg)	Cd (mg/kg)	Fe (mg/kg)	Ni (mg/kg)	THC
ENSS1	0-15cm	6.33	1.19	0.09	0.07	4.0	102.0	2.3	35.0	1.60	70.9	12.6	0.22	0.25	1.26	0.51	0.02	41.3	0.34	0.04
	15-30cm	7.14	1.26	0.16	0.08	5.0	118.0	3.0	18.3	2.30	75.5	6.01	0.31	0.32	1.23	0.68	0.01	50.1	0.30	0.05
ENSS2	0-15cm	7.56	1.30	0.08	0.09	5.0	100.0	3.6	24.8	1.40	68.9	10.4	0.25	0.27	1.31	0.55	0.03	38.5	0.31	0.03
	15-30cm	6.84	1.35	0.17	0.05	2.0	113.0	2.8	13.9	2.60	74.0	4.00	0.29	0.31	1.27	0.78	0.02	55.3	0.33	0.04
Control	0-15cm	7.24	1.23	0.06	0.06	3.0	125.0	2.4	33.7	1.60	73.2	16.6	0.27	0.27	1.33	0.67	0.03	32.9	0.33	0.04
	15-30cm	7.66	1.34	0.19	0.08	3.0	112.0	3.3	13.7	2.20	75.1	7.04	0.34	0.35	1.29	0.70	0.04	53.4	0.30	0.03

(Source: FIX FM 103.3 field study, 2026)

4.8.3 GROUNDWATER QUALITY IN THE STUDY AREA.

The results of Physico-chemical and microbial analyses conducted on groundwater samples from the Project area are presented in **Table 4.6**. The pH of the groundwater sample was 6.41. The measured pH and temperature values in the groundwater samples fall within the FMEnv recommended limits of 6. – 8.5 for pH for potable water.

Electrical conductivity, a measure of the ability of the water to pass an electrical current, was recorded as 100 μ S/cm. The conductivity values obtained in the groundwater samples were within the WHO limit of 1000 μ S/cm.

Similarly, the Total Dissolved Solids (TDS) value obtained was 64mg/l which fall below the WHO and FMEnv limits of 500 mg/l for potable water. Both conductivity and TDS are indicators of how much ions are dissolved in the water samples.

Na was 2.31mg/l, SO_4^{2-} was 2.03mg/l, NO_3^- 1.24, PO_4^{3-} was 0.13mg/l amongst other cations analyzed (**Table 4.6**).

Oil & grease and Hydrocarbon contents were not detected in the water samples. Therefore, the ground water samples within the proposed sites are free from hydrocarbon contents contamination.

Heavy metals in the groundwater samples were analyzed using Atomic Absorption Spectrophotometer (AAS). Nickel, Lead, Mercury, Cadmium, and Chromium were not detected in the samples. Similarly, the concentrations of oil and grease measured in the groundwater samples were below the detection limit of 0.001mg/l, indicating that the groundwater samples are not polluted with hydrocarbons.

The percentage of hydrocarbon utilizing bacteria (HUB) recorded was less than 1 % of the total heterotrophic bacteria, indicating that the groundwater is not polluted with hydrocarbon compounds that could serve as substrates for the HUB to thrive well. Microbes are naturally found in groundwater resources. Predominant species of microorganisms isolated in the groundwater samples from the Project area are *Aspergillus niger*, *Bacillus* spp., and *Mucor* spp.

Table 4.6: Physicochemical Properties of Groundwater Resources in the Study Areas

Sample ID	pH	Conductivity (ug/cm)	TDS (mg/l)	Chlorine (mg/l)	Nitrate (mg/l)	Sulphate(mg/l)	Calcium (mg/l)	Magnesium (mg/l)	Sodium (mg/l)	Potassium (mg/l)	Total Hardness (mg/l)	Dissolved Oxygen (mg/l)	Phosphate (mg/l)	Turbidity (NTU)	Yeast and Mould (cfu/ml)	Salmonella (cfu/ml)	E. coli (cfu/ml)	Faecal Streptococcus (cfu/ml)
ENGW 1	6.41	100	64	3.5	1.24	2.03	7.00	0.34	2.31	1.40	1.33	3.79	0.13	4.30	Nil	Nil	Nil	Nil
FMEnv Limit	6-9	1000	1000	250	20	500	150	50	200	<1	200	>2	5.0	100	-	-	-	-

(Source: FIX FM 103.3 Field Studies, April 2026)

4.9 LAND USE

The land use component of this EMP is meant to identify and document the various uses to which land in and around the project areas are put. The land-use features and information were acquired from the fieldwork. The identified land use pattern around the proposed project sites is more of a residential/GRA within the heart of the town

4.10 Socio-economics study

4.10.1 Historical Background of Enugu State

Enugu State is in the southeast geographical zone of Nigeria. It was created in 1991 from the old Anambra state with Enugu city as its capital. The state derives its name Enugu (Hill Top) from the capital city which was established in 1909 as a small coal-mining town. The principal cities in the state are Enugu, Agbani, Awgu, Udi, Oji-River and Nsukka. There are 17 Local Government Areas in Enugu. These are Aninri, Awgu, Enugu East, Enugu North, Enugu South, Ezeagu, Igbo Etit, Igbo-Eze North, Igbo-Eze South, Isi- Uzo, Nkanu East, Nkanu West, Nsukka, Oji-River, Udenu, Udi, Uzo-Uwanu. The state shares borders with Abia and Imo State to the South, Ebonyi State to the East, Benue state to the Northeast, Kogi state to the Northwest and Anambra state to the west.

4.10.2 Governance in the Study Areas

4.10.2.1 Social Organizations

Community social organizations exist in the communities of the study areas, with the ultimate aim of community development. Prominent are the Women groups and the Youth Associations which organize routine sanitation exercises and negotiate members' enrolment in employment slots. Apart from the ubiquitous credit and thrift societies that exist to ensure the availability of revolving funds for members' economic advancement, the community also boasts of cooperative groupings. Also important are the age-grades and church-based societies. However, there is a high level of cooperative tendency which causes the people to speak with one voice and bear allegiance to their groupings of affiliation. The socio-cultural groups play very significant roles in the maintenance of law and order in the community, and they also provide a sense of belonging for the average indigenous resident.

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4.10.2.2 Governance and Political Administration in Study Area

There are well-recognized leadership structures that oversee the political administration of the study areas. There are two (2) levels of political organization in the study area:

- The Formal Government
- The Traditional Administration

4.10.2.3 The Formal Government

The entire country is divided into 36 states and federal capital territory. These are further sub-divided into 774 local government areas which form the third tier of government while the central and state governments form the first and second-tier respectively. The third tier consists of the Local Government

Areas. The country practices a presidential system of government consisting of three arms of government: the executive, the legislature, and the judiciary (Nigerian 1999 Constitution). The executive consists of both elected and appointed members, while members of the legislature, both at federal and state levels are elected. This pattern is similar to what obtains at the Local Government level, except that there is no third arm (the judiciary) at the LGA level. Another major difference between the central government structure and that of the state is the presence of two legislative chambers at the center (i.e. the Senate and the House of Representatives), while the states have just one. The LGA administration is run by an elected Executive Chairman and appointees of the Chairman representing the executive arm of local government administration. There is also the legislature made up of ten Counselors elected from the wards in the LGA. The Chairman is the chief security officer of the LGA and the office is important in the operations of the proposed project.

4.10.2.4 Traditional Governance in the study area

This is typical of the Igbo-speaking tribe of Nigeria. The main political institutions among the Igbos were the Oha-na-Eze (The town assembly, the King or Rulers, the Council of Elders or Chiefs and the Age Grade). The Assembly of the whole town or village group is the highest platform for political decisions and action. All adult males can attend and participate in the meetings of the town assembly. In the town assembly, the titled elders presided over the affairs, deliberated over general decisions on a separate caucus consultation called ‘IgbaIzu’ and finally announced final decisions which quite often won a general vocal approval of the people. Occasionally, the final decisions of the elders are rejected and fresh efforts are started towards winning a common consensus.

The ruler or king popularly called ‘Igwe’ where they existed is the most important person in the town or village. He had the Judicial, Legislative and Executive powers but didn’t act alone. He is advised by his chiefs who could remove him from the office if he did not rule in the public interest. The council of elders was made up of chiefs and elders in the town. For example, the war chiefs, the religious chiefs, the market chiefs, the family or ward Chiefs etc. are all members of the council of elders. The functions of the council of elders include:

- Advising the King on a day-to-day administration
- Removing the King if need be
- Regulating trade by fixing a price for essential commodities
- Deciding on days for religious ceremonies and carrying them out
- Trying offenders and ensuring that the punishment imposed on them are carried out
- Organising age groups and assigning duties to them
- Negotiating peace with neighbours as well as planning for and engaging in war

The Age grades are formed by males and in some cases female children born within a given age bracket. For example, children born between 1960 and 1965, can be grouped under one age-grade. Each age grade usually is organised under a leader and other officials. The leader normally is the oldest or strongest member. The age-grades were called upon to perform public services and duties such as:

- Clearing bush path
- Repairing the King’s house and bridges
- Preparing the town centres for ceremonies and religious duties such as taking part in rituals and dances
- War duties and civic duties e.g. performing ceremonial functions
- Maintenance of Law and order and Peace
- Sanitation and cleaning of the environment

The Igbo Judicial Administration

- The family settled minor disputes within the family level
- Council of Elders or “Amala” handled major disputes
- The final adjudication of cases was done by the deities
- The age-grade settled minor disputes among themselves
- The Ala plays a great role in Judicial functions. For example, offenses such as homicide, murder and birth of abnormal children are crimes against Ala.
- The chief also takes part in the judicial settlement.

Sometimes, the whole village may constitute itself into a court to settle disputes. Finally, the ‘Dibia’ (native doctor) also settles disputes among the people.

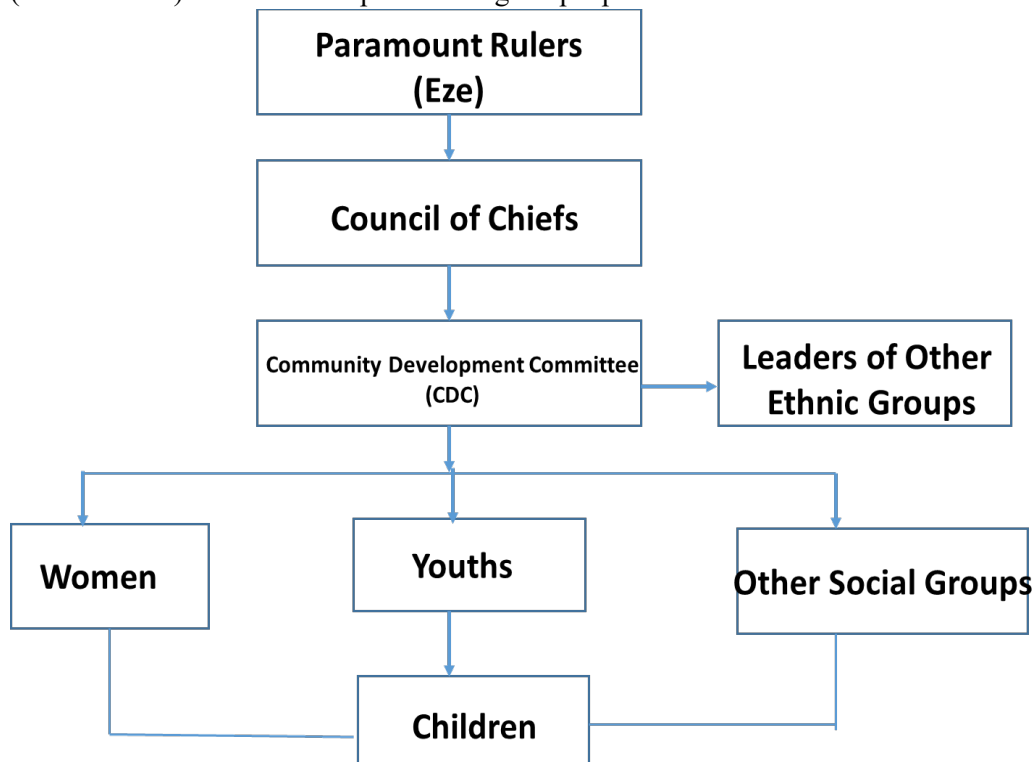


Figure 4.8: South-Eastern Nigeria Governance Structure
(Source: FIX FM Field Studies, April 2026)

4.10.3 Demographic Study of the Project Area

Enugu State is one of the states in the Southeastern geo-political zone. The predominant spoken language in the state is Igbo with dialectical differences. Modern-day Enugu State has been inhabited for years by various ethnic groups, primarily the Igbo people with minorities of Idoma and Igala peoples in Etteh Uno.

According to 2006 census figures, Enugu state has a population of 3,267,837 which is made up of 1,596,042 males and 1,671,795 females. A projection figure of about 12,268,958 at an annual growth rate between 2.1 to 2.6% is expected by 2050. The proposed project area falls under the jurisdiction of Enugu North Local Government Area with a population of 244,852 (NPC, 2006)

4.10.4 Household Composition, Structure and Size

The household structure of the community parallels the patriarchal leadership structure of most Nigerian ethnic groups. Men are typically the head of Nigerian households. The three different types of male-headed household structures are traditional (one husband one spouse), polygamous, and single male

(male with no spouse, including widowers and males that have never been married). Traditionally, the male is responsible for all the major household decisions.

Focus group discussions and questionnaire analysis revealed a high marital status of the respondents in the project areas (69%), followed by single persons (12%). Less than 8% of the respondents were widows/widowers while 11% account for Divorced/Separated persons among the respondents. As in other climes and traditions, marriage is largely determined by the economic status of the adult male.

It is normal as was observed to have both male and female members still unmarried. Similarly, although a higher percentage of households were found to be headed by males, compared to the female gender, it is also not uncommon to have an admixture of some households headed by females (female-headed households) as was observed amongst those interacted with in the communities.

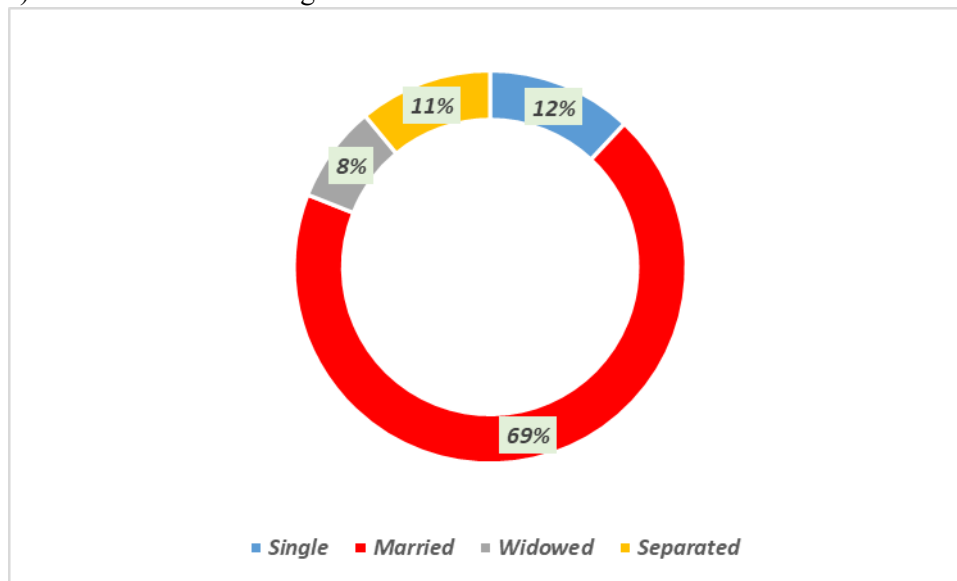


Figure 4.9: Marital Status of Respondents in the Study Areas

(Source: FIX FM Field Studies, April 2026)

The typical household unit in the study area has a head and several members. In many cases, the head is the father and members include his wife, children and wards. The wards are often children of relations and, in some cases, friends. These are usually fed and generally catered for from the resources of the household. Members of the household are not necessarily related biologically. The household could also be composed of members who are not related but have agreed to live together under a common household head. This latter type of household group is not common in the study area.

The analyzed questionnaires also revealed that an average number of children per married woman in the community ranges from 1-6 and translates to a mean household size of 5 persons per household in the study areas.

Larger household size is a common phenomenon in most rural Nigeria, which is influenced largely by the culture of polygamy. Also, in contrast to the nuclear family model prevalent in the developed world, households are often composed of grandparents, sons and their spouses, children and other relatives, all tied together by bonds of kinship to form the household economic unit. Added to this fact is the observation that rural households in Nigeria are still very much associated with fertility/fecundity (NDHS, 2018).

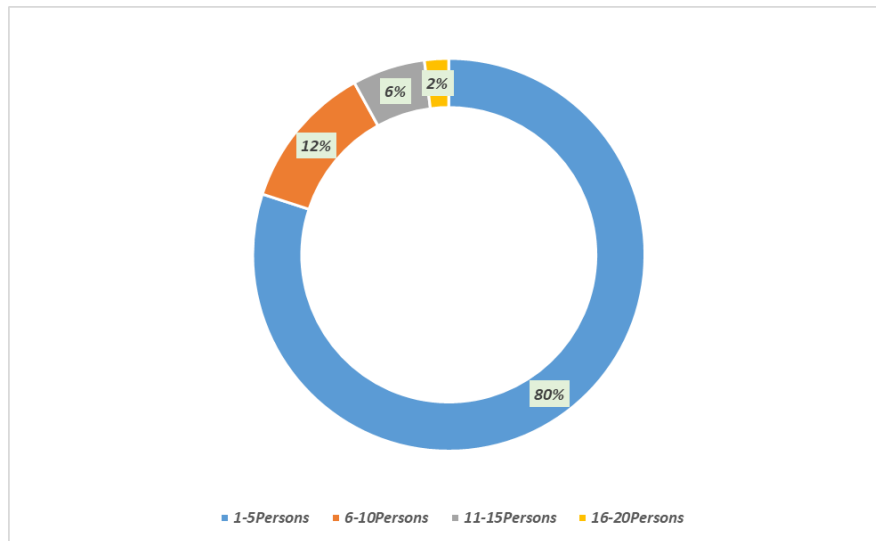


Figure 4.10: Family Size in the Study Areas
(Source: FIX FM Field Studies, April 2026)

The sex ratio is the ratio of males to females in a given population, usually expressed as the number of males for every 100 females. Gender statistics of the project-affected communities indicate a preponderance of males over females although the margin seems to be dropping off.

4.10.5 Age and Sex Distribution of Respondents

The survey instrument shows that in communities under study, the adult population (18–45 years) constitutes 45% of the total population. 36% are above 45 years while 19% are below 18 years (**Figure 4.20**). The implication of this is that the communities have an able-bodied labour force that could participate actively in the various productive activities that will take place in the proposed project.

4.10.6 Religion Practice in the Study Areas

The religion practiced in the studied communities in which the proposed Radio FM station is located cut across all the types of religion in the country. Figure 4.11 illustrates the religious adherence in the study area.

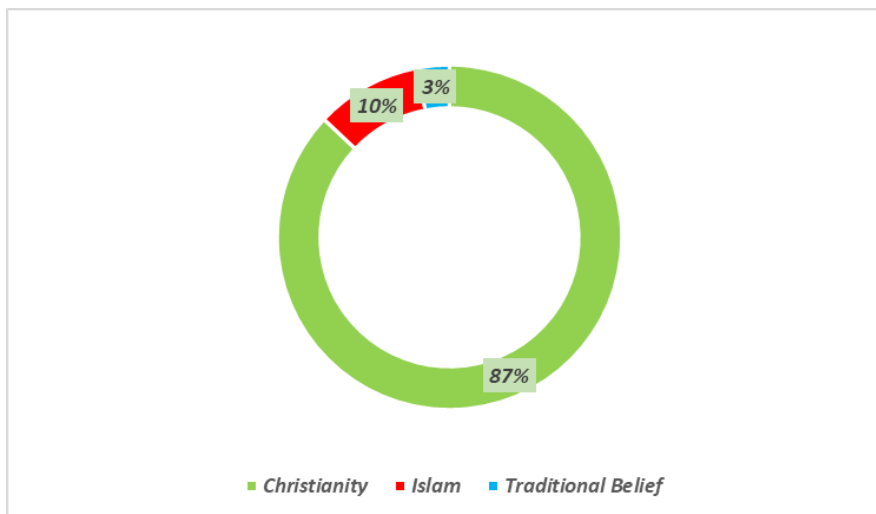


Figure 4.11: Religion Adherence in the Study Area
(Source: FIX FM Field Studies, April 2026)



Plate 4.6: Religion Houses in the Study Areas
(Source: FIX FM 103.3 MHz Field Studies, September 2025)

4.10.7 Tourism and Festival in the Study Areas

The Project affected state possesses immense tourism potentials and some of the tourist attraction places.

Festival

The Indigenes of the project area are known for their customs and traditional values. There are many Festivals associated with the project area.in the affected State, some of which date to the period before the arrival of the major religions in these ethnically and culturally diverse communities. The main Muslim and Christian festivals are often celebrated in ways that are unique to the state or unique to the people of their locality. Some of these are been upgraded and have become important sources of tourism revenue.

4.10.8 Livelihoods and Micro-Economy

Livelihoods - the Livelihoods (in terms of the diversity, adequacy and sustainability) of communities are important factors in determining the resilience of a community that will be affected by a particular project. The most sources of livelihood for the surveyed communities’ households are depicted in Figure 4.12.

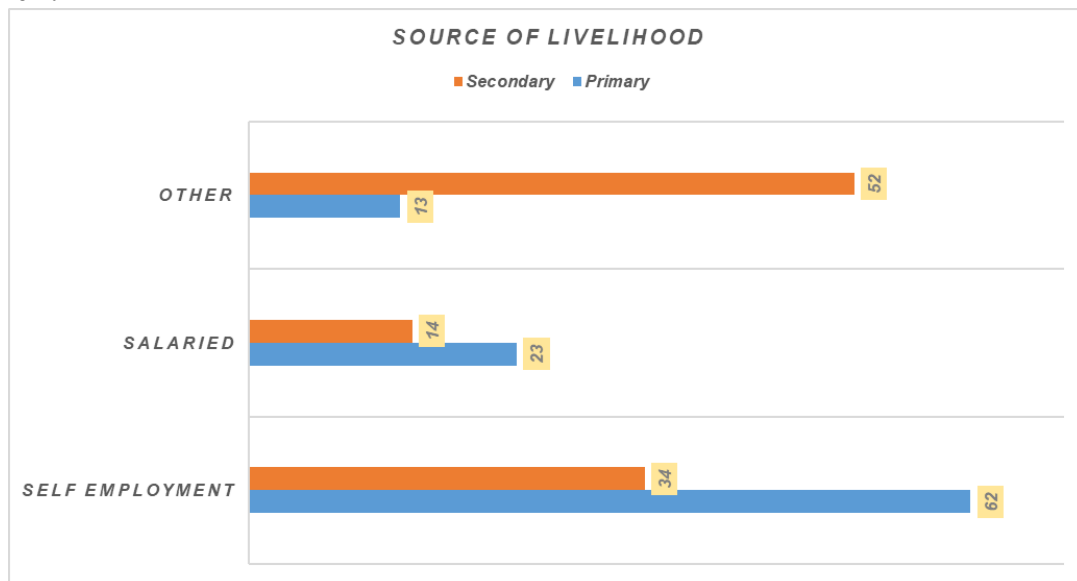


Figure 4.12: Sources of Livelihood in Study Area
(Source: FIX FM Field Studies, April 2026)

As can be seen in Figure 4.13, Self-Employment (farming, Trading, Artisan/Craft, Company Worker, and Business) is considered the main source of livelihood for residents in the community to be affected by the proposed project. The occupation of people in the study area cut across all the types of occupations, such as traders, civil servants, artisans, transporters, farmers, teachers, secretarial/administrative workers, and students. Data obtained from house-to-house inventory reveals their occupational characteristics; Figure 4.13 shows the occupational distribution of the respondents in the affected study areas and their states. The major occupations of the residents of the communities are Farming (12%) and Artisan/Crafting (15%), Petty Trading (20%), Business/Contracting (22%), Civil/Public Service (18%), and transportation (8%) and five (5%) percent accounts for other form of occupations

Apart from trading/business, artisan practices and Artisan represent another major form of livelihood activities. Some of the artisan practices identified in the study area include tailoring, welding, carpentry and masonry, electrical and electronic fittings, and repairs. Others are activities in the auto industry including mechanics, electrical, vulcanizing, and panel beating. Some residents practice more than one livelihood activity. Engaging in multiple livelihood activities provides household members with complementary sources of income. In many cases, it is an indication that each one of these activities only provides subsistence income.

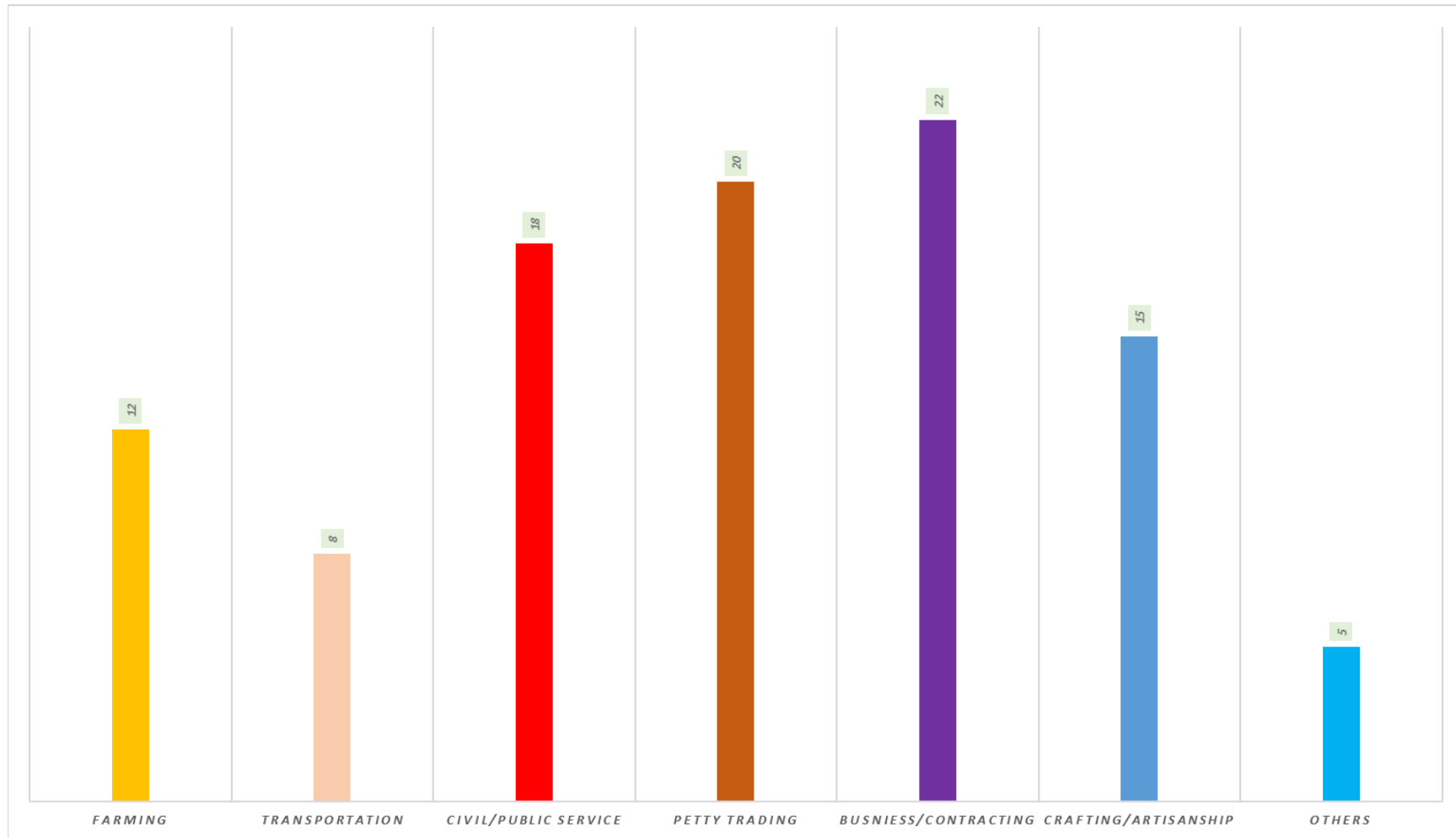


Figure 4.13: Occupation Distribution pattern of residents in the study Area

(Source: FIX FM Field Studies, April 2026)

According to FGDs some of the community residents in the study area engage in petty trading by buying farm produce such as yams, vegetables, fruits from village market and transporting it to the area where they make a profit on the goods sold. Other resident trades in provisions, generator spare parts and household appliances.

4.10.9 Employment Situation in Households

The employed in the study area include all who are aged between 15 years and 64 years who work for pay, inclusive of those who work for themselves, the work may be on a full-time or part-time basis. The unemployed, on the other hand, are those of the same age bracket who are not full-time students and have been willing to work and looking for work and not able to secure one in the last six months preceding this study. While many residents are employed in industry, public service or engaged in self-employment some others are unemployed.

Unemployment was experienced in several households in the communities. Results obtained from discussion and interview sessions indicated that about 5% of the household across the studied communities had one or two unemployed member(s). Unemployment was determined as being ready and looking for work but unable to secure one in the last 6 months preceding this study. This was attributed to the absence/lack of enough placements for employment a typical Nigerian problem and lack of basic facilities for the establishment of industries. There is also very limited access to credit, particularly to finance new businesses and business ideas in the surveyed community.

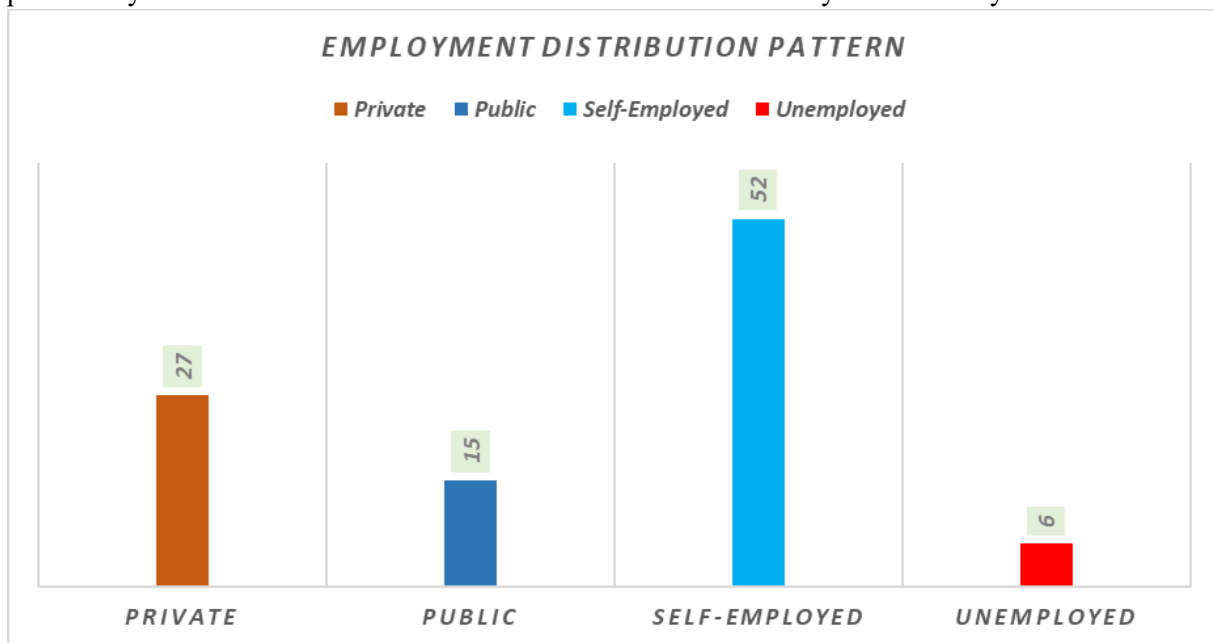


Figure 4.14: Employment Distribution in the Study Area
(Source: FIX FM Field Studies, April 2026)

4.10.10 Income Levels of Sampled Population in Study area

Income distribution in any area is closely linked with inequality in the area. For this study, FGD reveals that significant variations were noted in the monthly income levels of households in the study areas. Factors responsible for this include the number of people employed in a household, their livelihood activities, and the volume of investment. Household monthly incomes in the study area are presented in **Figure 4.15**

Findings reveals that the highest incomes accrue to the very small number of contractors, while lowest incomes accrue to roadside mobile phone recharge cards sellers.

From the discussions and interviews held in the project impact community, the mean daily income of people in the study community is N900. This is slightly above the current national minimum wage of N30, 000/month. It should be noted that the national minimum wage is paid to individuals who may be heads of households and its overall impact will be significantly below what a household requires for its sustenance.

Findings show 20% of the respondents earn N1,000 – N10, 000 monthly, 60% and 12% earns N10, 000 – N50, 000 and N50, 000 – N100, 000 respectively monthly and 8% earns more than N100,000 monthly and a majority of respondent earn an average monthly income range from to N10,000 to N50,000.

The income-generating activities of the people in the communities of the project area include crop farming, trading, artisanship, farming/livestock rearing, processing of farm produce, especially garri processing, hunting, fishing, sale of automobile and power generator spare parts, food items, household appliances, among others. The common income-generating activities for men are trading/ business, company work and artisanship, while the women engaged mostly in trading (sales of farm produce, food items, drinks, etc) and youth in the communities, generate most of their income from, company work, Okada riding and farming. Income level is rated moderate in the study area.



Plate 4.10: Street Trading in the Study Area
(Source: FIX FM 103.3 MHz Field Studies, September 2025)

In summary, basic challenges to income-generating activities in the project area include:

- High cost of transportation;
- High level of post-harvest loss;
- Poor storage and processing facilities, and
- Lack of productive inputs and inadequate extension visitation;
- High cost of transportation;
- Lack of access to credit facilities;
- High cost of Housing
- Multiple Taxation
- High cost of labour among others.

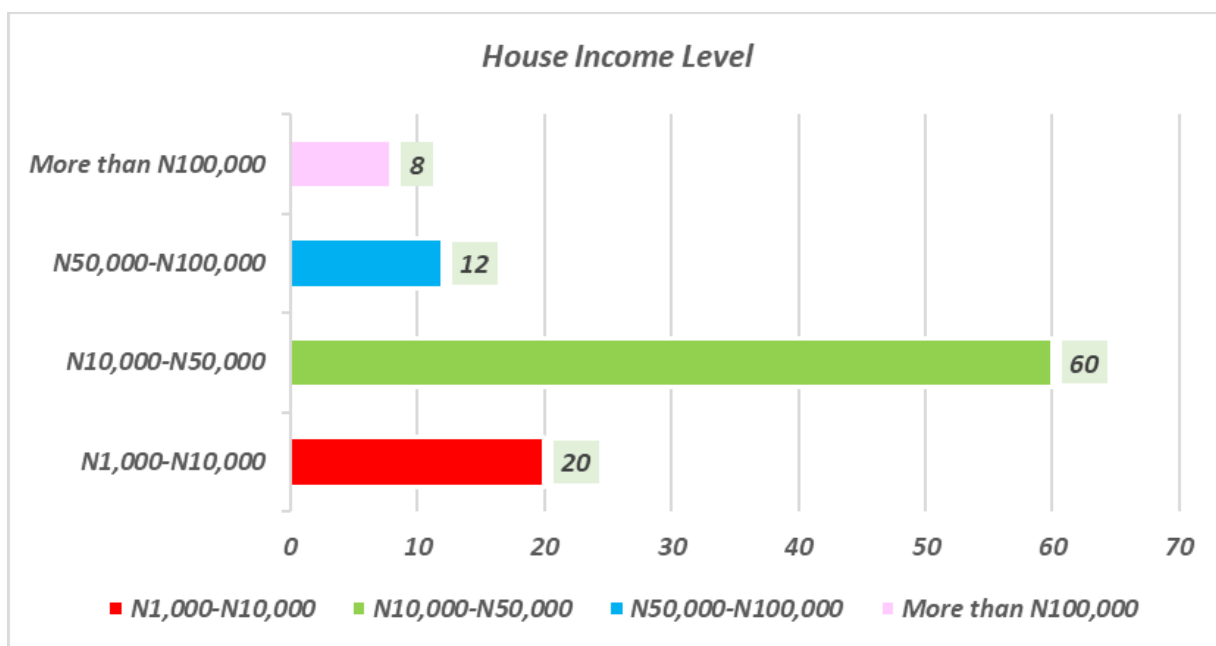


Figure 4.15: Household Income Level in Study Area

(Source: FIX FM Field Studies, April 2026)

The expenditure patterns of the typical household in the study community are presented in **Figure 4.16**. The main expenditure items include food, education, health care, residential accommodation, transportation, clothing and household items, and utilities. Residents in the study area indicated during an interaction that these account for about 85% of their incomes. Some foods eaten in households in some of the studied communities are bought. Most households also spend considerable sums in paying school fees, buying learning materials and also hiring part-time teachers to coach their wards at home after normal school hours. Health care services are accessed at a high cost. Over periods of one-month households typically spend significant sums of money, especially to buy drugs from drug stores. Other items, on which residents spend their incomes, include transportation to various locations especially work, school, market and church. Purchases of clothing and other household items, especially electricity and fuels to operate private electricity generators are done regularly.

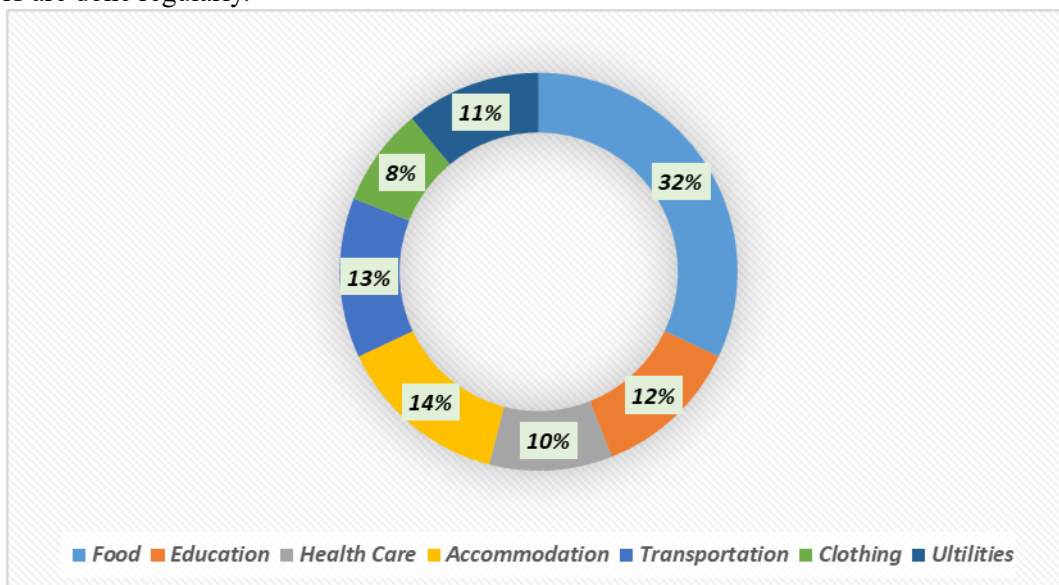


Figure 4.16: Household Expenditure Pattern in Study Area

(Source: FIX FM Field Studies, April 2026)

4.10.11 Adult Literacy Level and Education of the Study Area

The adult literacy rate determined by the proportion of population aged 15 years and above that has completed a normal course of primary education and can read and write in the English language, was obtained for study area: Males-89.4% and females-82.8% (National Literacy Survey, 2010). Comparatively, there were slightly more illiterate females than males and nearly half (40%) of the adult population attained secondary level education. This level of literacy among household members indicates that there is a literate pool of labour that could provide useful services for the Radio FM station facilities. The education level of the population is often used as an indicator of the socio-economic development of the country. Moreover, many phenomena, such as reproductive behaviour, use of contraception, infant and child mortality, and hygienic habits are affected by education. Education being one of the pillars of development has a very important role to play in the efforts to sensitize and mobilize any community for its development. In this regard therefore there is the need to assess the level of educational development of communities to establish measures to adopt and the necessary strategies to use to make any meaningful progress of the State. The urban-rural difference is more pronounced at the secondary and the tertiary level (NDHS 2018).

Education is one of the most important aspects of social and economic development. Education improves capabilities and is strongly associated with various socioeconomic variables such as lifestyle, income, and fertility for both individuals and societies. Overall, 36% of females and 27% of males in Nigeria have no education (Source: Nigeria Demographic and Health Survey, 2018). Eighteen percent of females and 19% of males age 6 or older have attended some primary school; however, only 11% of both sexes have completed primary education. The median number of years of schooling is 3.6 for women and 5.4 for men.

The literacy status of a person can be determined by assessing their ability to read all or part of a simple sentence in any of the major language groups of Nigeria. The ability to read is crucial for exploring social and economic opportunities during a person's lifetime.

The education status in the study area showed that over 90% of respondents have had at least primary education and can speak (communicate orally) as well as read and write using English Language (NDHS, 2018). The educational status in the study area also revealed that educational status and literacy rate was about 96% and that literacy rate was higher among males (84.46%) than females (73.11%).

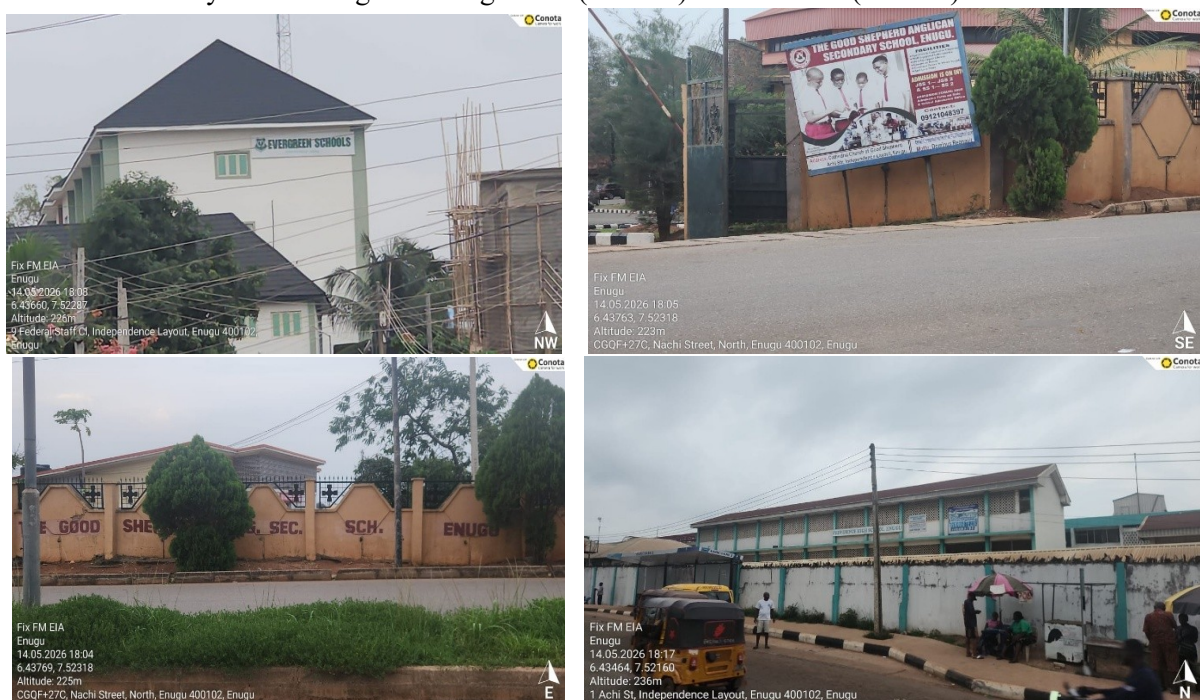


Plate 4.11: Educational Facilities in the Study Areas
(Source: FIX FM 103.3 MHz Field Studies, May 2026)

4.10.12 Quality of Life in Study Area

Settlement Pattern and Housing Conditions

The community has the characteristics of both linear and nuclear settlements. The linear characteristics derive from the concentration of houses along the main streets and lanes in the area. The nuclear characteristics derive from the clustering of houses. Houses are built in clusters which in some cases may identify family lineages and kindred groups. Development and limited access to land have generally encouraged this clustering of houses. Spacing between houses is not definite and could range from one or two meters to about six meters.

The houses are quite diverse in their design and construction materials. Some houses have modern designs and they are built with utilities like kitchen, toilet, and bath, in-house. These modern houses are also constructed with stable and permanent materials like cement blocks and roofed with corrugated iron and aluminum sheets. A majority of the houses in the area are family bungalows, tenement (rooming) houses, and duplexes. Housing attributes in the study area are presented in Figure 4.17.

The most common types of accommodation in the study area are owned houses, Figure 4.18. These constitute about 40% of houses while 27% were tenement (rooming) houses, and the remaining are occupying either relative or official apartments.

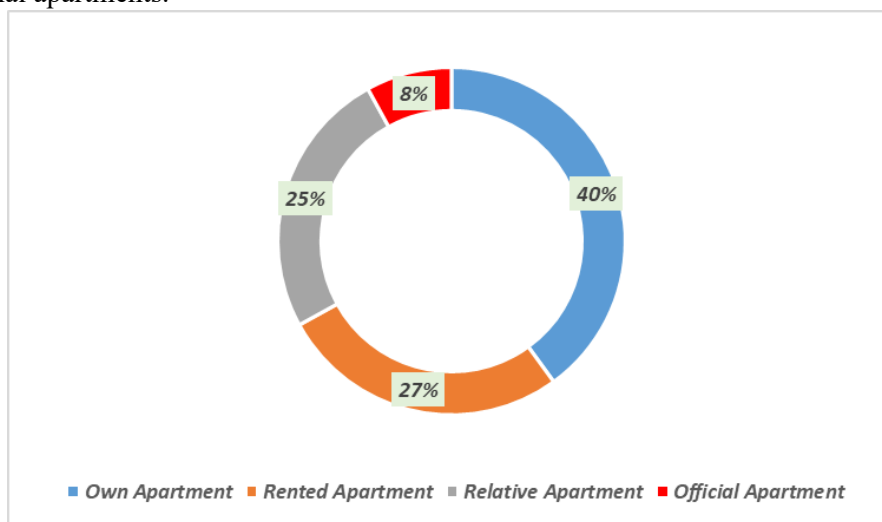


Figure 4.17: Occupiers Status in Living Quarters in the Study Area
(Source: FIX FM Field Studies, April 2026)



Figure 4.18: Housing Attributes in the study area
(Source: FIX FM Field Studies, April 2026)



Plate 4.12: House Types in the Study Areas
(Source: FIX FM 103.3 MHz Field Studies)

4.10.13 Source of Energy Available to Household

All the communities in the project area are linked with the national power grid line for electricity supply but on an irregular basis, which is a typical Nigerian problem as far as the power situation, is concerned. The available sources of energy for cooking household meals and for lighting in the communities are kerosene, firewood and electricity.

Among the various sources of cooking fuel available, the majority 84% of the households use gas stove for cooking, followed by kerosene, 7%, while 4% make use of firewood for cooking and the remaining uses of other sources.

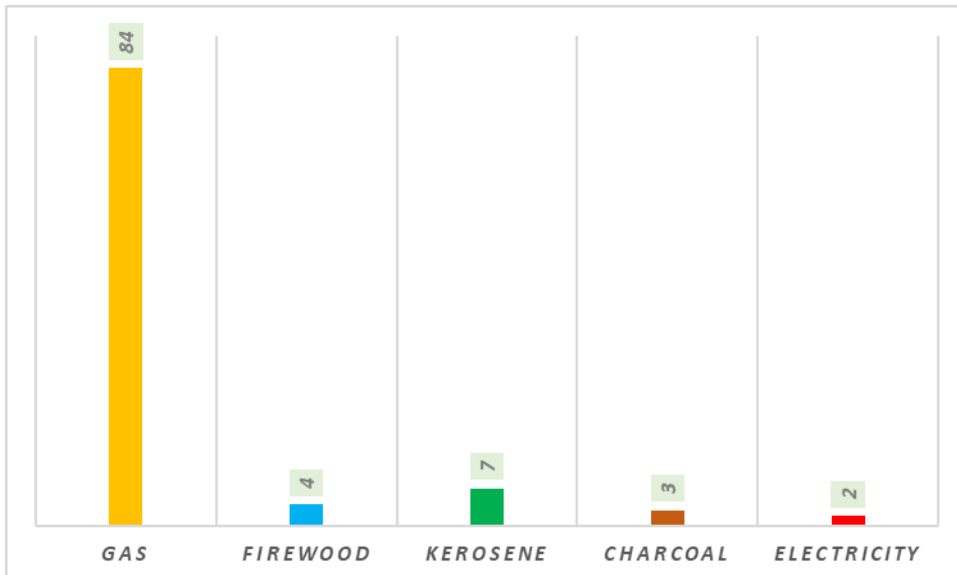


Figure 4.19: Source of Energy for cooking in the Study Area
(Source: FIX FM Field Studies, April 2026)

For lighting, a significant proportion of households about 2% depend on their kerosene lamps, 76% rely on the public light provided by DISCO in the area while 16% uses private power generating set and 6% depends on renewable energy (lamp) for lighting purpose.

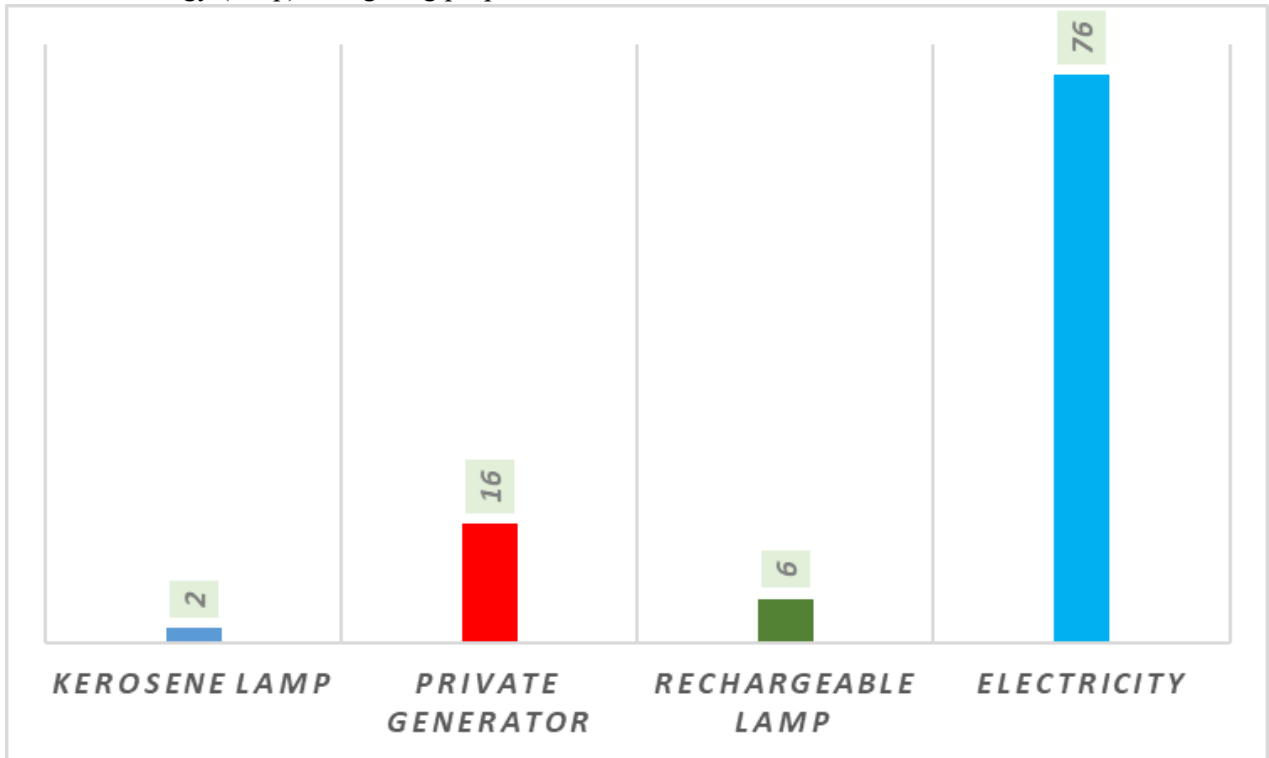


Figure 4.20: Source of Energy for lighting in the Study Area

(Source: FIX FM Field Studies, April 2026)



Plate 4.13: Filling Station in the Study Area

(Source: FIX FM 103.3 MHz Field Studies)



Plate 4.14: Power Transmission Lines and Transformer in the Study Area
(Source: FIX FM 103.3 MHz Field Studies)

4.10.14 Infrastructure in the Study Area

Available Infrastructure and Its Functional Status

The available infrastructural framework of the study area is dominated by social amenities. The social amenities consist mainly of education, water supply and electrification facilities while the physical amenities comprise mainly of roads and telecommunications facilities.

Public access to the project-affected communities is by road, additionally, telecommunication services from GSM service providers are received in all the communities, although these services fluctuate. These physical infrastructural amenities have been provided mostly by the state government and private sector.

4.10.15 Information, Communication and Technology

Postal services, radio, and television among others form the channels of a communication network in the study area in studied states. This is supported by speed post services such as DHL, IAS, EMS, UPS, et cetera. In addition to the foregoing channels of communication, the study areas receive all newspapers published in the country as well as international magazines. These increase the political awareness of the people encourage their participation in decision making, especially at the local level, with implications for the development of leadership qualities, social status as well as political and economic growth.



Plate 4.15. Telecommunication infrastructure in the Study Area
(Source: FIX FM Field Studies, 2026)

4.10.16 Transportation and Road Network

The means of transportation used for inter and intra community movement within the study communities in the affected state cut across all means of transportation such as motor vehicles, motorcycles, Tricycle, bicycles, etc. The study areas have both an asphalted and no-asphalted road network. Some parts of the communities are accessible or linked by dilapidated earth roads.

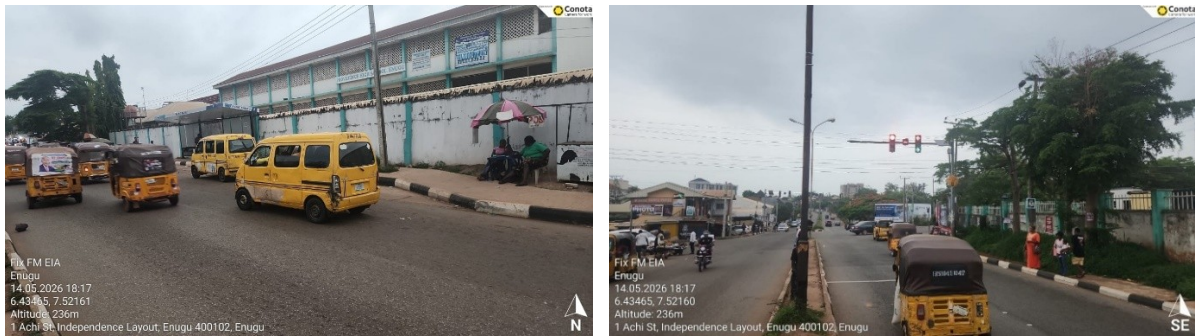


Plate 4.16: Means of Transportation in the Study Area
(Source: FIX FM Field Studies, May, 2026)

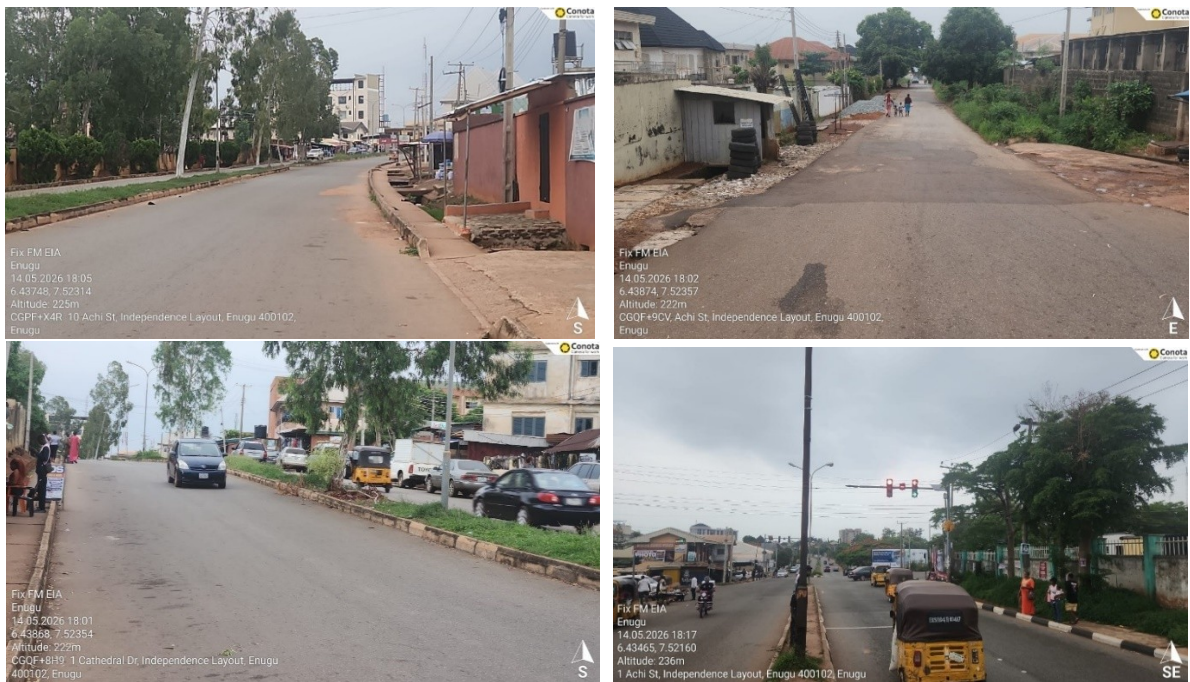


Plate 4.17: Road Network in the Study Area
(Source: FIX FM Field Studies, May, 2026)

4.10.17 Banking and Financial Institution

There is a presence of banking and other financial institutions in the Study Area. The uses of the Point of Sales (POS) Machine for the financial transaction were observed. Financial Institutions encountered during the study were Zenith Bank, GT Bank, Access Bank, Unity Bank, UBA, etc.



Plate 4.18: Financial Institution in the Study Area

(Source: FIX FM Field Studies, April 2026)

4.11 HEALTH ASSESSMENT

4.11.1 Household Survey and Impact of Project on Health

Questionnaire administration and interaction with households to elicit concerns about the potential impact of the proposed project. Feedback received from the respondents indicates that over 99% are optimistic the project will be more advantageous than negative. However, 1% of respondents identified radiation risk to health and noise level and vibration from generators during operation especially at night as the possible negative impacts of the project on the health condition of the communities.

4.11.2 Health Facilities and Services

The studies Areas have several hospitals, health care centers, maternities and dispensaries spread across the council area. There are also specialist hospitals and numerous traditional healing centers. In the rural areas there are various maternity clinics and some primary health centres which are generally not well equipped compared with those in the urban areas.

The study areas have both orthodox and non-orthodox health care providers and facilities. The orthodox facilities comprise health centres and health posts while the non-orthodox comprise mainly traditional birth attendants (TBAs). The functional orthodox facilities provide first aid and treatment for minor ailments, as well as immunization services for children and women of childbearing age. The antigens they give include BCG, OPV, DPT, Measles, TT, YF and HBV.

Apart from the orthodox facilities, there are drug stores (chemists) located in some of the communities. There are also hawkers (individuals who carry drugs, especially malaria drugs, analgesics, antibiotics and various creams and balms) hawking drugs from one settlement to another. The number and distribution of these were not determined during the study.

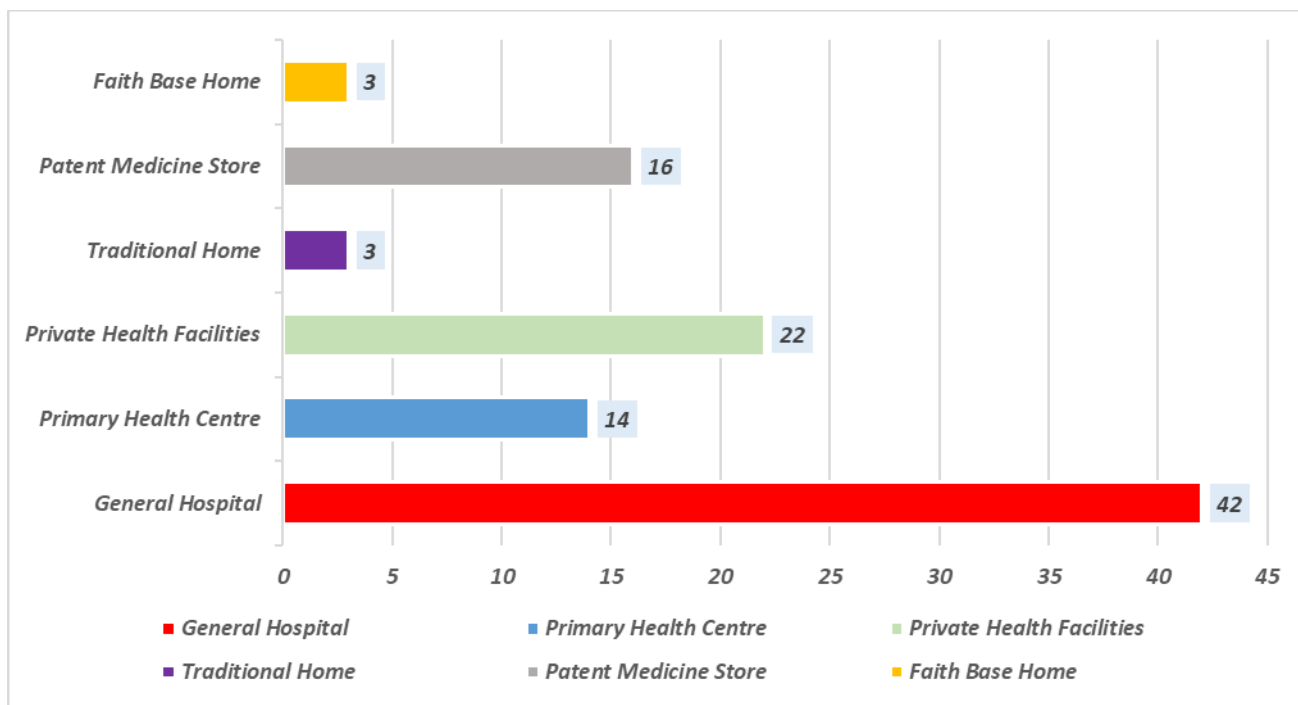


Figure 4.21: Type of medical facility used by Households in the Study Area
 (Source: FIX FM Field Studies, April 2026)

4.11.3 Disease Prevalence

Malaria is a major public health problem in the study areas in the project-affected States. According to the information from the primary health centers and field studies findings, malaria is responsible for 78.8% out of patient attendance in public health facilities. Other prevalence diseases identified in the project area are cough, yellow fever, gastroenteritis, pneumonia tuberculosis, urinary tract infection, upper respiratory tract infection, measles, dysentery/diarrhea and sexually transmitted diseases were among the common health problems reported in the communities.

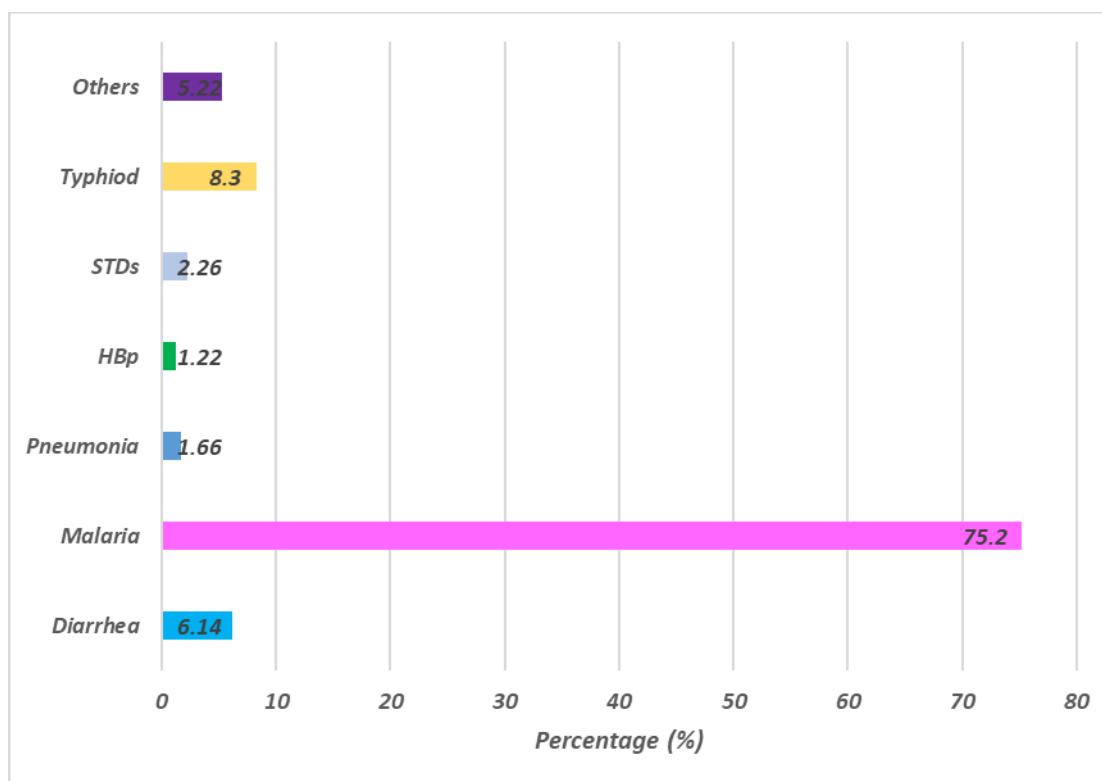


Figure 4.22: Disease Prevalence in the Study Area

(Source: FIX FM Field Studies, April 2026)

4.11.4 Water Supply in the Study Area

Water is crucial for all life on earth. It plays an essential role in our health, economy, food production, and environment. Despite this importance, water is a finite natural resource. It cannot be created. It is the hydrologic cycle that recycles water through the atmosphere. Twenty-one (21) of the thirty-seven (37) primary diseases in developing countries are related to water and sanitation therefore safe drinking water and freshwater are imperative for development and public health (World Water Organization, 2010). The survey indicated that the majority of households in the Study Area use mainly borehole and dug well water as their primary source of water for domestic purposes.

Overall, the quality of the borehole and well was rated as good and generally reliable. Some households also used Rainwater harvesting tanks/containers. A few households also reported using a combination of different water sources. Some households believed that borehole water was a better and more hygienic source compared to water from a well. Some of the respondents also noted that wells are indispensable because when there is no electricity to pump water from the borehole, well provide the needed water for household needs. Therefore, water supply to the community is also affected by inadequate electricity supply as some of the respondents claimed that they need electricity to pump water from their shallow and deep wells. However, because of the inadequate electricity supply, people could not use the borehole as effectively as they should.

Households in the study area indicated that the majority of them, 52.5% sourced water from borehole with pump, followed by the protected well (17%) and unprotected well (9.2%). Others are Pipe borne water (12%), rainwater (1.3%), water tanker/truck/vendor (8%). In the study areas, many households avoid the use of rainwater as a result of their belief that rainwater is being polluted by gaseous emissions and dust from activities in and around their communities. For this reason, also, the use of rainwater is mostly limited to washing clothes and other things and not for cooking. Although most households do not have access to safe potable water, there is no indication that they do not have sufficient water. At interviews, they indicated that hygienic practices of washing of hands (especially before and after meals, and after use of the toilet), washing

of clothes to keep them clean and taking regular daily baths are taught and practiced in households surveyed in the study area.

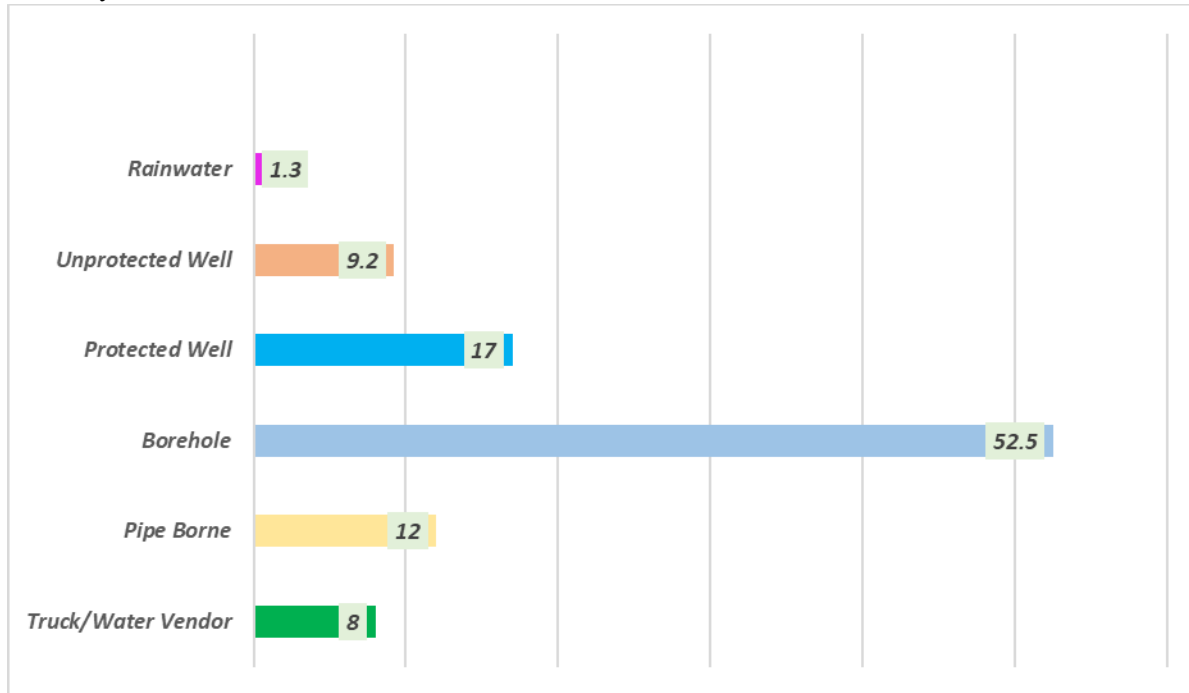


Figure 4.23: Source of Drinking Water in the Study Area

(Source: FIX FM Field Studies, April 2026)

4.11.5 Sanitation of the Living Environment

4.11.5.1 Refuse Disposal

The saying that cleanliness is next to godliness cannot be further from the truth. Any society that does not adhere to the basic needs of cleanliness is doomed to failure; and certain of contending with several other undesirable challenges. Chief among these challenges is the possible outbreaks of diseases and revulsion from city dwellers.

A filthy environment is vulnerable to decay and discourages all manner of business activities, whether public or private.

Residents in the study area have put methods in place to take care of generated waste. They have cultivated a cleanliness culture in waste gathering and disposal in their environment. Additionally, a comprehensive waste management system is practiced in some states, especially in urban centers. Findings from direct observation and interviews from residents in the entire project-affected reveal that all means of waste management. In urban towns comprehensive waste management system is observed to be practiced such as state-managed waste manager, approved waste collection point and approved dumpsite. While open burning, dumping at nearby bush/farmland, composting/Burying and dumping into river/stream are the most common method of refuse disposal in the study area.

Field studies showed that more than 80% of the household patronize the organized collection by government while 6% of the households burn and 12% dispose of into open dumping into the drain/borrow pit and unapproved dump site surroundings. 8% of respondents burying their wastes while 4% dispose of their waste and on an undeveloped piece of bushy land in their surroundings

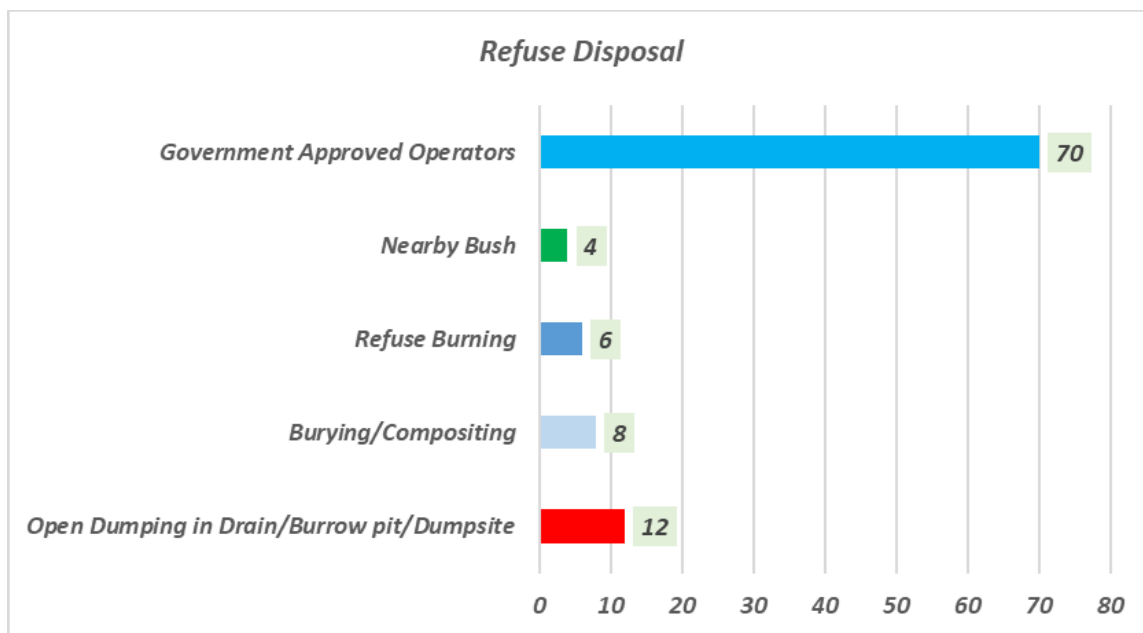


Figure 4.24: Refuse Disposal Methods in the Study Area

(Source: FIX FM Field Studies, April 2026)

The composition of wastes generated are typical of domestic, farm refuse/agricultural and construction wastes and they include garbage, rubbish, scrap metals, old tyres, cans, bottles, plastics and demolition materials etc.

4.11.5.2 Sewage Disposal

The most common disposal method in the study area is the modern water-closet system, consistent with its urban setting. Open defecation is not common as there are no nearby bushes in the study area.

Analysis from field studies revealed that more than 90% of the respondents use the water closet system, while less than 5% of the respondents use pit latrine which is mostly ceramic.

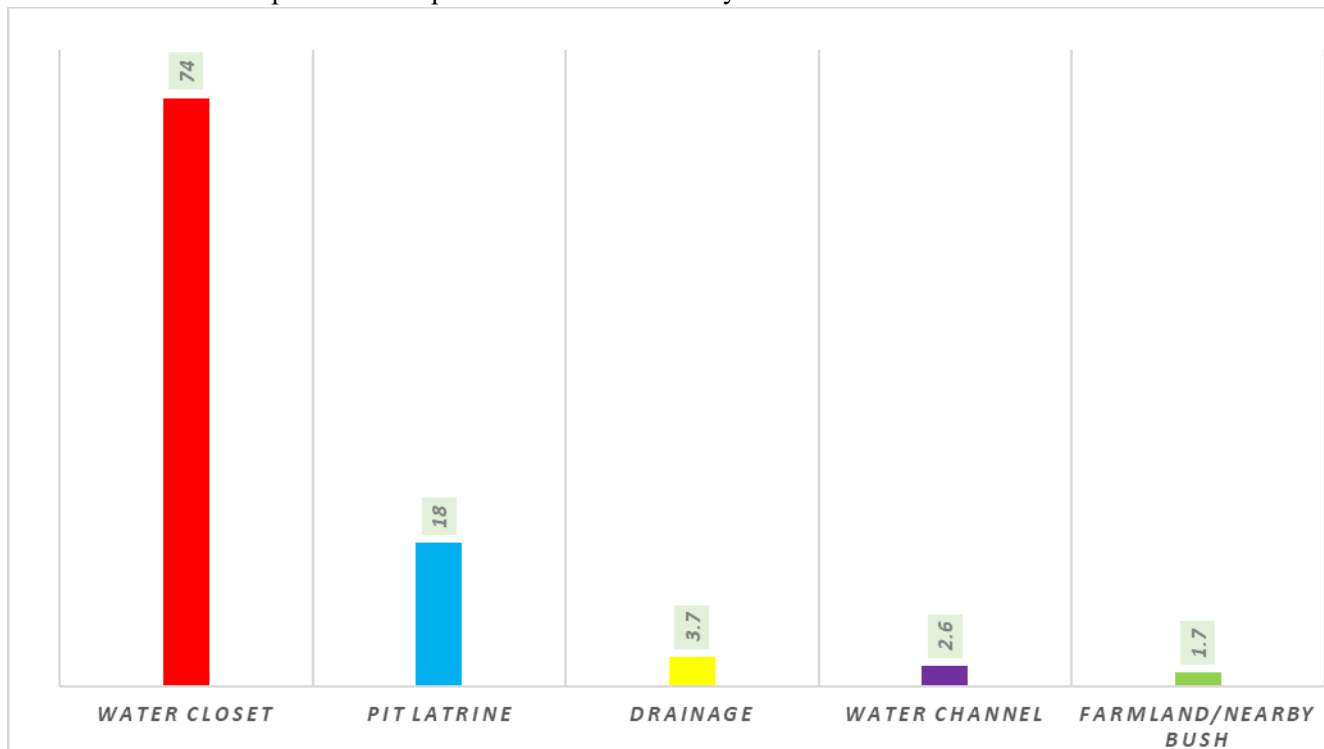


Figure 4.25: Sewage Disposal Methods in the Study Area

(Source: FIX FM Field Studies, April 2026)

4.12 COMMUNITY CONSULTATION

To create awareness and elicit comments on the proposed project from the nearest receptors, especially the direct stakeholder community, a consultation meeting was held with the residents in the study area. The attendance list for the meeting is presented in Appendix 3 while the photos of the meeting are shown in Plates below. A structured questionnaire was administered and oral interviews were conducted.

Below is a summary of the community views and opinions as well as responses obtained from the questionnaires that were administered. Some of the expected benefits mentioned by the respondents include; Improved communication with friends, family members and business associates
Creation of jobs through direct employment of the residents as staff.

All the respondents were unanimous in their demand for developmental projects in the community and welcomed the FIX FM project.

The community is of the view that the FIX FM project should help in the area of infrastructural development such as good road network, electricity, water supply, schools and health care facilities. Consideration in employment especially for unskilled labour.

The residents also expressed concerns about the health implications of the project but the benefits they enumerated seem to douse their fears about the health problems that might arise.



Plate 4.19: Consultation with Residents around the Study Area

4.13 FIX FM STATION CORPORATE SOCIAL RESPONSIBILITY

Corporate Social Responsibility (CSR) is a management concept whereby companies integrate social and environmental concerns in their business operations and interactions with their stakeholders. CSR is generally understood as being the way through which a company achieves a balance of economic, environmental and social imperatives (“Triple-Bottom-Line- Approach”), while at the same time addressing the expectations of shareholders and stakeholders.

Fix FM is a new company in Nigeria and currently at the point of finalizing its policies and plans on CSR. However, Fix FM CSR shall focus on support for education which shall include refurbishing of facilities, Supply of educational materials and adoption of schools where possible among others.

CHAPTER FIVE ASSOCIATED AND POTENTIAL ENVIRONMENTAL IMPACTS

5.1 INTRODUCTION

This chapter discusses the potential and associated impacts of the proposed project on the environmental, health and socio-economic characteristics of the project area. It equally presents an overview of the impact assessment methodology as well as results of impact screening and detailed qualitative and quantitative impact assessment.

The assessment covers all aspects of the project from preconstruction, through construction and operations as well as decommissioning of the project.

A key to successful Environmental Impact Assessment (EIA) is the use of appropriate impact identification and prediction methods. Generally, a number of impact assessment methods have been developed over the years and new approaches continue to emerge. All good methods have certain elements in common, which are widely accepted as essential to EIAs.

In this section, the potential impacts of the proposed FIX FM 103.3 MHz which could cause significant environmental concerns are identified and discussed. This discussion will form the basis for environmental management planning and will lead to designing of an EIA for the Radio FM station project.

The rationale used in this impact's evaluation is drawn from FMEnv sectoral guidelines and the World Bank Guidelines/ IFC performance standards. The assessment process is shown below:

- ✚ Identification of the various potential impacts using interaction matrix to show the relationship/ interaction between the project environmental components and planned project activities.
- ✚ A screening of potential impacts associated with each phase of the project is performed using a Risk Assessment Matrix; and
- ✚ A detailed evaluation of the individual impact producing factors that comprise each aspect of the project phases is then performed. The significances of the potential impacts are quantified using the same rationale as for the screening.

5.2 IMPACT ASSESSMENT METHODOLOGY

A list of environmental indicators and likely impacts on the project environment were developed to identify the significant impacts of the proposed project.

The assessment of project impacts and their significance is required both for the environmental management of the project and to communicate project information to stakeholders.

The approach adopted in this impact assessment was geared towards addressing both requirements. The methodology used for the proposed FIX FM 103.3 MHz activities is summarized in **Figure 5.1**, while a

description of the process and the results obtained on application of the method are described in the following sections.

In order to effectively carry out the impact assessment and prediction, the following inputs and approaches were relied upon:

- ✚ Superimposing project components on existing environmental conditions to identify potential impact areas and critical issues;
- ✚ Field investigations;
- ✚ Consultation with experts, stakeholders and nearby communities;
- ✚ Development and maintenance of a comprehensive database on the biophysical and socio-economic characteristics of the environment of the project area;
- ✚ Experience from similar projects worldwide;
- ✚ Discussions with project proponents and design contractors;
- ✚ Published and unpublished documents providing guidance on performing impact analysis.

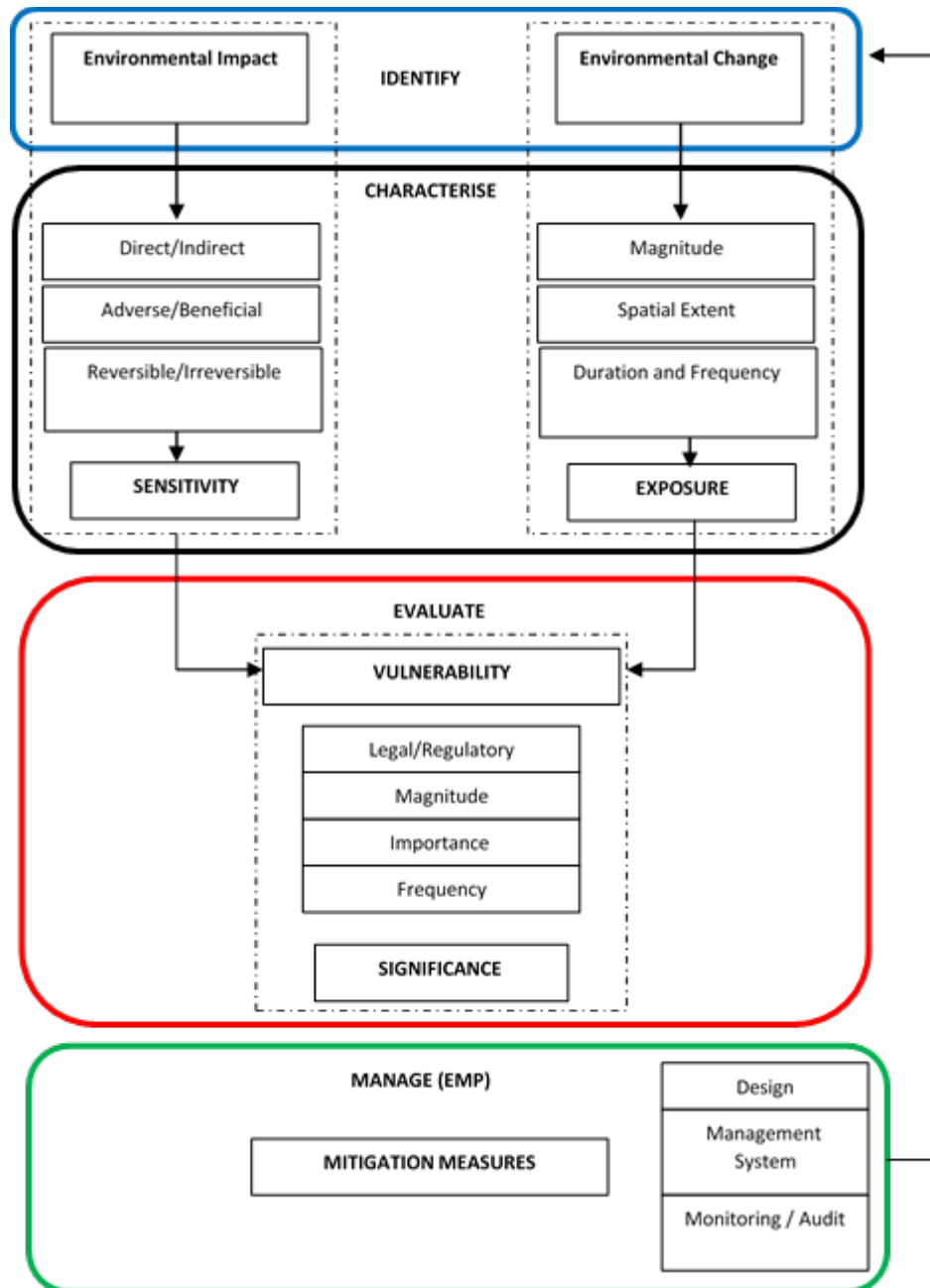


Figure 5.1: Schematic of the Impact Assessment Methodology

5.2.1 Identification of Impacts and Activities Interactions

Details of the Radio FM activities that could engender environmental impacts are as follows:

Pre-Construction Phase: Involves activities such as project design and planning, consultation, recruitment, site preparation and clearing, access road creation, transportation of the equipment to the site.

Construction and Installation: This phase involves the construction of civil structures, installation of equipment.

Commissioning Phase: It involves the integrated application of a set of engineering techniques and procedures to check, inspect and test every operational component of the project, from individual functions, such as instruments and equipment.

Operational Phase: This is usually ‘long term’, involving activities from post construction to pre-decommissioning. Transmission of radio signals, maintenance of the facility and waste management.

Decommissioning/ Abandonment Phase: It begins once the base transceiver site facility is discontinued or project life span has come to an end.

It should be noted that impacts can occur at any time; during these phases mentioned above i.e. pre-construction, construction/installation and operational phases of the project. Some impacts may however occur in some or all phases of the project.

At this stage of the impact assessment, a wide range of environmental components which project activities may possibly interact were considered. The components that were not relevant to the project were not considered. The environmental components considered are presented in **Table**

Table 5.1: Components of Environmental Aspects prone to Project Activities

Aspect	Components
<i>Biophysical</i>	Atmospheric elements: Air Quality, GHG emissions, etc.
	Noise level
	Aquatic Ecology: Biota, Water and Sediment
	Terrestrial: Geology, topography, soil quality, vegetation, Wildlife
	Ecosystem
<i>Human, Socioeconomic and Cultural</i>	Land-use pattern
	Local population level
	Socio-economic systems
	Socio-cultural Systems
	Basic Amenities and Station
	Transportation System
	Environmental justice
	Aesthetics
	Employment and income
Station (water and electricity supply)	

The Radio FM station construction and operation activities were examined for their potential to result in changes to the environmental components (Table 5.1) using impact indicators/indices as presented in **Table 5.2**.

Table 5.2: Environmental Components and their Impact Indicators

ASPECT	ENVIRONMENT	IMPACT INDICATORS
--------	-------------	-------------------

	AL COMPONENT	
<i>Biophysical</i>	Atmospheric elements	Gaseous emissions (like: NO _x , SO _x PM, CO) that contaminates ambient air quality and contribute to atmospheric impacts both at local and global level, e.g. GHG leading to issues like stratospheric Ozone depletion and climate change
	Noise levels	Increase in ambient noise level
	Aquatic Ecology	Changes in the baseline physic-chemical properties of surface water. Changes in the Physico-chemical properties of sediment. Changes in community composition and abundance of aquatic biota including; microbes, plankton, macro-benthos, fishes, mammals, reptiles, amphibians, bird's species, etc.
	Geology	Changes in geology and geomorphology
	Soil	Changes in physic-chemical and biological properties of soil
	Topography	Changes in land terrain and topography
	Vegetation	Changes to vegetation population, health, species abundance and diversity and impact on endangered and economic species
	Wildlife	Changes in wildlife distribution and abundance
	Ecosystem	Changes in ecosystem level of impacts such as: animal and plant communities, nutrient balance, loss of habitats, etc.
	Human, Socioeconomic and Cultural	
Land-use pattern		Changes in land-use patterns such as agriculture, fishing, logging, hunting, etc,
Local Population level		Immigration and emigration of remote people
Socio-economic system		Changes in employment opportunities, income differentials, inflation, difference in per capita income, inequality of benefits to local population, etc
Socio-cultural system		Changes in social structure, organization and cultural heritage, practices and beliefs, natural resources, rights of access, changes in value system influenced by foreigners, etc.
Basic Amenities and Station		Access to goods and services such as housing, education, healthcare, water, fuel, electricity, sewage and waste disposal, consumer goods brought into the region, etc.
Transportation		Changes in transport systems and associated effects such as noise,

	System	accidents risk, changes in existing facilities, etc.
	Environmental Justice	Conflicts in choice making between development and protection of natural resources use, recreational use, historical and cultural resources, tourism, etc.
	Aesthetics	Presence of unsightly or noisy facilities.

5.2.2 Preliminary Identification and Screening of Environmental Impacts

In line with widely recommended impact assessment approaches (FMEnv. 1995; UNEP, 1996; Canter, 1996; Lohani *et al.*, 1997) the first level of impact assessment involved preliminary identification and screening of potential environmental impacts from anticipated activity-environment interactions based on understanding of the activities and nature of interaction with environmental components.

To further guide the identification and screening of impacts using the matrix, impact indicators or indices were developed for each of the environmental component's interaction. Impact indicators are observable or measurable parameters of each environmental component that can be directly or indirectly linked to changes in environmental conditions. **Table 5.3** gives a list of the typical impact indicators that were used for this impact assessment study.

A modified Leopold matrix (Leopold, 1971) was used for the identification and screening. The matrix arrays project activities against environmental (biophysical and socio-economic) components, and supports a methodical comprehensive and objective identification of impacts each activity could have on the environmental components. The matrix consists of a horizontal list of biophysical and socioeconomic environmental components that could be affected by the proposed activities versus a vertical list of project activities, which represent environmental aspects, or sources of impacts associated with each project phase. Entries in the matrix cells represent the nature and preliminary ranking of the impacts. Ranking of the severity is based on the colour code shown in Table 5.3 below.

Table 5.3: Impact Ranking Matrix

+	Positive Impact
0	Negligible/No Impact
1	Minor Impact
2	Moderate Impact
3	Major Impact

The impact ranking categories are defined as follows:

Positive Impact - this is impact that adds a measurable benefit to the environment.

Negligible Impact - this impact may occur but based on experience, available scientific information and expert knowledge will have very insignificant effect on the environment.

Minor Impact - this impact could either affect a large (as defined below) or moderate (less than 40%) amount of an affected resource and has mid to long-term effect, but is most likely reversible.

Major Impact - this impact would affect a large (higher than 40%) amount of a resource and/or has a relatively long-term effect.

In this preliminary screening, all potential impacts, whether likely or unlikely, are considered. The likelihood of an impact is further assessed in the detailed impact evaluation.

The result of the preliminary impact identification and screening is presented in **Table 5.4**.

Table 5.4: Modified Leopold Matrix – Preliminary Impact Identification and Screening Results

PROJECT PHASE AND ACTIVITIES	BIOPHYSICAL ASPECTS									SOCIO-ECONOMIC ASPECTS/HEALTH				
	Soil and Topography	Geophysical	Hydrology	Air Quality, Noise and Vibrations	Climate Change	Surface and Groundwater Quality	Vegetation	Wildlife	Land Use	Population	Economy	Transportation\Traffic	Facilities and Station	Health, Safety and Security
A. PRE-CONSTRUCTION PHASE														
Project Initiation and Design	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Project FMEnv. Permit Application	0	0	0	0	0	0	0	0	0	0	+	0	0	0
Site Acquisition and Survey	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Movement of Men and Materials	1	0	0	1	0	0	0	1	0	1	+	2	1	2
Excavation of soil	3	1	1	2	0	1	3	1	1	1	+	2	2	2
B. CONSTRUCTION PHASE														
Formworks to column base and reinforcements	1	0	0	2	0	0	0	1	1	0	+	2	1	3
Casting, block-works and cementing	1	1	0	1	0	0	0	1	1	0	+	1	2	2
Site drainage and access road construction	2	0	0	2	0	1	2	1	2	1		1	2	1
Transportation of construction materials, electrical generators, equipment and personnel	1	0	0	1	1	0	1	1	1	1	+	2	1	1
Erection of tower and installation of equipments	1	0	0	1	0	0	0	1	0	0	+	0	1	1
Operation of machines and vehicles	1	0	0	1	1	0	0	1	1	0	+	0	1	1

PROJECT PHASE AND ACTIVITIES	BIOPHYSICAL ASPECTS									SOCIO-ECONOMIC ASPECTS/HEALTH				
	Soil and Topography	Geophysical	Hydrology	Air Quality, Noise and Vibrations	Climate Change	Surface and Groundwater Quality	Vegetation	Wildlife	Land Use	Population	Economy	Transportation\Traffic	Facilities and Station	Health, Safety and Security
Wastes Disposal	3	0	0	1		2	0	1	1	0	0	0	0	3
Vehicular fumes	1	0	0	3	1	0	0	1	0	0	0	1	1	2
C. OPERATION PHASE														
Handling and storage of fuel	1	0	0	1	0	2	0	0	0	0	0	1	0	2
Generator and other equipment operation	0	0	0	3	1	1	0	1	0	0	0	0	0	2
RF emission from the antennae	0	0	0	0	0	0	0	1	0	0	0	0	0	1
Disposal of wastes	1	0	0	1	0	2	0	1	1	0	0	0	0	1
Maintenance	1	0	0	1	0	2	0	0	0	0	+	1	0	1
D. DECOMMISSIONING PHASE														
Dismantling of Tower and other facilities	2	1	0	2	0	1	1	0	2	1	+	2	2	2
Restoration of site	+	0	0	1	0	0	+	0	+	0		0	0	1
Disposal of wastes	1	0	0	1	0	2	0	1	1	0	0	0	0	1

Identification and screening of impacts relied on the following:

- ✚ Documented impacts of similar projects in similar environments
- ✚ Consultation with thematic experts
- ✚ Professional judgment.

Spatial boundaries of interaction were decided based on specialist knowledge and documented experience of the specific activity-environment interaction. **Table 5.5** gives the associated and potential impact of the Radio FM at various stages of the project.

Table 5.5 Checklist of Associated and Potential Impacts for Greenfield sites

PROJECT PHASE	PROJECT ACTIVITIES	ASSOCIATED AND POTENTIAL IMPACTS
PRE-CONSTRUCTION	Mobilization of equipment and personnel	<ul style="list-style-type: none"> • Increased traffic and delays • Road accidents • Noise from heavy duty vehicles • Gas emission from vehicles/machines • Damage to roads e.g. potholes
	Recruitment of workers	<ul style="list-style-type: none"> • Generation of employment • Increase in economic activities • Increase in the price of commodities (High demand for food, fuel etc) • Socio-cultural difference/language differences • Increase population/Demographic changes • Conflicts between the migrant and the Local people • Increase in unplanned pregnancies, communicable and sexual disease transmission e.g. HIV, Hepatitis etc • Increase in demand for drugs and utilities • Increase demand for housing
		<ul style="list-style-type: none"> • Youth unrest resulting from unemployment • Communal clashes resulting from differences in the employment of youths
CONSTRUCTION	Soil Excavation	<ul style="list-style-type: none"> • Underground water contamination from intrusions • Loss of top soil/Soil erosion • Accidents leading to injury /death of workers • Dust emission
	Erection of tower and installation of equipment	<ul style="list-style-type: none"> • Accidents leading to injury /death of workers • Waste generation and disposal
OPERATION	<ul style="list-style-type: none"> • Use of power generator • Transmission of radio signals • Fuel supply and storage • Maintenance of facility 	<ul style="list-style-type: none"> • Hearing Impairment due to noise/nuisance from the generators • Cracking of structures due to Vibration from generators. • Air pollution due to gaseous emissions from generators • Exposure to radiation due to RF emission from

PROJECT PHASE	PROJECT ACTIVITIES	ASSOCIATED AND POTENTIAL IMPACTS
		<ul style="list-style-type: none"> antennae • Ground water and surface water contamination due to diesel spillage • Soil pollution due to spent oil discharges • Waste generation and disposal • Job creation • Improved communication leading to better business opportunity and economic enhancement • Increased income for FIX FM 103.3 MHz and revenue for Government. • Collapse of tower • Electrocutation • Fire Outbreak • Fall from height leading to injuries or death
DECOMMISSIONING	<ul style="list-style-type: none"> • Dismantling of Tower and other facilities • Restoration of site 	<ul style="list-style-type: none"> • Injuries from exposed machines, metals, woods etc • Bad Aesthetics and environmental pollutions • Accumulation of waste materials in the environment

5.2.3 Detailed Assessment of Impacts

The preliminary identification and screening of environmental impacts resulted in a group of focus impacts, which were further assessed in terms of severity and significance. Impact severity and significance criteria used at this stage relied on a number of resources and tools including the following:

- ✚ Federal Ministry of Environment (FMEnv.) EIA Guidelines;
- ✚ Overlaying project components on maps of existing conditions to identify potential impact areas and issues;
- ✚ Environmental Baseline Studies conducted specifically for this project;
- ✚ Consultation with Nigerian experts and residents;
- ✚ Experience from similar projects in Nigeria and worldwide;
- ✚ Published and unpublished documents (such as *The World Bank Environmental Assessment Sourcebook* and other authoritative texts on performing environmental impact assessments) providing guidance on performing impact analysis for industrial development activities;
- ✚ UNEP EIA Training Resources Manual (1996);
- ✚ European Commission Guidance on EIA EIS Review (*European Commission, 2001*).

These significance criteria were applied to all potential impacts initially identified during the screening process to determine whether they would likely be negligible, minor, moderate, or major. The impact assessment at this stage takes into consideration design mitigation measures. Those issues determined to be

inconsequential or not applicable after consideration of the design mitigation measures were eliminated from or “screened out” from further consideration. Table 5.6 summarizes the Impact Severity Ratings.

A Qualitative and quantitative discussion of the potential for cumulative effects was then used to further qualify the impact based on knowledge of other attendant or anticipated stress factors.

Table 5.6: Impact Severity Criteria

	Magnitude	Areal Extent	Frequency	Duration	Sensitivity of Receptor
High	Large amount of the resource or pollution is affected; an easily observable and measurable effect OR greater than quantitative or semi-quantitative criteria	Impact to the national, regional or global environment (e.g.,GHG emissions)	Continuous impact: impact will occur continuously throughout the life of the project	Long-term impact; recovery will not occur within ten years.	Receptor is of high economic, social and/or environmental importance and/or has intrinsic sensitivity (including vulnerability and exposure) to the specific impact.
Medium	Moderate amount of the resource or population is affected; generally measurable and observable effect OR at the quantitative or semi-quantitative criteria	Impact to the general vicinity of the project site or study area	Intermittent impact: impact will occur intermittently over the life of the project	Moderate-term impact; recovery will occur between one and ten years	Receptor is of moderate economic, social and/or environmental importance and is not particularly vulnerable and/or exposed to the impact
Low	Small amount of the resource or population is affected; a low magnitude impact may be within the range of normal variation of background conditions OR less than the quantitative or semi-quantitative criteria OR impact not detected or at	Impact limited to the immediate vicinity of the activity or occurrence that result in the impact.	Rarely occurring impact: impact will occur a very limited number of times (e.g., construction impacts)	Short-term impact; recovery will occur in less than one year	Receptor is of low economic, social and/or environmental importance and is not vulnerable and/or exposed

	background conditions.				
Negligible	The amount of the resource or population affected is unnoticeable or immeasurable small OR impact not detected or at background conditions.	Impact limited to a very small part of the activity area.	Negligible category is not applicable in this situation because impact with no frequency would not occur, and were screened out.	Recovery from impact is short-termed and almost immediate.	Receptor is not of economic, social and/or environmental importance and/ sensitive and/or vulnerable.

5.3 IMPACT EVALUATION

Impact quantification and Determination of Significant Impacts

The identified associated and potential impacts of the proposed Radio FM were quantified using the Risk Assessment Matrix and the ISO 14001 criteria.

Criteria and rating for identifying significant environmental impacts of the project are as follows:

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

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 proposed project 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 proposed project were identified as those impacts in the checklist table.

The basis for rating the level of significance of each impact as 'High', 'Medium' or 'Low' is as follows:

High Significance

- (i) $(L+R+F+I+P) \geq 15$: Sum of weight of legal requirements, risk factor, frequency of occurrence, importance and public perception greater than or equal to the benchmark (15).
- (ii) $(F+I) > 6$: Sum of weight of frequency of occurrence and importance of affected environmental component exceeds the benchmark (6).
- (iii) $P=5$: The weight of the public perception / interest in the potential impact exceeds the benchmark (5)

Medium Significance

$(L+R+F+I+P) \geq 8$ but < 15 : Sum of weight of legal requirements, risk factor, frequency of occurrence, importance and public perception greater than or equal to (8) but less than (15).

Low Significance

$(L+R+F+I+P) < 8$: Sum of weight of legal requirements, risk factor, frequency of occurrence, importance and public perception less than (8).

5.4 CHARACTERIZATION OF ASSOCIATED AND POTENTIAL IMPACTS

Direct Impact (D) – These are impacts resulting directly (direct cause-effect consequence) from a project activity.

Indirect Impacts (I) – These are impacts that are at least one stop removed from a project activity. They do not follow directly from a project activity.

Beneficial Impacts (B) - These are impacts that would produce positive effect on the biophysical or socio-economic environment

Adverse Impact (A) – Adverse impacts are those that would produce negative effect on the biophysical or socio-economic environment.

Long term Impact (L) – These are impacts whose effects remain even after a specific project activity.

Short Term Impact (S) - These are impacts whose effects will last only within the period of the project.

Reversible Impacts (RV) - can be addressed on the application of adequate mitigation measures.

Irreversible Impacts (IRV) - These are impacts whose effects are such that the subject (impacted component) cannot be returned to its original state even after adequate mitigation measures are applied.

Cumulative Impact (C) - These are impacts resulting from interaction between on-going project activities with other activities, taking place simultaneously.

Residual Impact (R) - These are impacts that would still remain after mitigation measures have been applied.

Table 5.7: Risk Assessment for Environmental Consequences

	A	B	C	D	E	CONSEQUENCES	Probability Category	Definition
I							A	Possibility of Repeated Incidence
II							B	Possibility of Isolated incidence
III							C	Possibility of Occurring Sometimes
IV							D	Not likely to occur
Consequence Category	Consideration							
	Safety/Health		Public duration	Environmental Impact	Final Impact			
I	Fatalities/Serious Impact on Public		Large Community	Major/Extended Duration/Full Sale Response	High			
II	Serious injury to Personnel/Limited Impact on Public		Small Community	Serious/Significant Resources Commitments	Medium			
III	Medical Treatment for Personnel/No Impact on Public		Minor	Moderate/Limited Response of Short Duration	Low			
IV	Minor Impact on personnel		Minimal to None	Minor/Little or No Response Needed	None			

Table 5.8: Potential Impacts Identification, Qualification and Rating

PROJECT	PROJECT ACTIVITIES	ASSOCIATED POTENTIAL IMPACT	AND	IMPACT QUALIFICATION	IMPACT QUANTIFICATION	IMPACT RATING
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PHASES			Long Term	Short Term	Direct	Indirect	Beneficial	Adverse						L	R	F	I	P	F + I	L+R_F+I+P	Overall Rating	
PRE-CONSTRUCTION	Mobilization of equipment and workforce	• Increased road traffic		*	*			*						1	1	3	1	1	4	7	Low	
		• Road accidents		*	*			*	*	*					1	1	1	5	5	6	13	High
		• Noise from heavy duty vehicles		*	*			*	*						3	3	3	1	1	4	11	Medium
		• Gas emission from vehicles /machines		*	*			*	*	*					3	1	3	3	1	6	13	Medium
		• Damage to roads e.g. potholes		*	*			*	*						0	1	1	3	1	4	6	Low
		• Pressure on the medical facility in the community		*			*	*	*						0	1	1	3	1	4	6	Low
		• Increase in demand for drugs and other commodities	*		*			*	*						0	1	3	1	1	4	6	Low
		• Increase demand for housing		*	*			*	*						0	1	1	3	1	4	6	Low
		• Increase in the price of commodities (High demand for food, fuel etc)	*		*			*	*	*					0	1	1	3	1	4	6	Low
		• Socio-cultural difference		*	*			*	*						0	1	1	3	1	4	6	Low
		• Increase population/demographic changes		*	*			*	*	*	*				0	1	3	1	1	4	6	Low
		• Increase demand for stations		*	*			*	*	*					0	1	3	1	1	4	6	Low
		• Increase in the spread of communicable and sexual disease e.g. HIV, hepatitis etc	*		*			*	*	*					0	1	1	1	3	2	6	Low
• Conflicts/ quarrel between the migrant workers and the indigenous people resulting		*	*			*	*						0	1	1	1	3	2	6	Low		

	Recruitment of workers	from customs differences																				
		• Job creation	*		*	*	*		*		*				3	1	3	3	5	6	15	High
		• Youth unrest resulting from unemployment	*		*			*	*					3	1	3	3	5	6	15	High	
	Site clearing and creation of access roads	• Destruction of vegetation		*	*			*	*					3	1	1	3	1	4	9	Medium	
		• Destruction of wildlife habitats		*	*			*	*					3	1	1	3	1	4	9	Medium	
		• Migration of wildlife to other areas		*	*			*			*			3	1	1	3	1	4	9	Medium	
		• Damage to crops/farmlands		*	*			*		*				3	1	1	1	3	2	9	Medium	
		• Attack on field workers by dangerous wildlife such as Snakes, Scorpions, Bees and Spiders etc.		*	*			*		*				3	1	1	1	3	2	9	Medium	
	• Soil Erosion and change of topography		*	*			*	*		*			0	1	1	1	3	2	6	Low		
CONSTRUCTION	Excavation of Foundations for civil structures	• Underground water contamination from intrusions	*		*			*		*	*			0	1	1	3	1	4	6	Low	
		• Soil erosion		*	*			*	*					0	3	1	1	1	2	6	Medium	
		• Sustenance of injury / death by workers	*		*			*				*			0	1	1	1	3	2	6	Low
		• Change in land use	*		*			*	*						0	1	1	1	1	2	4	Low
		• Deterioration of workers health due to air & noise pollution, accidents & injuries	*		*			*		*					0	1	1	3	1	4	6	Low
	Erection of tower and installation of equipment	• Sustenance of injury / death by workers		*	*			*	*					3	1	3	1	1	4	9	Medium	
		• Waste generation and disposal		*	*			*	*					3	1	3	1	1	4	9	Medium	
OPERATION	Radio FM Operation	• Noxious gas emission e.g. SOx, NOx	*		*			*	*		*			3	1	5	3	1	8	13	Medium	
	• Transmission of Telecom signals	• Injury / accident to workers		*	*			*		*	*			3	1	1	1	1	2	7	Low	
	• Equipment maintenance Use of Power generators	• Tower collapse due to wind, faulty foundation or rusty metals			*			*		*				5	5	1	5	5	6	21	High	

		• Noise and vibration from generator	*		*			*		*	*	3	3	5	3	3	6	17	High
		• Electrocutation from direction contact with high voltage electricity during maintenance		*	*			*		*	*	3	1	1	1	1	2	7	Low
		• Shocks from lighting and malfunction of earthing installation		*	*			*		*	*	3	1	1	1	1	2	7	Low
		• Thermal effects due to exposure to EMF		*	*			*		*	*	3	1	1	1	1	2	7	Low
		• Wildlife migration due to noise and air pollution	*		*			*	*			3	1	1	3	1	4	9	Medium
		• Deterioration of workers health due to air & noise pollution, accidents & injuries	*		*			*	*	*	*	0	1	1	1	3	2	6	Low
		• Groundwater and surface water contamination due to diesel and oil spillage	*		*			*	*		*	0	3	3	3	3	6	12	Medium
		• Exposure to radiation	*		*			*		*	*	3	1	3	3	5	6	15	High
		• Land degradation due to disposal of solid wastes	*		*			*	*			3	1	3	1	3	4	11	Medium
		• Job creation	*		*	*	*		*			0	1	3	5	5	8	13	Medium
		• Improved communication leading to social and economic enhancement	*		*		*		*			0	1	5	5	5	10	16	High
DECOMMISSION	• Dismantling of equipment Restoration of the Environment	• Injuries from exposed machines, metals, woods etc		*	*			*		*	3	1	1	1	1	2	7	Low	

	<ul style="list-style-type: none"> • Bad Aesthetics and environmental pollutions 		*			*									0	1	1	3	1	4	6	Low
	<ul style="list-style-type: none"> • Accumulation of waste materials in the environment 		*	*		*		*	*						3	3	3	3	3	6	15	High
	<ul style="list-style-type: none"> • Increased road traffic 		*	*		*									1	1	3	1	1	4	7	Low
	<ul style="list-style-type: none"> • Road accidents 		*	*		*	*	*							1	1	1	5	5	6	13	High
	<ul style="list-style-type: none"> • Noise from heavy duty vehicles 		*	*		*	*								3	3	3	1	1	4	11	Medium
	<ul style="list-style-type: none"> • Gas emission from vehicles /machines 		*	*		*	*	*							3	1	3	3	1	6	13	Medium

5.5 DESCRIPTION OF IMPACTS

In discussing the impacts of the project, an assessment of the effects of the activities listed below on the various relevant environmental components was undertaken and is presented accordingly.

A. *Construction Activities*

- ✚ Movement of materials and men;
- ✚ Clearing of site of vegetation, Excavation of soil and blasting;
- ✚ Formworks to column base and reinforcements;
- ✚ Casting, block-works and cementing;
- ✚ Sanitary fittings, site drainage and access road construction;
- ✚ Transportation of construction materials, electrical generators, equipment and personnel;
- ✚ Hooking up equipment and other;
- ✚ Operation of machines and vehicles;
- ✚ Wastes Disposal (industrial and domestic)

B. *Operation and Decommissioning Phase*

- ✚ Handling and storage of fuels;
- ✚ Noise and vibration from the generator
- ✚ RF from the antennae;
- ✚ Disposal of industrial and domestic wastes;
- ✚ Maintenance;
- ✚ Decommissioning Activities
- ✚ Vehicular fumes

5.5.1 *Positive impacts*

5.5.1.1 *Impacts on Economy*

The impacts of the Radio FM station development and operation activities on economic activities will be felt at both national and the local (micro-economy) level through improved radio signal transmission during the operational phase. Primarily, positive impacts are expected to arise on the economy during construction. Some of these impacts include the following:

- ✚ During these activities, traders around project sites may witness increased sales, as project workers will patronize them. This will result in increased inflows for them.
- ✚ Similarly, a significant proportion of the materials to be used for the project can be obtained locally. Therefore, project proponent will acquire many of these things within the local market. This means that there will be financial injections into the economy. This will translate into slight improvements in cash flows within the local economy.

The operation of the New Radio FM will increase FIX FM 103.3 MHz Stations income and invariably increase the revenue to the Federal Government through tax.

5.5.1.2 Job creation opportunities both locally and international

The labor required for the project will be sourced locally and internationally. The rate of unemployment in the project area presently is high. During mobilization, movement of goods, personnel and equipment will create unskilled jobs (Foundation excavation, offloading, storing, security-related, etc). During the site preparation, construction and operational maintenance phases, the communities and other Nigerians will also benefit from both skilled and unskilled jobs.

5.5.2 Negative impacts

5.5.2.1 Construction Impacts

Impacts on Air Quality, Noise and Vibrations

Potential impacts on the air quality during construction phase will be due to exhaust and dust emissions generated in and around the construction site by the construction equipment. Motor vehicles used to mobilize materials for construction and machines will affect the ambient air quality by emitting pollutants through exhaust emissions.

Typical construction activities during the project include heavy machinery such as earth movers etc. The process of mobilizing these to site and using them for various project activities is usually attended with the emission of various air contaminants such as suspended dust particles, noxious gases from generators and other diesel-fired equipment. These could negatively impact on air quality. Based on baseline conditions documented in the area, air quality is currently in good shape. This impact will be minor in terms of magnitude and duration. In addition, it will be reversible.

In addition, noise from the various pieces of equipment and machinery as well as the actual construction activities will contrive to elevate noise and vibration levels beyond the existing ambient levels. Such noise could adversely affect the hearing of people close to construction site. In addition, vibrations from the various equipment and machinery could trigger off resonance in nearby structures thus causing cracks and faults, and eventually, collapse of such structures. This impact will be minor in terms of duration and magnitude and will also be reversible, since noise will be restricted to a limited area during the construction period.

Impact on Hydrology

Access of construction vehicles and construction personnel onto the site can result in the onset of erosion. The clearance of vegetation and increase in impermeable surfaces will reduce the capacity of the land surface to retard the flow of surface water, thus decreasing infiltration, and increasing both the quantity and velocity of surface water runoff. Human activities, which disturb the soil structure, such as the compaction of soil along footpaths and vehicle tracks, and the disturbance of the soil structure through movement of soil, can result in

increased susceptibility to erosion as a follow-on impact from increased surface water flow. The stockpiling of excavated earth and construction materials in an incorrect manner could result in contamination of runoff, as a result of erosion of stockpiles. The above potential impacts could impact on the river located near the site. Should increase water flow occur from the site, it could have potential negative impacts on the rivers functioning and processes. During the construction phase of the development, the impact extent will be limited to the site and its duration will be relevant through to the end of the construction phase and is therefore determined as negative to minor term. The possible spillage of fuel and oil as well as the clearance of vegetation (should this occur) will alter the affected environment. However, the environmental functions and processes will continue in a modified manner, therefore, the intensity of the impact is rated as minor. There is a possibility that the impact will occur to the extent that provisions must be made. Hence, the probability of the impact occurring is rated as likely. The mitigation efficiency is rated as minor. Therefore, the impact has a minor significance before mitigation. The effectiveness of the implementation of the mitigation measures will cause the significance after mitigation to be reduced to minor.

Impact on Soil

The Radio FM station project development will impact negatively on soil as a result of site activities such as site clearance, trenching/excavation, topsoil removal, soil disposal and refuse/waste disposal and will in no doubt have some impact on the environment.

The construction of physical structures on the site will obviously entail deliberate modification of the terrain. Thus, the construction and maintenance of solid stations such as buildings, roads, drainage channels, waste dump, sewage systems, etc will involve not only the use of the natural environmental resources, but also lead to the movement of environmental components, soils being a major victim. Incorrect placement of the new tanks could lead to ground water contamination.

In addition, improper excavations could cause unnecessary tank movement resulting in cracks and leaks. Should there be any spillage during the construction phase of the proposed development, the groundwater could be contaminated. Only portions of the land meant for immediate development should be cleared.

Drainage channels should be constructed in such a way to readily drain-off waste and rain water from the site, in order to forestall flooding. Thus, the impact will be negative and could be of major magnitude unless appropriate measures to protect the soil surface are adopted.

Impacts on Vegetation

It is certain that for Greenfield sites, the vegetation cover of the project site, mainly grasses, shrubs and few trees will be removed to give way for the construction of Radio FM station development. However, for Brownfield sites (roof tops), no vegetation will be removed. The effect of the dust to be generated during this process will especially be on humans living in the area and thus will implicitly impact negatively on the

vegetation. As the vegetation will be permanently removed from the allotted area, albeit small, the negative impact will be insignificant, though permanent and hence non-reversible. The magnitude of this impact could be adjudged minor.

Impacts on Wildlife

Construction activities such as vegetation clearing and site excavation could result to potential habitat destruction and wildlife migration. The rating of this impact is minor.

During construction phase, noise generated during operation of heavy-duty vehicles and machinery will disturb or drive the resident animals in the project area away. The rating of this impact is also minor because the site locations have been impacted heavily by human activities and there is little or no existence of wildlife in the areas. However, noise could be minimized if the machineries are fixed with noise mufflers where practicable.

Animal populations in the project vicinity and beyond could be killed or driven away if poisonous solid, liquid, or gaseous substances or wastes are discharged during construction. This has a modest influence. To limit or eliminate toxic discharges during construction, toxic discharges should be minimized or avoided whenever possible.

Impacts on Socio-economics

The expected impacts of the Radio FM station development on the socio economics of the Project area include the following:

- ✚ Demographic Impacts (redirection of labour, inflation). These impacts are expected to be minor as low influx of foreign labour is expected and will be limited to the duration of the project.
- ✚ Socio-economic Impacts (redirection of labour, inflation). These impacts are expected to be negligible as low influx of foreign labour is expected and will be limited to the duration of the project.
- ✚ Impacts on Lifestyles (sexual laxity, alcoholism, youth militancy). These impacts are expected to be negligible as low influx of foreign labour is expected and will be limited to the duration of the project.
- ✚ Impacts on Cultural Properties (religious sites/shrines, etc). These impacts are expected to be negligible as the project will be on the proponent acquired sites.

Impacts on Transportation of Personnel, Equipment, and Materials

The soils of the project area would be compacted if vehicles drive on earth roads and materials were stored on the ground. The increase in traffic may increase the rate of exposure to accidents. Roads may temporarily be obstructed or diverted to allow for movement of heavy equipment and materials. Apart from emissions from exhausts, the traffic situation could impose physiological stress on neighbours of the project site, in addition to significant man-hour losses in traffic. The effect is not significant, of short-term duration and reversible. This impact will only occur periodically during the lifetime of the project; thus the impact is adjudged to be of

minor magnitude and duration. Also, it is reversible since activities will normalize once the project-related transportation is completed.

Impacts on Health and Safety

Construction sites always present an element of danger. Construction workers will be exposed to accidental injuries as a result of the intensive engineering and construction activities including erection and fastening of materials, metal grinding and cutting, concrete work, steel erection and welding among others. Such injuries can result from accidental falls from high elevations, injuries from hand tools and construction equipment cuts from sharp edges of metal sheets.

Project workers during the various installation activities will be exposed to loud noise levels, especially within the immediate vicinity of the project site. Major concerns include long-term health effects, such as hearing impairment. Similarly, workers could be exposed to harmful levels of emissions from the various equipment and machinery that will be used for the project as well as the generators when operating. Thus, these negative impacts could be major but temporary unless adequate measures for workers' safety and health are put in place during the installation and operational activities.

Waste Disposal

A number of waste types shall be produced during the construction of the projects. These include metal scraps, gaskets, lubricant filters, domestic waste associated with construction etc. Improper waste disposal would lead to loss of aesthetics, risk of accidents by sharp objects/scrap piles, and contamination of soil and water bodies (through run-offs). The effects of improper waste disposal are significant, can be reversed and are of short term.

5.5.2.2 Operational Impacts

a. Impacts on Air Quality and Noise Level

The generators in the Radio FM will consume fossils fuels which are non-renewables, the energy consumption generate gaseous emissions. The escape of noxious gases, such as benzene and other chemicals related to fuels, poses a threat to human health. The dangers associated with fuels, such as petrol, include the effect of inhaling noxious gases. Benzene is a common contaminant of volatilized gases and vehicles emit gases like total hydrocarbons (HC), oxides of nitrogen (NO_x) and carbon monoxide (CO). The vapour loss occurring at offloading and loading area, with petrol transfer, is about 0.16% (Stockman & Sogorka, 1997). This would occur twice, when the tanks are discharging, and when the storage tanks are filled. Accidental petrol spills may increase the evaporative loss of petrol. However, with good housekeeping, this could be kept to a minimum, and it is therefore considered to be of lesser significance. The people closest to the petrol vapour release are the workers. The Radio FM would be sources of low-level emissions. These would disperse into the atmosphere and get diffused at rates that would be determined by atmospheric stability. Pollutants would tend to follow the

wind directions, and because of the turbulence and mixing, pollutant concentrations would reduce as the distance from the source increases. Another source of minimal air pollution is derived from the vehicles and trucks visiting the site and the fumes they emit.

The operation of Radio FM station mast sites will result in more vehicular and human traffic on site, which could lead to an increase in ambient noise level.

The VOC emissions will occur at a regional level with a minor to major intensity. The handling and storage of fuel is expected to last through the entire operational phase of the development unless the power situation improves. Therefore, the duration of the impact is calculated as long term for the operational phase of the development. The mitigation efficiency was calculated at minor to major. The impact will therefore have minor to major significance before mitigation and a no impact to minor significance if all mitigation measures are correctly implemented.

b. Noise and Vibration Impact

Noise and vibration shall be generated from the power generator in the sites. The effects of excessive noise and vibration include hearing impairment and communication problems. These may cause elevated stress levels and associated behavioural and health problems. They can also cause auditory fatigue, sleep disorders, and even contribute to learning problems in children. Vibrations can damage nearby structures, particularly makeshift or lightly constructed buildings.

It is likely that Noise levels that shall be generated during the operation of the Radio FM would slightly exacerbate the prevailing levels. The design of the Radio FM is such the generators are enclosed within the concrete bunkers and the noise level outside the bunkers are reduced to the barest minimum. Secondly, all the sites are located at a minimum distance of 10m from the nearest existing structures. It is expected that the noise level will be reasonably or completely attenuated before reaching the buildings. It may be concluded, therefore, that impacts to the public is low because it is envisaged to be insignificant in terms of severity and rare in likelihood.

c. RF Emission Impact

The radiation emitted by Radio FM (the antennas on the surface which communicate with the phones), constitute an area of worry to the population's health because, in contrast to mobile handsets, it emitted RF power continuously and is more powerful at close quarters. On the other hand, due to the attenuation of power with the square of distance, field intensities drop rapidly with distance away from the base of the antenna. Radio FM emissions must comply with ICNIRP guidelines of a maximum power density of 4.5 W m^{-2} for 900 MHz and 9 W m^{-2} for 1800 Mhz. Emissions usually fall well below these guidelines - often thousands of times lower than the ICNIRP limit. The vast majority of scientific studies that been carried out have shown no any adverse health risks/effects.

However, in order to protect the public from the risks that may arise from exposure to EMF radiation from Radio FM, all the Radio FM shall be sited in compliance with the NCC approved minimum setback from the nearest structures. There would also be fences around the stations to deter people from gaining entrance and there shall be warning signage to deter and educate unwanted visitors based on precautionary principles.

For staff that would be exposed, the frequency of contact/visit to the Radio FM shall be highly limited. Appropriate risk assessment shall be carried out and use of appropriate personal protective equipment ensured.

d. Waste Generation

The probable sources of impact are waste from servicing of equipment; and waste oil from the generators as well as disposal of these materials in the project area, which could have negative impact on the terrestrial environment, especially in term of aesthetic values and possible impact on groundwater. This impact is minor in magnitude and duration, and is reversible.

e. Mast Integrity

Buried metallic materials are susceptible to corrosion and may lead to tower collapse. Foundation of civil engineering structures that are designed without taken cognizance of soil engineering are bound to suffer settlement and subsequent failure.

f. Geologic Impact

The study area lies in a very geologically (both tectonic and seismic) stable region with no recorded cases of earthquakes or tremors. Furthermore, no major or minor faults are known to traverse the area. Therefore, the possibility of any geo-hazards occurring in the area is remote. Overall impact risk is neutral.

g. Soil Pollution

Potential impacts to soil during the operation phase could occur through the improper use, storage and handling of waste such as spent oil, oil filters, rags and diesel spillage at the Radio FM. The comprehensive environmental management

procedures prepared for the project will ensure that any potential impact(s) are adequately mitigated against. Thus, impact level is rated low with a remote likelihood of occurrence and no detectable severity.

h. Groundwater Contamination

There is a possibility of impacting the ground water during then operational phase if there is spillage of fuel. Diesel spillage usually occurs as a result of vandals attempting to steal diesel or faulty generators. Thus, the impact is rated low since the likelihood of occurrence is remote and measures to contain spillage shall be put in place.

5.5.2.3 Accidental Occurrences

Accidents are not planned events, so it is difficult or impossible to completely eliminate them from day-to-day activities and operations. However, it is possible to minimize them and/or to plan to effectively handle the situation, if and when they occur. With regards to the Radio FM station development project, a number of potential accidental occurrences have been identified. In the following sub-sections, recommendations have been made on possible measures to handle such emergencies.

a. Risk of Fire and Explosions

Source of the impact:

- ✚ The transportation of fuel;
- ✚ The storage of fuel; and
- ✚ The handling of fuel.

b. Description of the Impact

Fuel will be transported to out of the proposed depot via a tanker (vehicle). For a serious fire or explosion to result, the tanker carrying the fuel would have to rupture, thereby allowing air to mix with the fuel. Fuel spilling on the road would burn if ignited, but would not explode unless it is in a confined space. The storage of fuel always carries with it the chance of fires and explosions. These explosions may be harmful to human life and the surrounding properties. An accident during the loading of tankers would have impacts limited to the site only. Over recent years there have been reports of fires resulting due to cell phone use on site. Such incidents are cause for concern regarding the potential for future incidents on site.

c. Significance of the Impact

Should there be a fire or explosion on site, the extent of the impact will be regional, as would a fire or explosion along the tankers route. Functions or processes of the affected environment will cease to exist, causing a high intensity impact. The duration of the impact is rated as short term because the impact will either disappear with mitigation or will be mitigated through a natural process in a period shorter than that of the construction or operational phase. It is improbable that the impact will occur as several safety and precautionary measures will be employed by the Radio FM station development's management. Such safety procedures ensure that incidents do not occur on site, and therefore the significance of the impact without any mitigation is calculated as minor. As a result of the mitigation efficiency being rated at minor to major, the significance of the impact after mitigation is calculated as minor

5.6 HAZARD AND RISK ASSESSMENT

The risk and safety risk associated with the project is grouped into hazards from site preparation, installation activities and operation and maintenance. The hazards would occur due to loss of containment or loss of control of hazardous materials during construction and operational phases. This section outlines the materials that will

be stored, handled and used and facilities that will be used and operated at and how these materials and facilities may result in hazards and risks.

5.6.1 Hazard Identification

a. Pre-construction and site preparation

The movement of heavy trucks and equipment/ machineries could increase the risk of accidents/injuries due to increase in road traffic around the Radio FM station stations. Petrol and diesel would be stored on site and used for re-fuelling equipment during construction. Petrol is classified as dangerous goods. Diesel is a combustible liquid.

The most common ailments identified in the project area malaria, typhoid, and rheumatism. It is therefore possible that site staff can be exposed to the ailments. It is expected that at this stage of the project, there will be influx of people into the area and there may be introduction of sexually transmitted diseases (STDs) and HIV.

b. Installation Activities

Health and Safety Hazard during this phase of the project will include injuries and fall from height. Only competent personnel will be used during mobilization and installation of equipment. The use of PPEs will be strictly enforced.

c. Operation and Maintenance

There would be storage tanks for diesel during operation. These tanks would be constructed in the same concrete bund. The site shall be surrounded by an on-grade drainage collection system so that a fuel spill (if any) would be collected in one place. The tanker loading activities would be coordinated subject to a site operational management plan. Good safety and housekeeping practice if overlooked or neglected can seriously increase the occurrence of occupational injuries/accidents and also affect the pollution potential of a facility.

5.6.2 Risk Assessment

The identified health and safety risk of the project have been assessed in **Table 5.9** using the Bow Tie.

Table 5.9: Management of selected Health Risk/Impacts using the Bow Tie for the project

Hazard	Threat	Barriers	Top Event	Consequence	Recovery
Health Issues					
Malaria	Stagnant water and bushes at project site.	Constant fumigation of indoors and outdoors	Loss of containment; ill health	Absence from work; man-hour losses.	Standard Medicare
Typhoid	Lack of potable water	Awareness; preventive healthcare	Illness, weakness	Absence from work; man-hour losses	Standard Medicare
STDs	Influx of workers and immigrants; social habits.	Awareness campaign. Provision of condoms.	Illness and Depression.	Absence from work; man-hour losses	Standard Medicare
AIDS	Influx of immigrants	Awareness campaign. Provision of condoms.	Illness, Ostracisation, depression.	Absence from work; man-hour losses	Standard Medicare
Safety Hazard					
Flooding	Water overflowing the Radio FM station site	Weather updates from NIMET daily during operation	Drowning staff	Man-hour loss	Flood detection
Vandalism	Fire out breaks and spillage of diesel	Area shall be declared prohibited for trespassers and adequate security shall be put in place.	Disruption of activities	Closure of operation	Provision of security
Fire	Fire engulfing neighbouring facilities	Use of spark proof tools in the depot	Destruction of life and properties	Closure of operation	Training

5.7 CUMULATIVE IMPACTS

In theory, any development such as the construction of FIX FM 103.3 MHz may be taking place at the same time as other developments, causing impacts affecting the same resources or receptors, such that there will be cumulative effects with the proposed Project.

The location of majority of the proposed Radio FM are within mixed residential/agricultural areas and future residential building construction activities are envisaged.

Research of relevant documents and consultations with local and state authorities has not identified any other significant future developments whose cumulative impacts should be considered in this EIA.

5.7.1 Air Quality

The proposed FIX FM 103.3 MHz Radio FM are located within residential areas and the current sources of air emissions in the areas include burning from domestic activity, emissions from various households' power generators and traffic emission.

The measured air quality baseline values in the proposed project sites are low and within permissible limits. The expected emissions from the Radio FM station construction vehicles are very low. The power generators to be installed within the Radio FM are not different from the ones used in various household and the emissions are expected to be low as well. The cumulative dust impacts are also expected to be low since the construction phase for the project will be short and the dust generating activities shall emanate from localized excavations and vehicular movement.

The cumulative impacts on air quality are therefore considered to be of insignificant negative significance as a result of emissions from the project.

5.7.2 Noise

The proposed Radio FM station site is located within residential area and the current sources of noise emissions in the area includes domestic/communal activity, noise from various households' power generators and traffic. There are no other known developments in the area which could contribute significantly to the noise levels.

The Project operational phase Noise is not expected to be significant on the receptors in the vicinity of the site. Noise will result from vehicular movement, occasional noise resulting from wood and metal works and noise from the operation of the power generator. During construction most of the works shall be done in the day time, therefore the noise level reaching the households that are nearest to the site will be low and tolerable.

During the operation the noise level from the generator will be very minimal considering the reinforced concrete bunker design of the proposed Radio FM station site which allows little or no noise outside the Radio FM

station site. It is predicted that there will be little or no change in the baseline noise level during the operation. Therefore, the cumulative noise impact of the communities will be insignificant.

5.7.3 Soil and Geology

During the construction phase, the Project will result in the removal of vegetation in some areas and soil within a 225m² area in each proposed site, changes in drainage regime (including increased runoff due to compaction) and increased erosion potential offsite, as well as increased runoff and siltation of any run during construction, operation, and decommissioning. There's also the risk of contamination from onsite diesel storage.

When considered with the implementation of mitigation measures, the cumulative impacts on soils and geology over the three phases of the Project is considered to be minor.

5.7.4 Waste

The Project will generate various types of general and hazardous wastes during the life of the project, resulting in the potential for the contamination of soil and water resources. Wastes will include spoil, excess concrete, used timber, general and household refuse, spent oil, electrical and electronic wastes, rubble (during decommissioning) and small amounts of hazardous waste. Due to the relatively low magnitude of the contribution to the regional wastes generated and assuming implementation of mitigation, cumulative impacts are considered to be insignificant.

5.7.5 Employment and Economy

The proposed Radio FM station project is expected to provide direct, indirect and short-term employment opportunities to the contractors, technicians etc. across all phases of the project, also resulting in secondary and induced positive impacts on the economy. The provision of radio broadcasting services to the people of the region will result in significant economic benefits locally, regionally and nationally. The cumulative impacts of this additional employment in the area and radio broadcasting services to the surrounding communities will result in minor- moderate positive cumulative impacts.

5.8 SUMMARY

The FIX FM 103.3 MHz Station is very important and key development in the broadcasting sector, it is evident that the proposed initiatives will have a variety of positive and negative impact. In order to maintain environmental sustainability, efforts should be made to mitigate or totally remove the negative impacts of Radio FM station mast installation and operation.

CHAPTER SIX MITIGATION MEASURES

6.1 Introduction

Adequate planning and proper implementation of appropriate mitigation measures for adverse environmental impacts represent important activities in the EIA process. The associated and potential impacts of the proposed construction and operation of an FM Radio station in Enugu state, Nigeria by FIX FM 103.3MHz have been identified and evaluated while the impacts significance (adverse and beneficial) have also been discussed in chapter five. Consequently, the mitigation and enhancement measures for the adverse and beneficial impacts of the proposed project are presented in this chapter.

Mitigation measures are activities aimed at reducing the severity, avoiding or controlling project impacts and where possible enhance environmental quality through design alternatives scheduling or other means. Mitigation may be in the form of avoidance (alternative action taken to avoid impact) compensatory payment of money or replacement in kind for losses or recreation of lost/damaged habitat.

6.2 Mitigation Objectives and Hierarchy

In proffering mitigation measures, the primary objectives include prevention, reduction and control of adverse negative environment and social impacts.

1. **Avoidance** – methods aimed at preventing the occurrence of negative impacts, and/or impeding such occurrence from having harmful environmental/social outcomes;
2. **Minimization** – limiting or reducing the degree, extent or duration of adverse negative impacts. Reduction can be achieved by scaling down, relocating, or redesigning elements of a project;
3. **Control** – ensuring that occurring impacts are reduced to a level as low as reasonably practicable;
4. **Compensation**- to make amends for residual impacts by offsetting the effects.

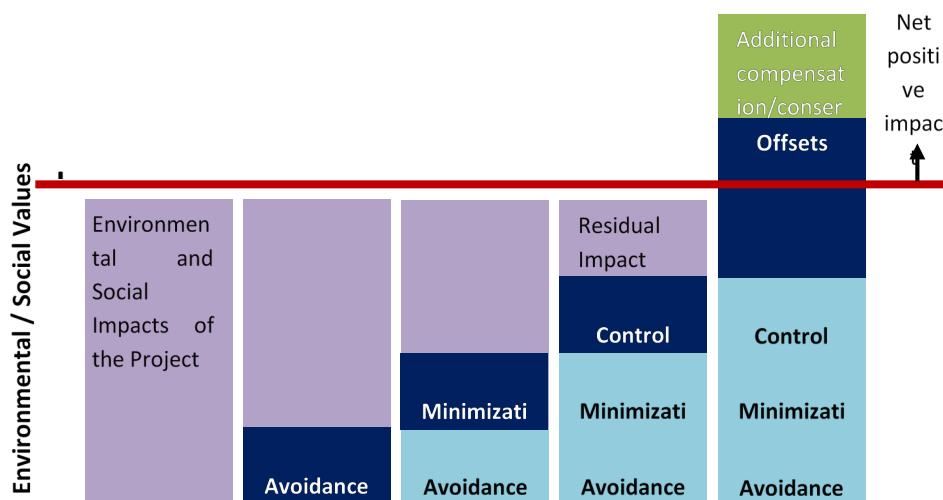


Figure 6.1: Impact Mitigation Hierarchy

6.3 *Mitigation Measures*

The mitigation requirements and measures for the identified impacts (significant and adverse) of the proposed project were generally based on the associated effect to the environment and human health/safety. The significance of the impact, probability or likelihood that the impact would occur and the severities of its consequences (as determined from the risk assessment matrix), were indices used for determining the mitigation requirement. Subsequently, the specific mitigation measures satisfying the mitigation requirement were established putting into consideration available resources and competencies, on-conditions, public concerns and technology.

The mitigation measures prescribed for identified adverse potential impacts of the proposed projects are presented in **Table 6.1 to 6.4**.

Table 6.1: Associated and Potential Impacts and Mitigation Measures for Pre-Construction Phase

PROJECT ACTIVITIES	ASSOCIATED AND POTENTIAL IMPACTS	Impact Significance before mitigation	MITIGATION MEASURES	Impact Significance after mitigation
Mobilization of equipment and personnel	<ul style="list-style-type: none"> Increased traffic and delays 	Low (-)	<ul style="list-style-type: none"> FIX FM shall ensure that the heavy vehicle and equipment are deployed in the night FIX FM shall ensure that the driver are properly educated to obey roads signs and rules FIX FM shall ensure that the vehicles are properly maintained and serviced FIX FM shall ensure that the vehicle and equipment are properly checked before moving to site FIX FM shall ensure that outriders are engaged during heavy vehicle and equipment movement FIX FM shall ensure that well trained worker are employed for this service 	Low (-)
	<ul style="list-style-type: none"> Road accidents 	High (-)	<ul style="list-style-type: none"> FIX FM shall ensure that the driver are properly educated to obey roads signs and rules FIX FM shall ensure that the vehicles are properly maintained and serviced FIX FM shall ensure that well trained workers are employed for this service FIX FM shall ensure that workers are in good physical health and are not under Alcohol or drugs 	Moderate (-)
	<ul style="list-style-type: none"> Noise from heavy duty vehicles 	Moderate (-)	<ul style="list-style-type: none"> FIX FM shall ensure that the heavy vehicle and equipment are installed with noise mufflers FIX FM shall ensure that the vehicles are properly maintained and serviced. 	Low (-)
	<ul style="list-style-type: none"> Gas emission from vehicles/machines 	Moderate (-)	<ul style="list-style-type: none"> FIX FM shall ensure that the heavy vehicle 	Low (-)

			<ul style="list-style-type: none"> and equipment are deployed in the night FIX FM shall ensure that the vehicles are properly maintained and serviced 	
	Damage to roads e.g. potholes	Minor (-)	<ul style="list-style-type: none"> Access road to the site shall be reinforced to minimize damage. 	Low (-)
	Pressure on the medical facility in the community	Low (-)	<ul style="list-style-type: none"> FIX FM shall maintain retainership agreement with a good medical facility and manned by well-trained staff. 	Negligible
Recruitment of workers	<ul style="list-style-type: none"> Socio-cultural difference/language differences 	Minor (-)	<ul style="list-style-type: none"> FIX FM shall ensure the belief and place of worship e.g. shrines are not destroyed. FIX FM shall ensure that the workers are properly cautioned to respect the culture and place of worship of the people 	Negligible
	<ul style="list-style-type: none"> Conflicts between the migrant workers and the Local people 	Minor (-)	<ul style="list-style-type: none"> FIX FM shall ensure proper consultation with the host communities and youth organizations on recruitment of labour FIX FM shall ensure effective transport system is put in place for movement of workers FIX FM shall maintain retainership agreement with a good medical facility and manned by well-trained staff. FIX FM shall ensure that the workers are properly educated on sexual and communicable disease FIX FM shall ensure that cases that cannot be handled in the clinic are referred to general hospitals FIX FM shall put in place safety measures to safeguard the health of the workers FIX FM shall ensure the availability of drugs/hospital consumables in the Clinic 	Negligible
	<ul style="list-style-type: none"> Increase in unwanted pregnancies, communicable and sexual disease transmission e.g. HIV, Hepatitis etc 	Minor (-)	<ul style="list-style-type: none"> FIX FM shall ensure that the workers are properly educated on sexual and communicable disease 	Negligible
	<ul style="list-style-type: none"> Increase in demand for drugs and utilities 	Minor (-)	<ul style="list-style-type: none"> FIX FM shall maintain retainership 	Negligible

			<p>agreement with a good medical facility and manned by well-trained staff.</p> <ul style="list-style-type: none"> ✚ FIX FM shall ensure that cases that cannot be handled in the clinic are referred to general hospitals ✚ FIX FM shall ensure the availability of drugs/hospital consumables in the Clinic 	
	✚ Employment of workers	Medium (+)	✚ FIX FM shall ensure that the host communities are consulted and considered during recruitment of workers.	Medium (+)
	✚ Increase demand for housing/stations	Low (-)	<ul style="list-style-type: none"> ✚ FIX FM shall make arrange for its workers, also ensure Its contractor make adequate arrangement for their staffs. ✚ FIX FM shall ensure proper consultation with the host communities in cases of any demand for accommodation arises 	Negligible (-)
	✚ Youth unrest resulting from unemployment.	Medium (-)	✚ FIX FM shall ensure proper consultation with the host communities and youth organizations on recruitment of labour	Negligible (-)

Table 6.2: Associated and Potential Impacts and Mitigation Measures for Construction Phase

PROJECT ACTIVITIES	ASSOCIATED AND POTENTIAL IMPACTS	Impact Significance before mitigation	MITIGATION MEASURES	Impact Significance after mitigation
Soil Excavation	<ul style="list-style-type: none"> Soil erosion (not applicable Roof Top Site) 	Moderate (-)	<ul style="list-style-type: none"> FIX FM shall ensure proper evacuation and disposal of soil removed from excavation. Excavated areas shall be rehabilitated by filling. The sites shall be leveled and landscaped. Shrubs/grasses shall be planted to check erosion. Embankments shall be developed on steep slopes to protect them from erosion. Stone pitch to protect slopes where necessary. 	Negligible (-)
	<ul style="list-style-type: none"> Surface Water contamination from spoil (not applicable Roof Top Site) 	Moderate (-)	<ul style="list-style-type: none"> FIX FM ensure that soil removed from excavation activity do not wash back into rivers or streams by run -offs 	Negligible (-)
	<ul style="list-style-type: none"> Accidents leading to injury /death of workers 	Moderate (-)	<ul style="list-style-type: none"> Provide safety warning and instruction signboards All visitors to the project sites must be briefed on safety Ensure safety briefings each morning before workers go on with their work Barricade project site and write signs in English and local language mounted at strategic positions to ward off intruders or unwanted visitors Provision of diversions away from construction site Open ditches and other potential hazards to be properly marked with visible tapes 	Negligible (-)
Erection of tower and	<ul style="list-style-type: none"> Accidents leading to injury /death of workers 	Minor (-)	<ul style="list-style-type: none"> Provide safety warning and instruction signboards 	Low (-)

installation of equipment			<ul style="list-style-type: none"> ✚ All visitors to the project sites must be briefed on safety ✚ Ensure safety briefings each morning before workers go on with their work ✚ Barricade project site and write signs in English and local language mounted at strategic positions to ward off intruders or unwanted visitors ✚ Provision of diversions away from construction site ✚ Open ditches and other potential hazards to be properly marked with visible tapes 	
	✚ Waste generation and disposal	Moderate (-)	<ul style="list-style-type: none"> ✚ Waste receptacles shall be created to ensure proper disposal of waste on site. ✚ FIX FM shall ensure that worksites remain clean, well maintained and free of hazards. ✚ Government approved waste managers shall be engaged to handle all wastes. ✚ Spent oil shall be managed by certified oil recycling companies. 	Negligible
	✚ Collapse of tower structure	Major (-)	<ul style="list-style-type: none"> ✚ FIX FM shall ensure that all design and construction are in line with acceptable engineering standard and make use of deep foundation system to support the columns of the bridge likely to suffer from differential settlement of subsurface condition ✚ Regular inspection shall be carried out to ascertain the integrity of the towers. ✚ Use deep foundation system to support the columns of the bridge likely to suffer from differential settlement of subsurface condition. ✚ Ensure structural stability of all facilities with reference to the appropriate safety design codes ✚ FIX FM shall include requirement for 	Low (-)

			independent materials testing in contracting documents ✚ FIX FM shall give adequate attention to the recommendation of the geotechnical survey.	
	✚ Fears of the residents about the perceived health impact of the project	Medium (-)	✚ Regular enlightenment of the communities on their safety as it relates to the existence of the facility around their homes	Negligible

Table 6.3: Associated and Potential Impacts and Mitigation Measures for Operational Phase

PROJECT ACTIVITIES	ASSOCIATED AND POTENTIAL IMPACTS	Impact Significance before mitigation	MITIGATION MEASURES	Impact Significance after mitigation
Use of power generator	✚ Air pollution due to gaseous emissions from generators and haulage vehicles such as CO ₂ , VOCs, NO _x , SO _x that results to climate change	Moderate (-)	✚ Public Power supply shall be used as much as possible. The site will run on hybrid batteries especially at night and this will reduce of amount of gases released into atmosphere ✚ Generators with high combustion efficiency shall be used ✚ Facilitate the use of cleaner fuels ✚ Engage well maintained and efficient fuel leakage trucks in line with recommended standards by manufactures. ✚ Service vehicles as and when due as stipulated by the manufactures.	Low (-)
	✚ Nuisance and cracking of structures due to Noise and Vibration from generators. ✚	Moderate (-)	✚ The generators shall be confined within an enclosed concrete sound proof structure ✚ All generators should be serviced promptly ✚ All over-aged generators should be replaced with new ones. ✚ Sound proof generators shall be installed. ✚ FIX FM should ensure that all generators are placed on a reinforced concrete plinth to minimize vibration ✚ All generators should be installed with effective vibration dampers.	Low (-)
✚ Transmission of broadcasting signals	Improved Radio signal transmission and coverage	High (+)	✚ FIX FM shall ensure adequate maintenance of the facility	High (+)
		Minor (-)	✚ Radiation emitting equipment shall be confined within a concrete structure	Negligible

	Exposure to radiation due to RF emission from antennae		<ul style="list-style-type: none"> ✚ FIX FM shall ensure that PPEs are provided for staff ✚ Fence shall be erected around the station to deter people from gaining entrance ✚ Regular RF monitoring shall be carried out around the site to ensure that the radiation levels are within acceptable limits. ✚ There shall be warning signage to deter and educate unwanted visitors based on precautionary principles. ✚ For staff that would be exposed, the frequency of contact/visit to the bases station shall be highly regulated and they shall undergo regular medical check-up 	
✚ Fuel supply and storage	Soil pollution due to spent oil discharges	Medium (-)	<ul style="list-style-type: none"> ✚ All spent oil generated from maintenance of generators shall be collected in an appropriate receptacle and given out for recycling by a competent facility. 	Negligible
	Ground water contamination due to diesel spillage Ground water contamination due to diesel spillage	Minor (-)	<ul style="list-style-type: none"> ✚ Bund walls shall be erected around all fuel storage. ✚ Surface soil within the site shall be paved ✚ FIX FM shall adopt a standard fuel delivery process to ensure non spillage of diesel during delivery 	Negligible
✚ Maintenance of facility	✚ Air pollution due to gaseous emissions from generators and haulage vehicles	Medium (-)	<ul style="list-style-type: none"> ✚ Public Power supply shall be used as much as possible. ✚ The site will run on hybrid batteries especially at night. ✚ Generators with high combustion efficiency shall be used ✚ Facilitate the use of cleaner fuels ✚ Engage well maintained and efficient fuel leakage trucks in line with recommended standards by manufactures. ✚ Service vehicles as and when due as stipulated by the manufactures. 	Low (-)
	✚ Waste generation and disposal	Moderate (-)	<ul style="list-style-type: none"> ✚ Waste receptacles shall be created to ensure 	Low (-)

			<p>proper disposal of waste on site.</p> <ul style="list-style-type: none"> ✚ FIX FM shall ensure that worksites remain clean, well maintained and free of hazards. ✚ Government approved waste managers shall be engaged to manage the wastes. ✚ Spent oil shall be managed by certified oil recycling facilities. 	
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Table 6.4: Associated and Potential Impacts and Mitigation Measures for Decommissioning Phase

PROJECT ACTIVITIES	ASSOCIATED AND POTENTIAL IMPACTS	Impact Significance before mitigation	MITIGATION MEASURES	Impact Significance after mitigation
<ul style="list-style-type: none"> ✚ Dismantling of Tower and other facilities ✚ Restoration of site 	<ul style="list-style-type: none"> ✚ Road accidents 	Low (-)	<ul style="list-style-type: none"> ✚ FIX FM shall ensure that the drivers are properly educated to obey roads signs and rules ✚ FIX FM shall ensure that the vehicles are properly maintained and serviced ✚ FIX FM shall ensure that well trained workers are employed for this service ✚ FIX FM shall ensure that workers are in good physical health and are not under Alcohol or drugs 	Negligible
	<ul style="list-style-type: none"> ✚ Noise from heavy duty vehicles 	Moderate (-)	<ul style="list-style-type: none"> ✚ FIX FM shall ensure that the heavy vehicle and equipment are installed with noise mufflers ✚ FIX FM shall ensure that the vehicles are properly maintained and serviced. 	Low (-)
	<ul style="list-style-type: none"> ✚ Gas emission from vehicles/machines 	Moderate (-)	<ul style="list-style-type: none"> ✚ FIX FM shall ensure that the heavy vehicle and equipment are deployed in the night ✚ FIX FM shall ensure that the vehicles are properly maintained and serviced 	Low (-)
	<p>Damage to roads e.g. potholes</p>	Minor (-)	<ul style="list-style-type: none"> ✚ Access road to the site shall be reinforced to minimize damage. 	Low (-)
	<ul style="list-style-type: none"> ✚ Bad Aesthetics and environmental pollutions ✚ Accumulation of waste materials in the environment 	Moderate (-)	<ul style="list-style-type: none"> ✚ FIX FM shall follow FMENV / NESREA approved waste management plan ✚ FIX FM shall ensure cleanup in compliance with relevant national and international guidelines, involving the removal of the waste, etc ✚ FIX FM shall ensure that the equipment is removed and disposed properly ✚ FIX FM shall ensure that the machines and equipment are sold and cleared from site 	Negligible

CHAPTER SEVEN ENVIRONMENTAL MANAGEMENT PLAN

7.1 INTRODUCTION

Environmental Management Plan (EMP) is an environmental management application tool used to monitor the effectiveness of the mitigation measures and project commitments in the EIA report. The EMP is incorporated into the project implementation process to minimize or eliminate identified negative impacts, assess compliance with environmental regulatory standards and corporate safety policies.

The EMP in this document highlights the commitments of FIX FM to the implementation of the mitigation measures built into project design as well as the additional ones recommended in this EIA, and the roles and responsibilities of other stakeholders. The EMP also emphasizes all the biophysical and social environmental attributes that should be monitored by the proponent throughout the lifecycle of the proposed project. This is to curtail associated negative, residual and cumulative impacts and expose other impacts that have not been identified and elucidated in this EIA report arising from the implementation of the proposed project.

7.2 PROPOSED ENVIRONMENTAL MANAGEMENT PLAN AND OBJECTIVES

The ESMP is essential for successfully implementing the Project's social and environmental performance throughout the life of the Project. Having this framework in place ensures a systematic approach to bringing environmental and social considerations into decision making and day-to-day operations. It establishes a framework for tracking, evaluating and communicating environmental and social performance and helps ensure that environmental and social risks and liabilities are identified, minimized and managed. The ESMP will be a living document and will continue to develop during the design and construction phase to enable continuous improvement of the Project's social and environmental performance. In particular, the objectives of the ESMP are to:

- ✚ promote environmental and social management and communicate the aims and goals of the ESMP;
- ✚ ensure that all workers, subcontractors and others involved in the Project meet legal and other requirements with regard to environmental and social management;
- ✚ incorporate environmental and social management into project design and operating procedures;
- ✚ address concerns and issues raised in the EIA's stakeholder consultation process and those that will likely continue to arise during the Project's lifetime;
- ✚ serve as an action plan for environmental and social management for the Project;
- ✚ provide a framework for implementing project environmental and social commitments (ie mitigation measures identified in the ESIA); and ☺ prepare and maintain records of project environmental and social performance (ie monitoring, audits and non-compliance tracking).
- ✚ Respond to unforeseen events; and
- ✚ Provide feedback for continual improvement in environmental performance.

- ✚ Specify the procedures and methods of the plan

7.3 ELEMENTS OF THE ENVIRONMENTAL MANAGEMENT PLAN

- ✚ Environmental Management Organogram;
- ✚ Training and Awareness
- ✚ Documentation
- ✚ Stakeholders Communication
- ✚ Emergency Preparedness and Response
- ✚ Uncertainty and Change Management
- ✚ Environmental and Social Management Actions;
- ✚ Guidelines for Waste Management;
- ✚ Guidelines for Environmental Monitoring;
- ✚ Guidelines for Audit and Reviews;
- ✚ Supplementary Management Plans; and
- ✚ Guidelines for Decommissioning and Abandonment.

7.3.1 *Environmental Management Organogram*

The organogram showing the FIX FM line of authority and implementation of the EMP guidelines is shown in **Figure 7.1**. FMEnv shall closely monitor the EMP implementation and this shall involve a two-way information flow between FIX FM and the regulatory body.

FIX FM is committed to providing essential resources for the implementation of the EMP. Resources to include manpower and associated skills as well as dedicated and competent personnel on the basis of appropriate education, training, and experience that shall manage and oversee the implementation of the EMP aspects of project construction.

7.4 PROJECT MANAGEMENT AND RESPONSIBILITIES

Table: 7.1: Roles and Responsibilities

Role	Responsibilities
Project Manager	Oversee and coordinate all activities pertaining to the project and responsible for safety during the construction phase.
General Manager	Manage all technical operations pertaining to the project and responsible for safety during the operations phase
HSE Manager	Ensure that FIX FM operates in accordance with its HSE plans and assists line management in performing their line duties.
Facilities/Site Engineer	Monitor, report and ensure the efficient working conditions of all facilities on site
Community/ Regulatory Liaison	Liaison with the host communities and regulators on behalf of FIX FM

Officer	
Federal Ministry of Environment	Ensure that environmental recommendations in the EIA to mitigate against construction impacts are implemented
NESREA	Ensure that environmental recommendations in the EIA to mitigate against construction impacts are implemented
State Ministry of Environment	Ensure that environmental recommendations in the EIA to mitigate against construction impacts are implemented

Federal Ministry of Environment Oversight

- ✚ The FMEnv shall serve as a regulatory oversight to the EMP implementation of this project;
- ✚ The FMEnv shall in coordination with the state ministries of environment ensure that FIX FM periodically make available, documentations in form of monthly/quarterly reports or as may be required, showing evidences of carrying out monitoring requirements etc.
- ✚ The FMEnv shall require FIX FM to show evidences of carrying out monitoring requirements

HSE Manager

The HSE Manager shall report directly to the Project Manager (PM) and shall have the authority to stop work or any activity which poses danger to the environment, workers, or the general public during the project construction phase, until measures are put in place to eliminate the dangers or threats. His responsibilities shall include:

- ✚ ensure that mitigation measures outlined in the EIA are implemented;
- ✚ liaise with the EPC, sub-contractors, and other supervisors to ensure environmental protection, coupled with safe and healthy conditions at all work sites;
- ✚ coordinate environmental and safety activities between FIX FM, and all contractors/organizations providing services at the project site;
- ✚ ensure clear communication of safety, health and environmental and socio-cultural information to all categories of workers;
- ✚ liaise with management in deciding which environmental and safety concerns shall be handled in-house and which matters shall require external assistance; and
- ✚ co-ordinate, investigate and review environmental and safety incidents and complaints and maintain separate site incident and complaint records.

Site Project Manager

The overall management of the proposed BTS project from site preparation through construction, to operation and decommissioning is the sole responsibility of the Site Project Manager (SPM). The SPM supervises all activities during the project and reports to FIX FM management through the PM.

Engineering, Procurement and Construction Company

The Engineering, Procurement and Construction (EPC) Company that would eventually be selected would be FIX FM technical partner, and have deep understanding of the construction, installation and operation of the BTS project. They would supervise and ensure the successful execution and commissioning of the project.

Site Health, Safety Environmental Officer

The Site Health, Safety and Environmental (HSE) Officer is to report directly to the HSE Manager. He / she shall ensure that all safety, health and environmental policies and standards are kept and adhered to during the project execution. As a minimum, the Site HSE officer shall ensure all requirements of the EMP are met. The designated HSE Officer may, at his/ her discretion, stop any work, activity or process not in accordance with directives of FIX FM.

7.4.1 Training and Awareness

Training needs for personnel whose work may have a significant adverse impact upon the environment or social conditions shall be reviewed by FIX FM management and a training plan developed for the project. To a minimum, during construction phase of the project, the following environmental awareness and trainings programs shall be conducted:

Induction Briefing

An induction briefing shall be a requirement for every construction worker to be engaged in the project and shall be provided by the contractors. The briefing shall include:

- ✚ detailed job description for new workers
- ✚ safe work procedures
- ✚ use of personal protective equipment
- ✚ emergency responses and warning notices;
- ✚ personal hygiene and site/work station sanitation issues;
- ✚ environmental protection; and
- ✚ hazard recognition and incident reporting.

Weekly HSE Forum

There shall be a weekly environmental and safety awareness forum for construction workers during the construction activities at the project site. FIX FM shall be responsible for coordinating these meetings.

The meetings shall aim to increase HSE awareness and culture and the schedule may be sustained or adjusted during operational phase.

The HSE Manager is responsible for coordinating training, maintaining employee-training records, and ensuring that these are monitored and reviewed on a regular basis. The environmental officer shall also periodically verify that staff is performing competently through discussion and observation.

7.4.2 Documentation

The HSE Manager is responsible for maintaining a master list of applicable HSE documents and making sure that this list is communicated to the appropriate parties.

Documents shall include management plans; associated procedures; and checklists, forms and reports. These documents shall be controlled for distribution to regulators, stakeholders and other responsible parties. Archives in soft and hard copies shall also be documented.

7.4.3 Stakeholders Communication

FIX FM shall welcome suggestions and information from relevant stakeholders, contractors, visitors and the general public, which shall help improve its activities in order to minimise impact on the environment and worker health and safety. The HSE Manager shall be open to complaints and suggestions from the community. Complaints received from the community shall be documented and follow-up made to ensure that all grievances are addressed accordingly and in line with the established grievance redress mechanism that shall be incorporated in the related Stakeholders Engagement Framework to be developed before project commencement.

FIX FM shall maintain a formal procedure for communications with the regulatory authorities and communities. The HSE Manager is responsible for communication of HSE issues to and from regulatory authorities whenever required.

The Community Liaison Officer (CLO) shall be responsible for disseminating information and coordinating community communications throughout the course of the Project.

7.4.4 Emergency Preparedness and Response

FIX FM shall prepare plans and procedures for response to potential environmental accidents, health and safety emergency situations and for preventing and mitigating potentially adverse environmental and social impacts that may be associated with them. The plan shall incorporate emergencies such as fire, chemicals/oil spill, security threats etc.

Prior to a detailed Emergency Response Plan (ERP) which shall be effective during actual construction and operation FIX FM shall ensure the following is in place during the construction phase:

- ✚ Emergency training shall be conducted by the HSE Manager to enhance workers preparedness to respond appropriately to emergencies
- ✚ Emergency drill shall be conducted periodically and such drill shall include fire, security breach, as well as first aid and Cardio Pulmonary Resuscitation (CPR) emergencies.
- ✚ Response time and roll call shall be monitored and recorded by the HSE Manager, supervisor or fire warden as required, at each drill/training to ensure compliance.
- ✚ All drills and training exercise shall be documented by the HSE Manager.

The emergency response procedure flow chart in Figure 7.1 below shall guide FIX FM activities in implementation of this project.

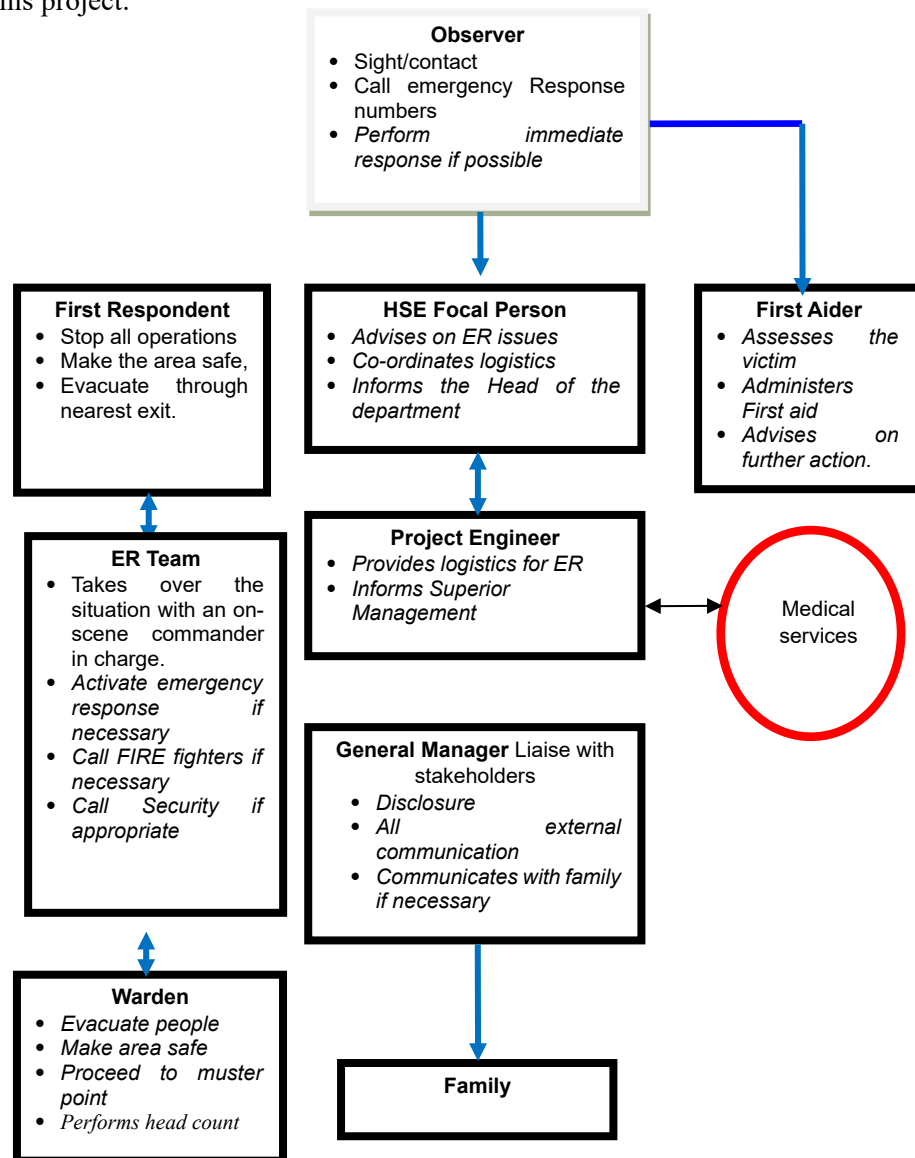


Figure 7.1: Emergency Response Procedure

7.4.5 Uncertainty and Change Management

A key element of an EMP is to address uncertainty through collecting information, additional assessment and where necessary, the development of further mitigation and management measures.

Changes in the project may occur due to unanticipated situations. Adaptive changes may also occur during the course of final design, construction or even decommissioning. The project shall implement a formal procedure to manage changes in the project that shall apply to all project activities.

The management of change procedure shall ensure that:

- ✚ proposed changes have a sound technical, safety, environmental, and commercial justification;
- ✚ changes are reviewed by competent persons and the impacts of changes are reflected in documentation, including operating procedures and drawings;
- ✚ hazards resulting from changes that alter the conditions assessed in the EIA have been identified and assessed and the impact(s) of changes do not adversely affect the management of health, safety or the environment;
- ✚ changes are communicated to personnel who are provided with the necessary skills, via training, to effectively implement changes; and
- ✚ the appropriate personnel accept the responsibility for the change.

7.4.6 Environmental and Social Management Action Plan

This section outlines the management action plan for residual potential and associated impacts documented in **chapters 5 and 6** of this report. The plan is a framework / guide to managing residual impacts of the project throughout its life span.

The outline includes monitoring requirements, timing/frequencies, key performance indicators, estimated cost of implementation and responsible parties.

CHAPTER EIGHT

DECOMMISSIONING AND ABANDONMENT PLAN

8.1 INTRODUCTION

The decommissioning plan outlines FIX FM station's management approach for the decommissioning, dismantling and / or abandonment of the proposed BTS project at the end of its useful life.

The project will no longer be viable/sustainable when the BTS facility deteriorates (because of wear and tear) to non/low supply levels. This usually indicates that the BTS's functional life has come to an end, and the project must be abandoned or decommissioned.

The BTS Site facility would be designed, built, and maintained to run efficiently for about 50 years before being decommissioned and abandoned in accordance with a plan that meets local and international regulatory requirements and standards.

However, in the development of events, there may be other reasons that could lead to decommissioning a BTS site before the expiration of the 50 years life span. Some instances that might lead to earlier decommissioning may include; Community hostility, security challenges, natural disaster etc.

The overall decommissioning strategy is to deliver a timely, cost-effective program while maintaining high standards of safety, security and environmental protection. Specifically, this plan aims to achieve the following:

- ✚ To comply with legal and regulatory requirements and FIX FM Station's project approvals.
- ✚ To meet stakeholders' expectations.
- ✚ To ensure safe, stable and non-polluting of land area which will be compatible with post-closure land use.
- ✚ To provide for the retention and beneficial reuse of constructed station.

A general approach will be to commence detailed planning of decommissioning activities from the project initial stage in line with FMEEnv provisions. This would ensure a safe, environmentally friendly and efficient decommissioning.

FIX FM Stations shall develop a plan that shall establish:

- ✚ Facilities to be decommissioned or recovered
- ✚ Environmental aspect of the decommissioning activity
- ✚ Methods for facility re-use, recycling, disposal or removal
- ✚ Proper consultation with all stakeholders (communities, other land users and regulators)
- ✚ Efforts to integrate negative environmental impacts and appropriately rehabilitate site

- ✚ Programmes for restoring the environment in accordance with national and international best practices and regulatory requirement.
- ✚ Scope of work to assess possible residual impacts of the BTS Site in the environment.

The content of the plan will take into consideration the extent of the decommissioning (temporary or permanent, partial or complete shutdown), plans for future use of the site and the condition of the site and environment at the time of decommissioning. A detailed post-operation study of the impacts of the project on the environment will be conducted to determine appropriate restoration and remedial measures. At this stage, only preliminary plans exist for decommissioning activities.

In general, however, decommissioning activities will be conducted in compliances with applicable regulations and guidelines or any other regulations that are in force at the time of decommissioning. The plan will also include regulations and a risk and cost analysis of various options. The plan will consider all facilities associated with the project.

8.2 STAKEHOLDERS CONSULTATION

This plan seeks to ensure that employees, the local community, regulators, and specialists will all be consulted as part of the project decommissioning strategy. Competent individuals from the facility's many departments, as well as regulatory authorities, will be part of the decommissioning team.

8.3 WIND –DOWN OPERATIONS

As the project approaches the end of its economic viability, plans will be put in place to wind down operations. These will include a review and rationalization of operations and personnel and a possible gradual shut down of some facilities. The decommissioning will be planned for a significant period before the cessation of the project. This will allow for a carefully planned redeployment and, where necessary, disengagement of personnel as appropriate. An adequate Compensation will be provided to the disengaged personnel to take care of themselves before getting their hands on new jobs,

8.4 DECOMMISSIONING OF FACILITIES

At the end of the facilities' utility, all equipment will be decommissioned. During the decommissioning, it is expected that a few minor impacts may arise as a result of the activities. The main positive impacts of the decommissioning are the availability of the land for other uses while some of the negative impacts that may occur includes;

- ✚ Injuries from exposed machines, metals, woods etc.
- ✚ Traffic delays as a result slight increase in the number of vehicles moving to the site
- ✚ Noise from heavy duty vehicle

- ✚ Increased air pollution from particulate matters arising from vehicular movement and soil excavations
- ✚ Bad Aesthetics and environmental pollutions
- ✚ Accumulation of waste materials in the environment

FIX FM Station's Health, Safety and Environmental plan will be implemented to assure safety of personnel and the public during decommissioning as well as minimize negative environmental impacts.

Particular attention will be paid to the following:

- ✚ Protection from noise
- ✚ Waste handling
- ✚ Spent oil management
- ✚ Traffic management
- ✚ Dust suppression

Once the facility has been properly and safely decommissioned, all structures would be dismantled and removed from the site. Disturbed areas (vegetation) will be identified and restored using native plant species.

8.5 RE-USE/RECYCLING OF EQUIPMENT

All facility components that can be used or re-cycled will be identified and quantified. Re-useable facilities will either be sold or converted to other uses.

8.6 RESIDUAL WASTES HANDLING

Several waste streams shall result from the decommissioning activities. All wastes generated during the decommissioning process are required to be containerized, characterized, labelled, marked, stored, transported and disposed of in accordance with regulatory requirements (local laws, FMEnv). Prior to decommissioning, the set team is expected to:

- ✚ conduct a waste audit covering the waste that would be generated in the dismantling process, prepare a written report of the audit,
- ✚ prepare a waste reduction work plan and,
- ✚ implement measures to communicate the plan to all other workers at the dismantling site.

The waste reduction work plan will entail efforts to find industry users that could benefit from the waste materials generated during dismantling and demolition. They include;

- ✚ Concrete and aggregate manufacturers,
- ✚ Electrical equipment manufacturers and resellers,
- ✚ Mechanical equipment manufacturers and resellers and
- ✚ Metal recyclers.

8.7 REPORTING

As required by regulations, a post decommissioning report will be prepared and submitted to FMEnv and State Ministry of Environment. The reports will provide the following details

- ✚ Overview of decommissioned facilities
- ✚ Details of methods used for decommissioning
- ✚ Nature of decommissioning (partial or whole)
- ✚ Records of consultation meetings
- ✚ Details of recyclable /re-useable material/ facility components
- ✚ Decommissioned facilities
- ✚ Decommissioning schedules
- ✚ State of surrounding environment
- ✚ Waste management plan
- ✚ Plans for restoration, where necessary.

8.8 SITE REMEDIATION PLAN AFTER CLOSURE/ DECOMMISSIONING

The proposed project, as conceived, is not expected to have any significant long-term negative effects on the environment, especially after closure/de-commissioning. A number of safety measures/devices shall be built into the project, such that it will operate at minimum risk. However, the following measures need to be planned for implementation after closure/de-commissioning:

1. Dismantling of the tower structures;
2. Removal of BTS equipment such as rectifiers, batteries, microwaves etc
3. Evacuation of power supply equipment and other project facilities and equipment to FIX FM station's warehouse for further operational usage and allocation;
4. Removal of Palisade fence and demolition of all concrete structures
5. Contaminated soils, where they occur, shall be restored, using various options such as chemical and/or biological remediation;
6. All pits and excavations shall be reclaimed and re-vegetated.
7. All structures and buildings used for different purposes shall be leased out or used for other productive ventures.

The waste that will be generated during the course of decommissioning shall be managed and disposed by government accredited waste management under the supervision of the Federal and State Ministries.

The Lagos and Kaduna states and Federal Government is expected to buy into this plan. It is expected that if these measures are implemented, an excellent site restoration after closure/ de-commissioning can be achieved.

8.9 OTHER CONSIDERATIONS

8.9.1 Emergency Response Plan

This is an important plan that shall be implemented through all the phases of the project in event of any emergencies. The potential emergency situations during decommissioning are the same as those identified

during construction and operation. All decommissioning workers at site shall be trained on emergency response, communication and safety procedures. Fix FM has an Emergency Response Plan documented (see Appendix 2)

8.9.2 Communication Notification

FIX FM shall create an effective communication plan that clearly outlines a process for two-way correspondence with stakeholder. This shall be made available at all times on site. All non-emergency communications shall be disseminated through various media (Signage, Letters etc) avenues to ensure stakeholders are well informed on project updates and activities.

CHAPTER NINE

CONCLUSION AND RECOMMENDATIONS

9.1 INTRODUCTION

This EIA report has provided a review of the legal, administrative and institutional frameworks guiding the project and environment (*chapter one*), justified the project concept, its sustainability and alternatives considered as seen in *chapter two*. The report also presents the proposed project description and activities stages and phases in *chapter three*. The baseline information on the existing environment and natural resources was reviewed and analyzed from desktop search and relevant previous studies around the area as well as a one season-based field sampling regime. A detailed description of the existing environmental, health and socio-economic conditions (*chapter four*) was also provided as basis against which the impacts of the project were assessed in *chapter five*. Identified biophysical, socio-economic and health impacts of the proposed project were then provided with mitigation measures (*chapter six*) to help avoid or reduce adverse impacts and enhance positive impacts. A register of project development activities' potential and associated impacts, mitigation measures, monitoring requirements and an environmental and social management plan for residual impacts were provided in *chapter seven*. A preliminary decommissioning plan has also been documented for the project in *chapter eight* of this report.

The proposed construction and operation of the FM Radio station by FIX FM is justifiable and will offer numerous economic benefits for the country, the company, and local communities

- ✚ Improved broadcasting services in Nigeria;
- ✚ Improve return on invest for FIX FM station
- ✚ Contribution of additional revenue to the Government of Nigeria through taxes
- ✚ Maintain or even expand its existing administrative and technical capabilities and create more jobs;
- ✚ Improved economic and social life of the people around the project area.

Despite the project's intended benefits, it may have a variety of negative consequences. The mitigating measures, as well as rigorous adherence to the management plans given in Chapter 5, will either prevent or considerably minimize the severity of the negative impacts.

9.2 *General Recommendations*

FIX FM Stations is ready to undertake this Radio FM project in an environmentally responsible manner with minimal negative consequences. The proposed Radio FM project will undoubtedly benefit the host communities. On the basis of the foregoing, it is suggested that: FIX FM arduously implement the project environmental management plan so that any significant environmental impacts poorly managed can be identified and promptly mitigated.

As a result, we believe that the Radio FM can be long-term viable if the required mitigating measures are implemented and facilities are audited on a regular basis in accordance with international best practice and FMEEnv guidelines, as recommended in the EMP.

The planned project is thought to have significant net potential and associated advantages, as well as being environmentally sound. This assessment report backs up this opinion.

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