

**ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT
(ESIA) FOR THE PROPOSED SPECIAL AGRO-INDUSTRIAL
PROCESSING ZONES (SAPZ) PROGRAM, KATSINA STATE,
NIGERIA**

By:

KATSINA STATE GOVERNMENT



Submitted to:

**FEDERAL MINISTRY OF ENVIRONMENT,
ABUJA, NIGERIA**



**KATSINA STATE MINISTRY OF AGRICULTURE AND
LIVESTOCK DEVELOPMENT**

JULY, 2024

Prepared by:
FAHAMU NIGERIA LIMITED
+2348023570800



TABLE OF CONTENTS

Table of Contents i

List of Tables viii

List of Figures x

List of Plates xi

Acronyms and Abbreviations xii

List of Consultants/EIA Report Preparers xvi

Acknowledgement xvii

Executive Summary xviii

CHAPTER ONE

1.0 Introduction 1

1.1 Background Information 1

1.2 Project Components 2

1.3 The Proponent... .. 3

1.4 Geographic Location and Description of Katsina State 4

1.5 ESIA Objectives... .. 7

1.6 ESIA Scope of Work 8

1.7 Approach and Methodology 8

1.8 EIA Procedural Guidelines 9

1.9 Administrative and Legal Framework... .. 51

 1.9.1 National Environmental Legislation... .. 11

 1.9.2 Federal Ministry of Environment 11

 1.9.3 National Environmental Standards and Regulations Enforcement Agency
(NESREA) Act, 2007 13

 1.9.4 The Nigerian Urban and Regional Planning Act CAP N138, LFN 2004 16

 1.9.5 Water Resources ACT, CAP W2, LFN 2004 16

 1.9.6 Land Use Rights Act No. 6, 1978 17

 1.9.7 Harmful Waste (Special Criminal Provisions) ACT CAP H1, LFN 2004 20

 1.9.8 The Forestry Act 21



1.9.9	<i>The Endangered Species Act, CAP E9, LFN 2004</i>	...	...	...	...	...	...	...	22
1.9.10	<i>Statutory Instruments 8, 9, and 15</i>	...	...	...	...	...	...	...	22
1.9.11	<i>The Factories Act, 1987 (Factory Act cap 126, LFN, 1990)</i>	...	...	...	...	...	...	...	22
1.9.12	<i>Labour Act - CAP. L1 L.F.N. 2004</i>	...	...	...	...	...	...	...	23
1.9.13	<i>Wages Board and Industrial Council Act, 1974</i>	...	...	...	...	...	...	...	23
1.9.14	<i>Workers' Compensation Act, 1987</i>	...	...	...	...	...	...	...	24
1.9.15	<i>Child Rights Act 2003</i>	...	...	...	...	...	...	...	24
1.9.16	<i>National Gender Policy 2006</i>	...	...	...	...	...	...	...	24
1.9.17	<i>Standards Organization of Nigeria (SON) Act CAP 412 LFN 1990</i>	...	...	...	...	...	...	...	26
1.9.18	<i>Nigerian Free Trade Zone Act No. 63, 1992</i>	...	...	...	...	...	...	...	26
1.9.19	<i>Nigeria Export Processing Zones Act (CAP N107 LFN 2004)</i>	...	...	...	...	...	...	...	28
1.9.20	<i>Katsina State Laws</i>	...	...	...	...	...	...	...	29
1.9.21	<i>International Guidelines and Conventions</i>	...	...	...	...	...	...	...	30
1.9.22	<i>World Bank Safeguard Policies</i>	...	...	...	...	...	...	...	30
1.9.23	<i>National Climate Change Policy for Nigeria (2021 – 2030)</i>	...	...	...	...	...	...	...	31
1.9.24	<i>State Legislations</i>	...	...	...	...	...	...	...	31
1.10	Terms of Reference	...	...	...	...	...	...	...	51
1.11	Structure of EIA Report	...	...	...	...	...	...	...	52
 CHAPTER TWO									
2.0	Project Justification	...	...	...	...	...	...	...	54
2.1	Introduction	...	...	...	...	...	...	...	54
2.2	Needs for the Project	...	...	...	...	...	...	...	54
2.3	Benefits of the Project	...	...	...	...	...	...	...	56
2.4	Value of the Project	...	...	...	...	...	...	...	56
2.5	Envisaged Sustainability	...	...	...	...	...	...	...	57
2.5.1	<i>Technological Sustainability</i>	...	...	...	...	...	...	...	57
2.5.2	<i>Economic Sustainability</i>	...	...	...	...	...	...	...	58
2.5.3	<i>Environmental Sustainability</i>	...	...	...	...	...	...	...	58
2.5.4	<i>Social Sustainability</i>	...	...	...	...	...	...	...	59



2.6	Project Development Options ...	...	...	...	...	...	...	59
2.6.1	<i>No project option</i> ...	...	...	...	...	...	...	59
2.6.2	<i>Delayed project option</i> ...	...	...	...	...	...	...	60
2.6.3	<i>Project Implementation option</i> ...	...	...	...	...	...	...	60
2.6.4	<i>Project Location Alternatives</i> ...	...	...	...	...	...	...	61
CHAPTER THREE								
3.0	Project Description ...	...	...	...	...	...	...	62
3.1	Background of the project ...	...	...	...	...	...	...	62
3.2	Description of Project Location (AIH)...	...	...	...	...	...	...	63
3.3	Existing Infrastructure ...	...	...	...	...	...	...	64
3.4	Description of ATCs Location...	...	...	...	...	...	...	71
3.5	Project Components ...	...	...	...	...	...	...	71
3.5.1	<i>Infrastructural Design of the proposed AIH</i> ...	...	...	...	...	...	...	72
3.5.3	<i>Water Storage Tank</i> ...	...	...	...	...	...	...	78
3.5.4	<i>Water Distribution Lines</i> ...	...	...	...	...	...	...	78
3.5.5	<i>Power Demands</i> ...	...	...	...	...	...	...	79
3.5.6	<i>Proposed Solar Power Estimation of this SAPZ</i> ...	...	...	...	...	...	...	81
3.5.7	<i>Wastewater Treatment System</i> ...	...	...	...	...	...	...	82
3.5.8	<i>Solid Waste Treatment Facilities</i> ...	...	...	...	...	...	...	82
3.6	Proposed ATCs Site Specific Description ...	...	...	...	...	...	...	83
3.6.1	<i>Proposed ATC Rimi Site Description</i> ...	...	...	...	...	...	...	85
3.6.2	<i>Kabomo ATC –Bakori LGA</i> ...	...	...	...	...	...	...	89
3.6.2	<i>Proposed ATC Bakori Site Description</i> ...	...	...	...	...	...	...	89
3.6.3	<i>Proposed ATC Daura Site Description</i> ...	...	...	...	...	...	...	94
3.6.4	<i>Proposed ATC Dutsinma Site Description</i> ...	...	...	...	...	...	...	98
3.7	Project Workforce ...	...	...	...	...	...	...	104
3.7.1	<i>Associated Facilities</i> ...	...	...	...	...	...	...	104
3.7.2	<i>Project Workforce</i> ...	...	...	...	...	...	...	105
3.7.3	<i>Implementation Schedule</i> ...	...	...	...	...	...	...	105

CHAPTER FOUR



4.0	Description of Existing Environment	107
4.1	Introduction	107
4.2	Study Approach	107
	4.2.1 <i>Baseline Data Acquisition Methods</i>	108
	4.2.2 <i>Consultation with Regulators and Stakeholders</i>	108
	4.2.3 <i>Reconnaissance Survey and Delineation...</i>	109
	4.2.4 <i>Desktop Studies...</i>	109
	4.2.5 <i>Field Sampling/Measurement</i>	111
4.3	Weather and Climate Change over study area	116
	4.3.1 <i>Rainfall</i>	117
	4.3.2. <i>Temperature</i>	117
	4.3.3 <i>Wind Speed</i>	119
	4.3.4 <i>Solar Radiation</i>	120
	4.3.5. <i>Wind Direction</i>	120
4.4	Ambient Air Quality and Noise Level Measurement	122
	4.4.1 <i>Methodology</i>	122
	4.4.2 <i>Results and Analysis of Air Quality</i>	123
	4.4.3 <i>Noise Level</i>	127
	4.4.4 <i>Result and Analysis of Noise Level</i>	129
4.5	Geology and Hydrology... ..	130
	4.5.1 <i>Geology of the Area</i>	130
	4.5.2 <i>Hydrogeology of the Area</i>	133
4.6	<i>Geography And Topography Of The Study Area</i>	134
4.6	Soil Quality	134
	4.7.1 <i>Soil Sampling</i>	135
4.7	Ground Water	142
7.8	Vegetation of Katsina Study Area	142
	4.8.1 <i>Groundwater Vulnerability</i>	142
4.9	Biodiversity Studies	149
	4.9.1 <i>Terrestrial Biodiversity</i>	150



4.9.2	<i>Flora Studies</i>	...	...	...	...	...	...	...	150
4.9.3	<i>Sampling Parameters and Methods</i>	...	...	...	...	...	...	...	151
4.10	Defining Stakeholder Engagement	...	...	...	...	...	...	...	151
4.11	Socio-Economic Study	...	...	...	...	...	...	...	157
4.11.1	<i>Secondary Data Collection</i>	...	...	...	...	...	...	...	162
4.11.2	<i>Socio-economic Baseline Information</i>	...	...	...	...	...	...	...	162
4.11.3	<i>Affected Communities and People</i>	..	...	...	...	...	...	...	163
4.11.4	<i>Administrative Structure</i>	...	...	...	...	...	...	...	165
4.11.5	<i>Demographic Profile of the Study Area</i>	...	...	...	...	...	...	...	166
4.11.6	<i>Cultural Heritage and Religion</i>	...	...	...	...	...	...	...	170
4.11.7	<i>Access to Education</i>	...	...	...	...	...	...	...	170
4.11.8	<i>Economic Activities within the Project Area</i>	...	...	...	...	...	...	...	171

CHAPTER FIVE

5.0	Potential and Associated Impact Assessment	...	...	...	...	...	...	...	183
5.1	Introduction	...	...	...	...	...	...	...	183
5.2	Impact Assessment Methodology	...	...	...	...	...	...	...	183
5.3	Identification and Description of Project Phases and their Possible Interaction With the Environment...	...	...	...	...	...	...	...	186
5.4	Preliminary Identification of Potential Impacts on the Environment	...	...	...	...	...	...	...	187
5.5	Screening of Impact Importance	...	...	...	...	...	...	...	190
5.6	Detailed Assessment of Selected Focus Impact	...	...	...	...	...	...	...	194
5.7	Final Assessment and Assignment of Overall Impact Significance Levels	...	...	...	...	...	...	...	200
5.8	Discussion of Impacts	...	...	...	...	...	...	...	210
5.8.1	<i>Positive Environmental Impacts of the Proposed Project</i>	...	...	...	...	...	...	...	210
5.8.2	<i>Anticipated Negative Impacts of the Proposed Project</i>	...	...	...	...	...	...	...	212

CHAPTER SIX

6.0	Mitigation Measures	...	...	...	...	...	...	...	217
6.1	Introduction	...	...	...	...	...	...	...	217



6.2	Impact Mitigation Methodology...	...	...	...	...	...	...	217
6.3	Management Procedure for Mitigation Measures...	...	...	...	...	...	...	219
6.4	Proffered Mitigation Measures...	...	...	...	...	...	...	202
6.5	Impact Mitigating Measures for Pre-Construction and Construction Phase	...	...	...	...	...	...	239
6.5.1	<i>Vegetation Clearance and Disturbance</i>...	...	...	...	...	...	...	239
6.5.2	<i>Run-off and Soil Erosion</i>...	...	...	...	...	...	...	239
6.5.3	<i>Dust Generation and Emission</i>...	...	...	...	...	...	...	240
6.5.4	<i>Noise and Vibration</i>	...	...	...	...	...	...	240
6.5.5	<i>Mitigation Measures for Energy Consumption Impact</i>...	...	...	...	...	...	...	240
6.5.6	<i>Exhaust Emissions</i>	...	...	...	...	...	...	240
6.5.7	<i>Construction Waste Impact</i>	...	...	...	...	...	...	241
6.5.8	<i>Water Use and pollution of water sources</i>	...	...	...	...	...	...	241
6.5.9	<i>Mitigation Measures for Landscape related impacts</i>	...	...	...	...	...	...	242
6.5.10	<i>Mitigation Measures for Human Health and Safety Impact</i>	...	...	...	...	...	...	242
6.6	Mitigation for Operation and Maintenance Phase Impacts	...	...	...	...	...	...	242
6.6.1	<i>Efficient Solid Waste Management</i>	...	...	...	...	...	...	242
6.6.2	<i>Social Impact</i>	...	...	...	...	...	...	243
6.6.3	<i>Energy Consumption</i>	...	...	...	...	...	...	243
6.6.4	<i>Mitigation measures for environmental pollution and contamination</i>	...	...	...	...	...	...	243
6.6.5	<i>Occupational Health and Safety Impact</i>	...	...	...	...	...	...	244
6.7	Mitigation for Decommissioning Phase Impacts	...	...	...	...	...	...	244
6.7.1	<i>Mitigation Measures for Dust Emission Impact</i>	...	...	...	...	...	...	244
6.7.2	<i>Mitigation Measures for Exhaust Emissions Impact</i>	...	...	...	...	...	...	244
6.7.3	<i>Efficient Solid Waste Management Impact</i>	...	...	...	...	...	...	245
6.7.4	<i>Mitigation Measures for Noise and Vibration Impact</i>...	...	...	...	...	...	...	245

CHAPTER SEVEN

7.0	Environmental and Social Management Plan (ESMP)	...	...	...	...	...	...	246
7.1	Introduction	...	...	...	...	...	...	246
7.2	EMP Objectives...	...	...	...	...	...	...	247



7.3	Core Elements of the EMP	...	...	...	...	...	...	...	248
7.4	Structure and Responsibility	...	...	...	...	...	...	...	249
	<i>7.4.1 Institutional Responsibility</i>	...	...	...	...	...	...	...	250
7.5	Framework for Implementing the EMP...	...	...	...	...	...	...	...	251
7.6	Katsina State Government	...	...	...	...	...	...	...	252
7.7	EMP Guidelines	...	...	...	...	...	...	...	254
	<i>7.7.1 Environmental Management Plan</i>	...	...	...	...	...	...	...	254
	<i>7.7.2 Training and Awareness – Site Induction</i>	...	...	...	...	...	...	...	279
	<i>7.7.3 Communications...</i>	...	...	...	...	...	...	...	280
	<i>7.7.4 Environmental Audit and Review</i>	...	...	...	...	...	...	...	281
	<i>7.7.5 Environmental Monitoring Programme</i>	...	...	...	...	...	...	...	281
	<i>7.7.6 Guideline for Waste Management</i>	...	...	...	...	...	...	...	284
	<i>7.7.7 Emergency Response Plan</i>	...	...	...	...	...	...	...	290
	<i>7.7.8 Project Traffic Management Plan</i>	...	...	...	...	...	...	...	292
	<i>7.7.9 Environmental Health and Safety Plan...</i>	...	...	...	...	...	...	...	294
	<i>7.7.10 Spill Contingency Management Plan</i>	...	...	...	...	...	...	...	295
	<i>7.7.11 Contractor Management...</i>	...	...	...	...	...	...	...	296
	<i>7.7.12 Air Quality: Generation of Air Emissions from Disturbance</i>	...	...	...	...	...	...	...	296
	<i>7.7.13 Generation of Air Emission from Vehicles and Equipment Engines</i>	...	...	...	...	...	...	...	297
	<i>7.7.14 Degradation of Water Quality due to Storm Water Runoff</i>	...	...	...	...	...	...	...	297
	<i>7.7.15 Degradation of Water Quality due to accidental spills and leaks</i>	...	...	...	...	...	...	...	298
	<i>7.7.16 Soil Contamination and Erosion due to erosion</i>	...	...	...	...	...	...	...	298
	<i>7.7.17 Noise Management</i>	...	...	...	...	...	...	...	299
	<i>7.7.18 Hazardous Materials Management</i>	...	...	...	...	...	...	...	300
	<i>7.7.19 Recurring Environmental and Social Issues</i>	...	...	...	...	...	...	...	301

CHAPTER EIGHT

8.0	Remediation Plans After Decommissioning /Closure...	...	...	...	...	...	...	...	308
8.1	Introduction	...	...	...	...	...	...	...	308
8.2	Consultation	...	...	...	...	...	...	...	309
8.3	Reporting...	...	...	...	...	...	...	...	309



8.4	Decommissioning Activities	309
8.5	Decommissioning and Abandonment Plans	310
8.6	Recommended Mitigation Measures for Decommissioning Phase	311
8.7	Decommissioning phase EMP... ..	311
8.8	Remediation Plans after Decommissioning... ..	312

CHAPTER NINE - STAKEHOLDER ENGAGEMENT AND GRIEVANCE REDRESS

MECHANISM

9.1	Introduction	313
9.2	Stakeholder Engagement	313
9.3	Objectives of Stakeholder Engagement	314
9.4	Disclosure and Participation Plan	314
9.5	Grievance Redress Mechanism	317
9.6	Grievance Management Standards	318
9.7	Roles and Responsibilities in Grievance Management... ..	319
9.8	Expectations when Grievances Arise	320
9.9	Setting up a Grievance Redress Mechanism	320
9.10	Grievance Redress Process Procedure... ..	322

CHAPTER NINE

10.0	Conclusion	324
10.1	Introduction	324

REFERENCES

APPENDIX



LIST OF TABLES

Table 1.1: Comparison of Nigerian Law and Good International Practice of the AfDB, IFC and EIB for Resettlement	41
Table 3.1: Proposed ATCs location and Priority Value Chains	71
Table 3.2: Internal roads specifications...	75
Table 3.4: Energy load estimation	79
Table 3.5: Detail of ATC sites and their coordinates	83
Table 3.3: Proposed Project Timeline	106
Table 4.1: Inventory of Biophysical and Socio Samples	113
Table 4.2: Average Result of Ambient Air quality and Noise Level for sites	113
Table 4.3: Monthly wind direction of the project area	120
Table 4.4: List of Air and Noise Quality Equipment used in the study	122
Table 4.5: Results of Air Quality and Nose levels at the Proposed AIH Project site..	126
Table 4.3: Plant Species identified with the IUCN Status in Katsina State	
Table 4.6: WHO Guidelines for Community Noise	128
Table 4.10: List of Plant Species observed in the project area	152
Table 4.11: Services offered by Plant Species observed in the project area	
Table 4.12: Wildlife species That have inhabit the proposed AIH project area	156
Table 4.5: Questionnaire administered and retrieved per community	158
Table 4.6: List of categories of stakeholders consulted	159
Table 5.1: Environmental Components and their Impact Indicators	186
Table 5.2: Checklist of Associated and Potential Impacts	188
Table 5.3: Impact Ranking Matrix	191
Table 5.4: Activity-Receptor Interaction for Impact Screening	193
Table 5.5: Impact Characterization	195
Table 5.6: Characterization of potential and associated impacts of the proposed project	
Table 5.7: Legal/Regulatory Requirements Criterion...	200
Table 5.8: Risk Assessment Matrix (RAM)	201
Table 5.9: Risk Criterion	202
Table 5.10: Frequency Criterion	202
Table 5.11: Importance Criterion	203



Table 5.12: Public perception /interest criterion	204
Table 5.13: Potential and Associated Impact Assessment of the Proposed Project ...	205
Table 6.1: Impacts and Mitigation Measures of the Proposed Project	221
Table 7.1: Roles and Responsibilities of Relevant Institution	250
Table 7.2: Roles and Responsibilities... ..	250
Table 7.3: Environmental and Social Management Plan	255
Table 7.4: Proposed Training Program for the Implementation of ESMP	279
Table 7.5: Monitoring Plan for the Project	283
Table 7.6: Waste Streams and Management	289
Table 7.7: Stakeholder Engagement and Disclosure Methods	314
Table 8.1: Recommended Mitigation Measures for Decommissioning Phase ...	318



LIST OF FIGURES

Figure 1.1: Map of Nigeria showing Katsina State	...	...	...	...	...	5
Figure 1.2: Satellite image of the proposed AIH Site	...	...	...	...	...	6
Figure 1.3: Overview of EIA Process in Nigeria (Source: FMEnv 2014)	...	...	...	...	...	10
Figure 3.1: Google earth imagery of the proposed project site	...	...	...	...	...	70
Figure 3.1: Satellite imagery of the proposed AIH and ATC locations	...	...	...	...	...
Figure 3.2: proposed SAPZ Project layout	...	...	...	...	...	73
Figure 3.6: Water supply schematic diagram	...	...	...	...	...	7
Figure 4.1: Generalised sampling map for all Environmental components studied at the proposed AIH project area	...	...	...	...	...	115
Figure: 4.1: Average Monthly Rainfall of the Study Area	...	...	...	...	...	117
Figure 4.2: Average high and low temperature of the study area	...	...	...	...	...	118
Figure 4.3: Relative humidity of the study area	...	...	...	...	...	118
Figure 4.4: Annual Average wind speed of the study area	.....	...	...	...	...	119
Table 4.5: Results of Air Quality and Noise levels at the Proposed AIH Project site	...	...	...	...	...	129
Table 4.8: Proposed Special Agro-Industrial Processing Zone Katsina Physical/Chemical Parameters of Soils Samples	...	...	.....	.....	.....	137
Figure 4.5: Showing Traditional Administrative Structure of Host Community	...	...	...	...	...	138
Table 4.10: List of Plant Species observed in the project area	...	...	...	...	...	152
Figure 5.1: Schematic of the Impact Assessment Methodology	...	...	...	...	...	153
Table 4.11: Services offered by Plant Species observed in the project area	...	...	...	...	...	153
Table 4.12: Wildlife species That have inhabit the proposed AIH project area	...	...	...	...	...	156
Table 4.13: Questionnaire administered and retrieved per community	...	...	...	...	...	158
Table 4.14: List of categories of stakeholders consulted	...	...	...	...	...	159
Figure 4.9: Showing Traditional Administrative Structure of Host Community	...	...	...	...	...	166
Figure 4.10: Male and female age distribution	...	...	...	...	...	167
Figure 4.11: Kusa ward age distribution	...	...	...	...	...	168
Figure 4.13: Marriage status with Kusa ward	...	...	...	...	...	169
Figure 4.14: Access to education within Project site communities	...	...	...	...	...	170
Figure 4.17: Prevalent ailments in the Communities	...	...	...	...	...	177



Figure 5.1: Schematic of the Impact Assessment Methodology	...	...	...	185
Figure 6.1: Matrix for Determination of Mitigation measures...	...	...	...	217
Figure 6.2: Management Procedure for Mitigation Measures...	...	...	...	219
Figure 7.1: Level of Risk and ALARP...	...	...	...	306
Figure 7.2: GRM flow chart	...	...	...	...



LIST OF PLATES

Plate 3.1: Infrastructural activities on the proposed AIH site ...	...	...	...	69
Plate 3.2: Infrastructures activities inside the project site	...	...	...	96
Plate 3.3: Infrastructures activities inside the project site	...	...	...	111
Plate 4.2: Sampling Materials	...	...	...	114
Plate 3.4: Infrastructures activities inside the project site	...	...	...	123
Figure 4.8: Geological Map of Katsina State identifying the Study Area	...	...	...	131
Plate 4.6: Photographs showing plant species observed in the study area	...	...	...	152
Plate 4.7: Ant holes and hills observed in the project site	..	...	...	155
Plat. 4.8: Consultation meeting with the Commissioner of Agriculture, Katsina State				160
Plate 4.14: Mr. Abel Agada, ESIA Consultant addressing participants during the Scoping Workshop	...	...	...	180
Plate 4.15: Group picture photograph at the Scoping Workshop	...	...	...	181



ACRONYMS AND ABBREVIATIONS

μSm^{-1}	Micron siemen per meter
AAS	Atomic Absorption Spectrophotometer
AfDB	African Development Bank
AIH	Agro-Industrial Hub
Al	Aluminium
Ar	Argon
ATC	Agricultural Transformation Centre
Ba	Barium
KTSG	Katsina State Government
BOD	Biochemical Oxygen Demand
KSADP	Katsina State Agricultural Development Program
KSMA&LD	Katsina State Ministry of Agriculture and Livestock Development
KSMenv	Katsina State Ministry of Environment
KSEPA	Katsina State Environmental Protection Agency
BTS	Base Transceivers Station
Ca	Calcium
Cd	Cadmium
CEC	Cation Exchange Capacity
CFC	Chlorofluorocarbon
Cfu/g	Colony forming units per gramme
CH ₄	Methane
CL ⁻	Chlorine ion
CLS	Core Labor Standards
Cm	Centimeters
CO	Carbon (II) Oxide
Co	Cobalt
COD	Chemical Oxygen Demand
Cond.	Conductivity
COx	Oxides of Carbon
Cr	Chromium



Cu	Copper
dB(A)	decibel (Scale A)
DCD	Development Control Department
DO	Dissolved Oxygen
DS	Dissolved Solids
E&S	Environmental and Social
EA	Environmental Audit
EAR	Environmental Audit Report
Ec	Electrical Conductivity
EIA	Environmental and Impact Assessment
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
EMP	Environmental Monitoring Plan
EMS	Environmental Management System
ESIA	Environmental and Social Impact Assessment
ESMF	Environmental and Social Management Framework
Fe	Iron
FEPA	Federal Environmental Protection Agency
FGN	Federal Government Nigeria
FMAFS	Federal Ministry of Agriculture and Food Security
FME _{env}	Federal Ministry of Environment
FNL	Fahamu Nigeria Limited
g	gramme
GDP	Gross Domestic Product
H ₂ S	Hydrogen Sulphide
HIA	Health Impact Assessment
HIV\AIDS	Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome
HSE	Health Safety and Environment
IFAD	International Fund for Agricultural Development
IsDB	Islamic Development Bank



ISO	International Organization for Standardization
K	Potassium
Kg	Kilogramme
KHz	Kilohertz
Km/hr	Kilometre per hour
KN/m ²	Kilonewton per square metre
KPA	Kilopascal
KVA	Kilo Volts (amp)
LGA	Local Government Area
m	Meter
m/s	Meter per second
MDAs	Ministries, Departments and Agencies
Mg/Kg	Milligram per kilogram
mg/l	Milligram per litre
MHz	Mega Hertz
ml	Millimeter
Mn	Manganese
Na	Sodium
NAFDAC	National Agency for Food and Drug Administration and Control
NBS	National Bureau of Statistics
ND	Not Detected
NE	North East
NGO	Non- Governmental Organization
NH ₃	Ammonia
Ni	Nickel
NO	Nitrogen Oxide
NO ₃ ⁻	Nitrate ion
NOx	Oxides of Nitrogen
NPC	National Population Commission
NTU	Nephelometric Turbidity Unit
°C	Degree celsius



OP	Operational Policies
PAD	Project Appraisal Document
PAR	Programme Appraisal Report
Pb	Lead
PCB	Polychlorobiphenyls
pH	Hydrogen Ion Concentration
PO ₄ ⁻	Phosphate ion
PPE	Personal Protective Equipment
SAPZ	Special Agro-industrial Processing Zones
SEP	Stakeholder Engagement Plan
SHE	Safety Health and Environment
SIA	Social Impact Assessment
SO ₂	Sulphur Oxide
SOM	Skidmore, Owings & Merrills
SON	Standard Organisation of Nigeria
SO _x	Oxides of Sulphur
SP	Suspended particle
SPM	Suspended particulate matter
STD	Sexually Transmitted Diseases
THC	Total Hydrocarbon
THC	Total Hydrocarbon Content
TOC	Total Organic Compound
ToR	Terms of Reference
TSP	Total Suspended Particles
VOC	Volatile Organic Compound
WHO	World Health Organization
Zn	Zinc



LIST OF PREPARERS

Name		Qualification	Role/Area of Specialization
1.	Prof. Nasiru M. Idris	B.Tech (URP) MSc (Env. Res. Mgt.) PhD (Env. Planning)	Team Leader (Project Coordinator)
2.	Abel Agada	B.Sc. Sociologist, M.Sc. Climate & Society Studies	Lead, Consultant
3.	Mba Emeodilichi Harrison	M.Sc. Geography, Env. Res. Mgt.	Head, Technical
4.	Elijah Oloche Oluma	HND Micro Biology, PGD Env. Mgt.	Analyst, Physico-chemistry (Soil/water/benthos/benthics analysis)
5.	Progress Shikben Isa	PhD Env. Res. Mgt.	Environmentalist (Emergency response, waste management)
6.	Elizabeth Egbo	M.Sc & PGD Geography and Env. Mgt.	Environmentalist (HSE/Emergency Response)
7.	Yunusa Ahmed Mohammed	M.Sc. Env. Mgt.	Environmental officer
8.	Dahiru Muhammad Bakano	B. Tech Biochemistry	Sampling/laboratory analysis (soil, water, sediment)
9.	Christian. C. Nwosu	B.Sc. Hons. Pure & Indus. Chemistry	Laboratory/Field work
10.	Prof. Ahmad Halilu Abba	B.Eng, M. Eng & PhD Agricultural/ Environmental Engineering	Agricultural Expert
11.	Dr. Salihu Usman	GIS & Remote Sensing	Geographical Features/ Topography/GIS
12.	Samuel Oteikwu	(M.Sc. Economics)	Socio-Economic
13.	Awajiowa Egopija	(PGD Env. Mgt.)	Data Gathering and Analysing



ACKNOWLEDGEMENT

Katsina State Ministry of Agriculture and Livestock Development acknowledges the Federal Ministry of Environment (FMEnv), Katsina State Ministry of Environment, the host communities and concerned stakeholders, for their support, assistance and understanding during this Environmental and Social Impact Assessment (ESIA) study. We thank all those that have contributed in one way or the other, especially those that supplied information, data and technical details that were used for the production of this report; sub-consultants of different professional background that have assisted in providing information and data that are used for the compilation of this report.



EXECUTIVE SUMMARY

ES.1 Background Information

The Federal Government alongside the African Development Bank (AfDB), the Islamic Development Bank (IsDB) and the International Fund for Agricultural Development (IFAD) has launched the Special Agro-industrial Processing Zones (SAPZ) initiative for Nigeria. It is driven by the Federal Ministry of Agriculture and Food Security (FMAFS) in collaboration with the State Governments, development partners, relevant Federal Ministries, Departments and Agencies (MDAs) and Private Investors to develop Agro-processing clusters in areas of high agricultural production across the country.

The SAPZ launch is focused on reinforcing Nigeria's commitment to significantly reform its agricultural sector, create jobs, attain food security, and generate economic revenue. The project is an integrated development initiative designed to physically concentrate agro-processing activities at scale in order to leverage and harness the high agricultural potentials of the State. The SAPZ will fast track the ongoing industrialisation of the State by boosting productivity and by integrating the production, processing and marketing of carefully selected commodity value chains that will enable agricultural producers, processors, aggregators and distributors to operate in the same production cluster.

The SAPZ is designed to develop multiple clusters of agricultural transformation centres, and added that they would have functional infrastructure including road networks, power, water, communication facilities, and others to attract private investments. The SAPZ entails the development and operation of agro-industrial processing clusters in areas of high food production across the country, to improve food and nutrition security, to reduce post-harvest losses, create jobs for women and youth, as well as create wealth for the rural community. The SAPZ is focused on building resilience rural communities where smallholder farmers can grow, produce small-scale agriculture and improve those outputs along the value chain to have rural, sustainable, vibrant communities.

Fahamu Nigeria Limited (FNL) was appointed as a Consultant to conduct an Environmental and Social Impact Assessment (ESIA) in accordance with the Nigerian Environmental Impact Assessment (EIA) Act Cap E12 Law of the Federal Republic of Nigeria (LFN) 2004, in compliance with Terms of Reference (ToR), in compliance with



the African Development Bank (AfDB), SAPZ's Environmental and Social Management Framework (ESMF), and the National Legislation. This process aims to identify the environmental and social impacts arising from project activities during the construction and operation phases, determine mitigation measures via Environmental and Social Management Plan (ESMP) to prevent or minimize potential impacts and risks, develop a Stakeholder Engagement Plan (SEP) to ensure effective stakeholder consultation in the process, and prepare Environmental and Social (E&S) management plans for guiding contractors' environmental and social performance during the project's construction period. The ESIA covers the entire life cycle of the proposed Project i.e. pre-construction, construction, commissioning, operation and decommissioning and it shall be carried out in line with the relevant requirements of the Federal Ministry of Environment (FMEEnv).

ES.2 The Proposed Project

The Special Agro-Industrial Processing Zones (SAPZ) program is a flagship African Development Bank initiative. The zones bring together the production, processing, storage, transport, and marketing of commodities. The program has four broad components:

1. support for the development of enabling climate-adapted infrastructure for agro-industrial hubs;
2. improving agricultural productivity and enterprise development to enhance value chains and job creation in the SAPZ catchment areas;
3. supporting agro-industrial zone policy and institutional development,
4. program coordination and management.

Given Nigeria's enormous potential for agriculture, the SAPZ program will help strengthen the country's agricultural supply chain. It supports sustainable agro-industrial development and unlocks the country's agriculture sector to promote industrialization by developing value chains for strategic livestock and crops, including rice, cassava, and tomatoes. The program will enhance the competitiveness of key selected value chains. It will achieve this through increased production, aggregation, and processing activities driven by private-sector investments. About 1.5 million households are expected to



benefit directly throughout the agricultural value chain. This includes private agribusinesses, agro-processors, smallholder farmers, agripreneurs, and agro-dealers. SAPZs will create at least 400,000 direct jobs, and a further 1.6 million indirect jobs during construction and the operational phase. Micro, small, and medium enterprises, including factories, along the value chain will create most of the jobs, along with tenant industries in the agro-industrial hubs.

The SAPZ will be made up of two main building blocks which include:

1. Agricultural Transformation Centres (ATC)
2. Agro-Industrial Hub (AIH)

1. Agricultural Transformation Centre (ATC)

The ATCs are designed to link smallholder farmers to the agro-processing hub and are centres strategically located in high production areas, with the aim of serving as aggregation points to accumulate products from the community to supply the agro-processing hub for further value addition, or to send them to centres of great demand for distribution and retail to consumers.

2. Agro-Industrial Hub (AIH)

The Agro-Industrial Hub will be supported by a network of compact and efficient Agricultural Transformation Centres (ATCs) that will coordinate farmers, their cooperatives and clusters' production (land preparation, planting and input supply), harvesting, agglomeration (primary on-farm storage, preservation and processing), and marketing, activities. The hub will include the installation of various crop processing factories for several commodities.

ES.3 Project Location and Description

The project site is located at Kusa, Katsina Industrial Estate, Special Economic Zone (SEZ), which spread across an area of 800ha, while 200ha is allocated for the SAPZ project, in Jibia Local Government Area (LGA) of Katsina state. The land is elevated and slop from north to south, rectangular in shape, and grazing ground. The project site is within Latitude 7°32'18"E, Longitude 13°02'13"E. The site elevation is 1,683ft above the



sea level with a savanna. The proposed AIH is host community is Natsinta village in Jibia LGA along Niger Republic Border Road, Katsina State. It is about 44km to the Niger Republic Border. The proposed site is a government gazette land with a vast range of landscapes including the sceneries such as ongoing critical infrastructural installation like drainage gutters, electric power utility pole, access gate, perimeter fencing, electric control room, as depicted in Plate 3.1.

Katsina State government has earmarked a total land cover of 200 hectares for phase 1 of the Katsina-SAPZ project. There is the Nasaini Training Institution sharing boundary with the project site. The project site is about 30km to the Niger border. Other surrounding features along the project road are 35 Battalion Army barrack about 4.5km, Prison yard about 2.5km, NTA office is about 1.5km and an abandoned landfill belonging to Ministry of Environment about 1.3km. There are 10 security checkpoints intervals before getting to the project site from ring road roundabout about 4.5kkm. The security checkpoints are the Nigeria Customs, the Nigerian Police, the Nigerian Army, the DSS, the Immigration, Civil Defiance among others who continue to display exceptional services in various intervals along the project road. Being a Border Road that leads to the boundary between Nigeria and Niger Republic, the government of Nigeria is doing everything possible to secure the area against transborder crimes and promote national security.

The sustenance of the proposed AIH is solely dependent on the continuous inflow of raw materials. An aggregation centre that shall serve as an input feeder for every ATC shall be strategically located in four LGAs places within the radius of influence/procurement of that ATC apart from having its collection facilities for the benefits of the farmers in the near vicinity. The proposed ATCs centers are distributed in four (5) Local Government Areas with their value chain commodities as highlighted in Table 1 below.



Table 1: Proposed ATCs location and Priority Value Chains

S/N	Community	LGA	Priority value chains
1.	Are	Rimi LGA	Soybeans
2.	Samarin Kabomo	Bakori LGA	Cotton
3.	Suduje	Daura LGA	Maize
4.	Makera	Dutsinma LGA	Soybeans
5	Rimaye	Kankia LGA	Maize

Source: Field work, 2024

ES.4 ESIA Objectives

The key objectives of this ESIA study are to generate environment and social baseline information within the study environment and affected communities before the implementation of this project implementation. In line with statutory requirements for environmental protection in Nigeria. Also to assess the potential environmental and social impacts of the proposed works as described in the scope of work and prepare an Environmental and Social Impact Assessment (ESIA) that will include detailed Environmental and Social Management Plans (ESMP) along all value chains.

ES.5 ESIA Scope of Work

The scope of study includes:

- Review existing ESMF prepared for SAPZ and incorporate AfDB requirements into the operationalization of the ESIA final report and ESMP developed;
- Review Environmental Safeguards instruments of the World Bank Safeguards policies triggered by the project;
- Describe the proposed project by providing a synthetic description of the project relevant components and presenting plans, maps, figures and tables;
- Review of national and international environmental regulations guiding the project;
- Consultations with regulators and other relevant stakeholders concerned with the proposed project;
- Extensive and comprehensive literature review specific to the project site to obtain background information on the environmental characteristics of the area;



- Impact identification, prediction, interpretation and evaluation from project activities;
- Development of an effective mitigation/ ameliorative measures and monitoring programmes for significant impacts;
- Development of comprehensive Environmental Management Plan covering the project life cycle;
- Development of best conceivable plans for restoring the environment after decommissioning of the proposed project
- EIA reporting following Federal Ministry of Environment (FMEnv) guidelines and procedures as well as public disclosure.



ES.6 Approaches and Methodology

A multidisciplinary approach was employed in order to holistically address all pertinent aspects of the proposed project on the bio-physical and socio-economic environment. Accordingly, the bio-physical and socio-economic environment of the proposed project was characterized and assessed using a number of survey instruments, field studies including broad-based community consultations to determine the likely environmental and social impacts of the proposed project and thereafter formulated specific, measurable, achievable, relevant and time-based mitigation measures (SMART).

ES.7 Administrative and Legal Framework

The EIA study was carried out in accordance to FMEnv's relevant policies, laws, regulations and guidelines particularly the EIA Procedural Guidelines. The applicable legal and administrative framework, including the relevant international standards and guidelines to the Project and the EIA study, includes, amongst others:

- National Policy on the Environment, 1989
- Environmental Impact Assessment (EIA) Act. Cap E12, LFN 2004.
- The Nigerian Urban and Regional Planning Act Cap N138, LFN 2004
- National Environmental Standards and Regulations Enforcement Agency (NESREA) Act, No. 25, 2007
- Land Use Act, Cap 202, LFN 2004
- National Environmental Protection (Effluent Limitations) Regulations (S.1.8) 1991;
- National Environmental Protection (Pollution Abatement in Industries and Facilities Generating Wastes) (S.1.9) 2004;
- National Environmental Protection (Management of Solid and Hazardous Wastes) Regulations (S.1.15) 1991;
- Guidelines and Standards for Environmental Pollution Control in Nigeria 1991;
- Sectoral Guidelines for EIA 1995
- Harmful Wastes (Criminal Provisions) Act No. 42, 1988;
- Environmental Impact Assessment Procedural Guidelines 2011;
- National Guidelines and Standards for Water Quality 1999
- National Guidelines on Environmental Management Systems (EMS) 1999



- National Guidelines on Environmental Audit in Nigeria 1999.
- Katsina State Ministry of Environment
- Katsina State Environmental Protection Agency (KSEPA) Edict No.3, 1997
- Katsina State Ministry of Environment and Forestry
- Katsina State Ministry of Lands and Housing
- Katsina State Ministry of Water Resources
- Standards Organization of Nigeria (SON) Act CAP 412 LFN 1990
- Nigeria Export Processing Zones Act (CAP N107 LFN 2004)
- Nigerian Investment Promotion Commission (NIPC) Act, 1995
- UN Framework Convention on Climate Change, 1992
- African Convention on the Conservation of Nature and Natural Resources
- WHO Health and Safety Component of EIA, 1982
- WHO Health for All Strategy and Policy, 1978
- SAPZ's Policy on Safety Health and Environment
- World Health Organisation (WHO) Health and Safety Component of EIA (1987)
- International Union for Conservation of Nature and Natural Resources;
- Basel Convention on the Control of Trans-Boundary Movements of Hazardous wastes and their Disposal
- Convention concerning the protection of the World Cultural and National Heritage Sites (World Heritage Convention)
- The Rio Declaration on Environment and Development
- United Nations Guiding Principles on the Human Environment

International Standards

The international safeguard policies to be applied here are Operational Policies (OP) of the World Bank. These policies contain the statements of the World Bank regarding the manner of implementation of development projects being financed by it and demonstrates its commitment to the eradication/reduction of poverty and promotion of social equality in the world.



AfDB Integrated Safeguards Systems

The AfDB’s Integrated Safeguards System (ISS) is a set of policies, procedures, and guidelines

established to identify, assess, and mitigate potential E&S risks and impacts associated with the Bank's funded projects and programs. The ISS were designed to ensure that the Bank's investments promote sustainable development and do not harm people or the environment. The updated ISS (April 2023) are comprised of the following:

- AfDB’s Vision for Sustainable Development
- AfDB’s E&S Policy
- Ten E&S Operational Safeguards (OS)
- E&S Guidance Notes (ISS Guidance notes)

There is a significant overlap between the AfDB operational safeguards and the IFC PSs; nevertheless, as the AfDB safeguards are also relevant to this Project the assessment of E&S performance is also assessed against these. A summary of the AfDB Safeguards is provided in Table below:

AfDB Safeguard	Description
E&S OS 1 (Assessment and Management of Environmental and Social Risks and Impacts)	<p>The aim of this overarching OS, along with the nine other Oss that complement it, is to mainstream E&S considerations; including those related to climate change vulnerability; into Bank operations and thereby contribute to sustainable development in Africa.</p> <p>An ESIA study carried out under this OS helps to determine the scope and extent to which other OSs are addressed. It sets out the Borrower’s (or Project’s) responsibilities for assessing, managing, and monitoring E&S risks and impacts associated with each stage of an operation/project supported by AfDB.</p> <p>This OS, together with OS10 (Stakeholder Engagement and Information Disclosure) provide the overall process framework for the E&S assessment and management of AfDB financed operations at project level.</p>
E&S OS 2 (Labour and Working Conditions)	<p>The objectives of OS2 are as follows: protect workers’ rights; promote safety and health in the workplace; promote the fair treatment, non-discrimination, and equal opportunity of project workers; protect project workers, including vulnerable workers; prevent the use of all forms of forced labour and child labour; support the principles of freedom of association and collective bargaining of project workers, provide project workers with accessible means to raise workplace concerns; and enquire that the Bank, and national competent authorities as appropriate, be informed promptly of any material adverse impacts and events relating to labour protection and health and safety at the workplace. The applicability of this OS is established during the ESIA described in OS1.</p>
E&S OS 3 (Resources Efficiency and Pollution Prevention and Management)	<p>OS3 sets out the requirements to address resource efficiency and pollution 36 prevention and Management throughout the project life cycle in a manner consistent with Good International Industry Practice (GIIP). Throughout the different phases of the project’s lifecycle—planning and design, construction, commissioning, operations, and decommissioning—the project is required to assess and evaluate resource-efficiency and pollution-prevention techniques and implement them, taking</p>



	into consideration their technical and financial feasibility and cost-effectiveness. The applicability of this OS is established during the ESIA described in OS1.
E&S OS 4 (Community Health, Safety and Security)	This OS addresses potential risks and impacts on communities that may be affected by project activities. Occupational health and safety (OHS) requirements for project workers are set out in OS2, and measures to avoid or minimize impacts on human health and the environment due to existing or potential pollution are set out in OS3. The applicability of this OS is established during the ESIA described in OS1.
E&S OS 5 (Land Acquisition, Restrictions on Access to Land and Land Use, and Involuntary Resettlement)	The objectives of OS5 are to: avoid involuntary resettlement where feasible, or minimize resettlement impacts where involuntary resettlement is deemed unavoidable after all alternative project designs have been explored; ensure resettlement plans and activities are informed by social assessments (including gender issues); avoid forced evictions; mitigate unavoidable adverse social and economic impacts from land acquisition or restrictions on land use; improve living conditions of poor or vulnerable persons who are physically displaced by the project; establish a mechanism for monitoring the performance and effectiveness of involuntary resettlement activities which result from project activities; conceive and execute resettlement activities as sustainable development programs; and ensure that resettlement activities are planned and implemented with appropriate disclosure of information, meaningful consultation, and the informed participation of those affected. The applicability of OS5 is established during the ESIA described in OS1
E&S OS 6 (Habitat and Biodiversity Conservation & Sustainable Management of Living Natural Resources)	This OS outlines the requirements for the Project to (i) identify and implement opportunities to conserve and sustainably use biodiversity and natural habitats, and (ii) observe, implement, and respond to requirements for the conservation and sustainable management of priority ecosystem services. The applicability of OS6 is established during the ESIA as described in OS1.
E&S OS 7 (Vulnerable Groups)	OS7 contributes to poverty reduction and sustainable development by ensuring that projects supported by the Bank enhance opportunities for vulnerable groups to participate in, and benefit from, the development process in ways that do not threaten their unique cultural identities and well-being. The applicability of OS7 is established during the ESIA as described in OS1
E&S OS 8 (Cultural Heritage)	This OS sets out general provisions on risks and impacts to cultural heritage from project activities. OS7 sets out additional requirements for cultural heritage in the context of vulnerable groups and highly vulnerable rural minorities including Indigenous Peoples (IPs). The applicability of this OS is established during the ESIA described in OS1.
E&S OS 9 (Financial Intermediaries (FIs))	The objectives of this OS are to: set out how the FI will assess and manage environmental and social risks and impacts associated with the subprojects it finances; promote good environmental and social management practices in the subprojects the FI finances; o promote good environmental and sound human resources management within the FI; support the adoption of best practice standards in corporate governance, business management and corporate responsibility by enterprises supported by the Bank based upon the requirements of OSs 1 through 10, as appropriate; and encourage the consideration of environmental and social governance issues in capital market institutions such as development finance entities and stock exchanges.
E&S OS 10 (Stakeholder Engagement and Disclosure of Information)	This OS therefore recognizes the importance of open and transparent engagement between the project and project stakeholders as an essential element of good international practice. Effective stakeholder engagement can improve the environmental and social sustainability of projects, enhance project acceptance, and make a significant contribution to successful project design and implementation. OS10 applies to all Bank Group’s funded operations. The project will engage with stakeholders as an integral part of the project’s ESIA and project design and implementation, as outlined in OS1



ES.8 Project Justification, Alternatives and Benefits

Needs for the Project

Nigeria is the most populous country on the African continent with over 223,000,000 million people, and a population growth estimated at 2.41% per year. Like other middle-income countries, Nigeria faces significant and persistent poverty and inequality. Major factors contributing to rural poverty include low agricultural production and productivity, limited opportunities for value-addition, challenges of marketing capacity, poor yields in quality and quantity, and significant deficits in support systems such as infrastructure, access to productivity-enhancing inputs, financial backing, commercial orientation, and effective policies, as well as environmental degradation and the effects of climate change. With the launch of the Special Agro-industrial Processing Zone (SAPZ) programme, Nigeria can, in less than a decade, banish food insecurity, while radically improving export earnings from agriculture, creating millions of lucrative agro-industrial jobs and opportunities for its citizens. The SAPZ is the flagship for Nigeria's agriculture, which entails the development and operation of agro-industrial processing clusters in areas of high food production across the country, to engender the competitiveness in agro-industrial production and processing that is critical to further unlock the potentials of Nigeria's agriculture, to improve food and nutrition security, to reduce post-harvest losses, create jobs for women and youth, as well as create wealth for the rural community.

ES.9 Value of the Project

The African Development Bank (AfDB), with support from other development partners, has launched \$520 million Special Agro-Industrial Processing Zones (SAPZs) in Nigeria with seven States as pioneer beneficiaries. The African Development Bank is providing \$210 million for the development of the SAPZs in Nigeria, in partnership with the Islamic Development Bank (IsDB) which is co-financing with \$150 million, and with the International Fund for Agricultural Development (IFAD), which is co-financing with \$160 million.



ES.10 Envisaged Project Sustainability

This proposed development project shall be sustained in broad and diverse ways. There will be harmonization and balance between this project and social, environmental, socio-economy of the project area of Katsina State, and the entire country. Katsina State Government intends to achieve the project sustainability by ensuring that the project environment is not abused; that the project meets viability content of the feasibility earlier carried out; that the project is integrative in the sense that social harmony will be enhanced among Nigerian occupants of the project; that technically, the project shall be executed using the best available technology in urban development, with regards to professionals, materials, construction, equipment, finishing, etc.

ES.11 Project Options and Alternatives

Project options and alternatives were well analyzed by the project proponent and her arrays of consultants and investors; haven decided to go ahead with the project option, a number of alternatives were also analyzed; alternative site/location, technology, waste management, materials, design and implementation schedule. In the end time tested technology, waste management, materials based on experience and quality were chosen. Since the site have been provided without encumbrances from governments at all levels and the community, no further alternative decision than to proceed with the project was acceptable by the proponent.

ES.12 Project Description

Component 1- Infrastructure Development and Management for Agro- Industrial Hubs

The SAPZ program will comprise an Agro-Industrial Hub (AIH) and a number of Agricultural Transformation Centres (ATCs), strategically located within the production area to serve as aggregation points to accumulate products from the community to supply the Agro-Industrial Hub for further value addition or send to centres of great demand for distribution and retail to consumers. During this Phase, the FGN and AfDB will support the set-up of the AIHs. Support for this component is AfDB- led and fully developed in the AfDB's Programme Appraisal Report (PAR).



Component 2- Agricultural Productivity, Production, Market Linkages and Value Addition in SAPZ Catchment Areas

Under this component, SAPZ's objective is threefold: (i) support smallholder farmers and small operators to increase their productivity/production and capacity to add value to raw materials on a profitable and environmentally sustainable basis; and (ii) link them to the additional market outlets offered by the AIHs, off-takers supplying the local and national market who operate in the target area, and small processors/traders supplying the local markets, including primary processors operating in the ATCs; iii) enhance the resilience and adaptive capacity of smallholder farmers to climate change. Activities under component 2 will be organized around three sub-components: (2.1) Agricultural market linkages and value addition; (2.2) Smallholder productivity/production enhancement; and (2.3) Access to finance and financial inclusion, including access to green agricultural investments facilitated through Inclusive Green Financing initiative (IGREENFIN) to support farmers in adopting and implementing climate change adaptation and mitigation best practices and solutions.

Component 3- Policy and Institutional Development Support

The objective of component 3 is to support the development of enabling policies, legislation, and regulation for SAPZs in Nigeria to create conducive business environment for private sector investment and to address inefficiencies and market failures in agricultural value chains. AfDB will support the development of enabling policies and regulatory framework for Agro-Industrial Zones. Through support for the setup of Commodity Alliance Forums, IFAD will focus on: i) facilitating local policy dialogue and influencing local investments for inclusive and conducive market linkages; ii) strengthening quality control, grading and standardization systems; and iii) supporting the establishment and strengthening of community conflict management mechanisms for sustainable investments.

Component 4 - Programme Coordination and Management

This component will ensure that the programme is efficiently and effectively managed to achieve expected results.



ES.13 Baseline Data of the Study Area

Site visits were carried out from 29th to 30th April 2024, to collect primary data relevant to the site assessment and for the generation of baseline information used in assessing potential impacts. The areas visited were the proposed Agro Industrial Hub at Natsinta and the ATCs in Are, Samarin Kabomo, Suduje and Makera communities in Katsina State. During the site visit, site assessment was carried out (strengthened by secondary data gotten from desk studies), samples for environmental assessment were collected, socio-economic data was collected through administration of questionnaires and conduction of semi-formal interviews, and stakeholder meetings were held.

The sampling strategy for this study was based on the report of site verification exercise by FMEnv dated 29th April, 2024; fourteen (14) sample locations and one (1) control were measured for air quality and noise level and soils, one (1) sample was taken for surface water and sediment, and two (2) were taken for groundwater. Data gathering took place between 29th and 30th April, 2024. Both primary and secondary data resources were relied upon for the report. The primary data were those sourced during field exercise: sampling for in-situ and ex-situ analysis, consultation, interviews and questionnaire administration; secondary data and information were sourced through desktop, National Bureau of Statistics (NBS), World Health Organisation (WHO), National Population Commission (NPC), Katsina State government websites.

The baseline characteristics of the project environment were determined from site reconnaissance and site visits. In-situ measurements were done with portable, handheld, calibrated equipment and tools; ex-situ measurements were done at Abuja Environmental Protection Board (AEPB) Laboratory, Abuja. Socio-economic data were sourced by direct interview, questionnaire distribution, consultation with community members and stakeholders.

Weather and Meteorology

Information on the climate and meteorology of the study area was obtained from Nigerian Meteorological Agency of the Federal Ministry of Aviation, Abuja. The study area is located in the semi-arid climatic zone of Nigeria and characterized by two distinct



seasons which are the hot dry season and a cool rainy season. Generally, Nigeria's climate is characterized by the dry and wet conditions associated with the movement of the Inter-Tropical Convergence Zone (ITCZ) north and south of the equator. The Inter-Tropical Convergence Zone (ITCZ) appears as a band of clouds, usually thunderstorms that circle the globe near the equator and Nigeria is located just north of the equator.

The entire area of the proposed AIH falls under the subtropical steppe climate. This is a factor of its latitude, terrain, altitude, as well as nearby water body and their currents. All these are natural factors that cannot be impacted by human (anthropogenic) activities. However, human activities in practice in the area such as vehicular movement, agriculture, overgrazing, desertification and energy generation have the capacities to impact on the climate.

With an elevation of 512.06meters above sea level, the proposed AIH project area experiences a tropical climate that is both wet and dry, similar to that of a savanna and experiences a yearly temperature 30.89°C. For the purpose of this EIA study, thermometers, hygrometer and anemometers were employed to monitor the weather condition at site. Results acquired were used to buttress secondary data acquired.

Air and Noise Quality

Fifteen (15) different locations including control were considered for measured of air quality, both within and outside the proposed Natsinta AIH project site. Measurements were conducted on the 29th of April 2024, which is for dry season. Particulates in sizes of P.M2.5 and P.M10 were detected in all the locations measured (Table 4.5). the concentrations ranged between 7ppm and 12ppm, and recording a mean value of 8.9ppm for P.M2.5; and between 9ppm and 14ppm and recording a mean value of 10.9ppm. PM2.5 is more likely to travel into and deposit on the surface of the deeper parts of the lung, while PM10 is more likely to deposit on the surfaces of the larger airways of the upper region of the lung. Particles deposited on the lung surface can induce tissue damage, and lung inflammation. Measured concentrations of both PM2.5 and PM10 were within withing the FME_{env} limit of 250ppm at all the points measured.

Geology of the Area



With its location in the northwestern region of Nigeria, the state is predominantly features sedimentary rock formations. These formations are mainly from the Cretaceous and Paleocene periods. The state's geology is shaped is shaped by various geological processes, including sedimentation, tectonism, and erosion. Some of the key geological features and formations of the state includes the sokoto basin which comprised of sedimentary rocks including sandstone, shale and limestone; gwandu formation which is known to consist interbedded standstone, shale and siltstone deposits; basaltic intrusions form from volcanic activities that occurred in the southern part of the state; alluvial deposits which are formed through erosion and deposition of alluvial soils and sediments; and laterite which are formed through the weathering of underlying rocks in hot and humid climates, and rich in iron and alluminium oxides.

The AIH project site is situated in a region with Migmatite formation (Figure 4.8), a composite rock found in medium and high-grade metamorphic environments, typically in Precambrian cratonic blocks. Migmatites consist of two or more layers, one older metamorphic rock reconstituted by partial melting, and the alternate layer with a pegmatitic, aplitic, granitic, or plutonic appearance.

Soil Study

A total of thirty (30 Nos) soil samples were collected within the proposed project site and one (1No) control soil sample. At each sampled point, soil samples were collected at two depths (0-15cm for top soil and 16-30cm for sub soil). This operation was carried out with the aid of stainless steel Dutch auger. Each sample was collected in aluminium foil, labeled appropriately, and stored in a cooler. The samples were then transported to Abuja Environmental Protection Board Laboratory (accredited by FMEnv.) in Asokoro District of Abuja. The physico-chemical characteristics of soil samples obtained from thirty (30) points and one (1) control point within the study area after in-situ/laboratory measurement and analyses is summarized

Groundwater study

Ground water sample were typically collected from a hand-dug well in Dan Naigaba community and a discharge line of a borehole in Gahoni community which are closest to



the proposed AIH project site. These samples were collected using 750ml plastic bottles, labeled appropriately, preserved in ice pack and transported to AEPB Laboratory in Abuja for laboratory analysis.



ES.14 Socio-Economic Environment

The estimated population of Jibia LGA is put at 179,313 inhabitants with the area mainly populated by members of the Fulani ethnic group. The Fulfulde language is commonly spoken in the area while Islam is the widely practiced religion in the LGA. Notable landmarks in Jibia LGA include the Jibiya Dam and the General Hospital Jibia.

Farming is an important economic activity among the people with crops such as wheat and rice grown in the area. Other important economic activities include hunting, pottery and the rearing of a variety of animals. The majority of the local population are Muslim with only a small number identified as Christian. Few Christian households were found in Natsinta village. There are no archaeological and sacred sites, such as traditional burial grounds and shrines in the communities. There are no sacred places/shrines within the communities. Furthermore, there are no taboos, although it is forbidden to entice married women into illicit relationship and stealing of any form is forbidden and attracts punishment. In conclusion, there are no taboos that will negatively impact contractor activity on the project. However, the major festival celebrated within the study area are Muslim festivals such as "Salah" celebrations of IdeI fitri and IdeI Kabir.

The household size distribution from the survey ranged from a minimum of one person to a maximum of 19 persons in Kusa ward. The average size of households is 6 persons for the project area community. On the extreme household size ends, the project area has 6.5% of the households with one to two members and 36.8% of the households with more than 8 persons. About 19.9% of the households have sizes of 7 or 8 persons while 21.3% showed sizes of 5 or 6 persons. The data showed 15.5% households have sizes of between 3 and 4 persons. The occupational distribution data from the questionnaires indicated that of surveyed households within the project communities, 46% are farmers; 20% are working blue collar jobs; 2% are civil servants; 14% are students and 18% are unemployed. The main source of income for the households surveyed came from farming and trading/business across the community.



Community Consultations/Stakeholder Engagement

The consultations served to provide stakeholders with information about the Project and to gather information important to the ESIA. Stakeholder engagement is an ongoing process of sharing project information, understanding stakeholder concerns, and building relationships based on collaboration. Stakeholder engagement is an all-inclusive, interactive, systematic and continuous process, spanning the entire life cycle of a project, in which stakeholders are engaged as active partners in establishing the priorities and focus of a project, and not treated merely as the passive recipients of the project when completed.

Information disclosure and consultation will be carried out throughout the preparation period, construction period and operation period of the project, by laying primary focus on the requirements (inclusiveness) of directly affected and vulnerable groups, such as the elderly, women, physical challenged, etc. The list of categories of stakeholders consulted are the Federal Ministry of Environment, Katsina State Ministry of Environment, Katsina State Ministry of Agriculture & Livestock Development.

The following were also identified as stakeholders consulted

- The paramount traditional Ruler in the identified Communities.
- The Council of Chiefs in the Communities.
- The Women Leader.
- The Representatives of the Youths.
- The Representative of the farmers.
- All the Project Affect People within the SAPZ project.
- The Honourable Councillor representing the political wards within the host communities
- The Representative of the host Local Government Areas



ES.15 Potential and Associated Impacts of the Project

Positive Project Impacts

- Provision of accommodation
- Increase in Income from Transportation
- Increase in Income from Employment
- Project Supporting Income Generating Service Activities
- Increased Trading of Local and National Materials
- Skills Acquisition and Training for Workers from Local Communities

Negative Impacts

➤ *Influx Related Impacts*

- Increase in price of goods and services mostly during construction
- Changes in social and cultural structure/situation
- Increase in social pathologies (crime, prostitution and others)
- Interference with archaeological and cultural resources

➤ *Surface Water*

Surface water contamination will arise from a number of sources including the following:

- Wash down of equipment during construction and operations
- Run off from the site during site preparation and construction
- Sanitary waste discharges from construction camp
- Oil leaks from machinery and vehicles

➤ *Groundwater*

Groundwater resources within the project area support the fresh water habitats in the area and are a source of drinking water. Identified sources of contamination include wash-down from equipment during site preparation and construction.



➤ **Noise and Air Pollution**

There will be increased noise and air pollution during general site preparation and construction activities such as movement of workers and materials, operation of combustion engines and various work site machinery.

➤ **Solid and Liquid Wastes**

Pre-operations activities will lead to generation of solid and liquid wastes, which have the potential to exacerbate the existing poor waste management condition in most of the project areas. Excavated materials also need to be handled properly to avoid environmental pollution.

➤ **Heavy Plant Operations**

Adverse impacts associated with plant operations include: Increased air emissions, increased ambient noise and Increased effluent discharge into the water bodies

Public and Community Health

Public and community health impacts of the project are mostly pollution- related such as air emissions and noise, and those associated with influx.

Influx related impacts of concern are traffic, psychosocial factors, accidents spills and fires.

➤ **Occupational Health**

A number of potential and associated occupational health impacts were also identified. These include: Over-exertion, Slips and Falls, Working at Heights, Struck by Objects, Moving Machinery, Confined Spaces, Excavations, chemicals and dust.

➤ **Cumulative Impacts**

Cumulative impacts of concern are those associated with air emissions, ambient noise, and effluent discharge.

ES.16 Mitigation Measures

Mitigation for Influx Related Impacts

- Employ casual, unskilled labour primarily from local communities;
- Give priority consideration to qualified local communities for hiring of workers;



Mitigation for Transportation Impacts

- Ensure that as much as possible, all heavy duty trucks working on the project move at off peak hours;
- Implement a Journey Hazard Management Plan for both road and water transportation associated with the project;

Mitigation for Impacts on Surface Water

- Store oil and grease and other chemicals in leak proof containers within an effective contained area;
- Construct drainage lines where necessary on the site;
- Ensure that runoff from the site is channeled through sediment/ silt traps before discharge into nearby water bodies;

Mitigation for Physical and Economic Displacement

- Notify potentially affected persons of project activity and affected routes;
- Implement livelihood compensation and enhancement programme for any project affected persons (PAP). The program shall also include a grievance mechanism.
- Integrate the people on the project

Mitigation for Vibration and Noise Impacts

- Adopt noise attenuation measures such as installation of acoustic mufflers on large engines and equipment;
- Provide sound-insulated control rooms with noise levels below 60 dBA;
- Provide hearing protection to all workers on site; and

Mitigation for Air Emission Impacts

- As much as possible ensure the use of modern equipment that minimize emission of air pollutants; service equipment regularly.
- Ensure that excavation, handling and transport of erodible materials shall be avoided under high wind conditions;
- Where possible, ensure that soil stockpiles shall be sheltered from the wind;



Mitigation for Solid Waste Impacts

- Pursue a waste minimization and utilization strategy;
- Engage government approved and reputable waste management firms in waste handling and disposal;

Mitigation for Liquid Wastes and Discharge impacts

- Ensure sewage generated at the temporary construction camps are collected in a closed system comprising a conservancy tank to separate solid materials from liquid wastes. The liquids would then be piped to a holding tank;
- Ensure that the Contractor(s) on site engage the service of a certified third- party waste disposal contractor to collect waste from the tanks on a regular basis and treat the sanitary waste offsite;

Mitigation for Health Impacts of Sanitary and Solid Waste

- Implement a Contractors Sanitation Plan for the project;
- Require its contractors to provide HSE induction training to all workers engaged on the project.

Mitigation for Communicable and Non-Communicable Diseases impacts

- Conduct periodic health awareness campaigns for STDs especially AIDS, and support safe sex initiatives;
- Provide adequate medical facilities for all construction workers.

Mitigation for Psychosocial Impacts

- Inculcate induction training into employment programme to intimate new intake with the culture and religious belief of the people;
- Maintain and implement a Drug and Alcohol Policy for all aspects of the project,
- Support anti-drug crusades and campaigns in the area;

Mitigation for Occupational Health Impacts

- Requires that all its Contractors develop and implement HSE Plans for their activities;
- Review all contractor HSE plans prior to contract award;
- Ensure all contractors staff are trained on basic safety procedures and emergency



- response procedures and environmental issues;
- Require that contractors maintain emergency and first aid facilities at strategic locations throughout the project area;

Mitigation for Moving Machinery impacts

Project managers shall require that contractors implement the following prevention and protection measures for all work areas with exposure to hazards of moving *machinery*:

- Plan segregate location of vehicle traffic, machine operation, and walking areas, and controlling vehicle traffic through the use of one-way traffic routes;
- Establish and enforce speed limits, and on-site trained flag-people wearing high-visibility vests or outer clothing covering to direct traffic;
- Ensure moving equipment is outfitted with audible back-up alarms;

ES.18 Environmental and Social Management Plan (ESMP)

The goal of this EMP is to ensure full compliance with project's HSE Policy and with mitigation and other commitments made in the ESIA. It outlines the actions necessary to attain this goal, and describes the means, time frames, and designation of responsibility required for compliance and conformance. The project managers shall execute the comprehensive EMP to achieve health, safety, and environmental (HSE) regulatory compliance objectives, institutional responsibilities and other related commitments for the proposed activities.

Estimated cost for the required ESMP actions

Generally, this ESMP provides a roadmap for implementation of enhancement and mitigation measures of the impacts identified by this ESIA. It comprises of the expected effectiveness of the proposed mitigations measures, the frequency of which they are to be applied, the responsible parties involved, and the minimum estimated cost for the required actions as presented in chapter seven. The estimated cost summary for the ESMP implementation are as follows:

1. Environmental and Social Management Plan for the proposed HUB Project

₦205,000,000.00



2. Environmental and Social Management Plan for the proposed ATC Projects
₦111,000,000.00
3. Proposed Training Program for the Implementation of ESMP ~~₦45,000,000.00~~

ES.19 Decommissioning Plan

Before decommissioning, project managers shall develop plans that include the following:

- Identification of components of the project that shall be removed;
- The choice of environmentally sound methods for removal, re-use, recycling or disposal of special wastes that may arise from the decommissioning process;
- Expressly outline the time frame/schedule for the decommissioning and post-decommissioning process, and communicate the same to BSEPA and other relevant regulatory agencies as well as the affected or concerned persons and groups;

ES.20 Conclusions and Recommendations

Based on the assessments, the Katsina SAPZ Project is predicted to have economic and social positive impacts at the site preparation, site development, and operational stages which include job creation, improvement of local economy, profitable use of land and land resources, capacity building, communal participation, capacity building, increased infrastructure development, reduced loss of farm yield, increase in revenue generation, attraction of FDIs, contribution to FOREX, increased urbanisation, CSR to host community, improvement in food security, and improvement of state's brand. Recommendations to enhance these positive impacts are contained in the report.

On the other hand, the negative impacts predicted by the assessment are mostly environmental and social. They include impacts on the ecosystem, pollution, waste generation, increase in storm water run-off, predisposition of soil to erosion, risk of accidents, noise generation, traffic generation, increased pressure on community infrastructure, increased risk of diseases, occupational/industrial hazards to workers, increased water demand, increased power demand, increased risk of gender based violence and harassment, increased risk of crime and juvenile delinquency, threat to



community culture, and risk of child labour. Mitigation measures to mitigate these negative impacts are proposed in the report.

The ESIA also proposes the following recommendations:

1. The establishment of adequate institutional capacity, including the recruitment and training of a competent Environmental Control Officer, to ensure compliance with the proposed ESMP as well as the daily operations during the site preparation and development stages of the Processing Hub and to form part of the Hub Management during the operation stage.
2. The conduction of Livelihood Restoration Plan for Kwanan Are ATC site
3. The conduction of Resettlement Action Plan for Rimaye ATC site
4. The requirement of all other farm holdings and industries that shall operate within the SAPZ to present site-specific EIA reports in accordance with national legislations.



CHAPTER ONE

1.0 INTRODUCTION

1.1 Background Information

The Federal Government of Nigeria recently launched the Nigeria Special Agro-Industrial Processing Zones (SAPZ) program to achieve greater economic diversification and promote long-term sustainable development. The Special Agro-Industrial Processing Zones program is an agro-based development initiative designed to concentrate agro-processing activities within areas of high agricultural potential to boost productivity and integrate production, processing and marketing of selected commodities. It has purposely-built shared facilities, to enable agricultural producers, processors, aggregators and distributors access to development services for increased productivity and competitiveness.

The SAPZ Program is designed to develop multiple clusters of Agricultural Transformation Centres (ATCs) and Agro-Industrial Hubs (AIHs) within major clusters of high agricultural production, where functional infrastructures like roads, power, water, communication are provided to attract private investment into modern agro-processing and value addition to locally produced crops, livestock and related agribusiness activities. The SAPZ Program is aligned with the national policies and priorities. It seeks to sustainably contribute to poverty alleviation, hunger and inequality while providing opportunities for economic diversification, job creation, building climate resilience and improved livelihoods in Nigeria. It will also contribute to rural infrastructure development, improved access to agricultural markets, increased farm productivity, the adoption of agricultural technology, climate smart agricultural production and processing practices, increased value addition and agro-processing, increased skills acquisition and job creation, for all actors along the value chain, including the smallholder farmers, women and youth.

In compliance with the Environmental Impact Assessment (EIA) Act Cap E12 LFN 2004, the World Banks Operational Policy 4.01: Environmental Assessment (1999), revised April 2012) among others, an Environmental and Social Impact Assessment (ESIA) study becomes an obligation for the approval of the proposed Special Agro-



Industrial Processing Zones project. In view of the above, Katsina State Government (KTSG) engaged Fahamu Nigeria Limited - an Environmental consulting company duly registered and accredited by the Federal Ministry of Environment (FMEnv) to carry out a comprehensive Environmental and Social Impact Assessment (ESIA) for the proposed special Agro-Industrial Processing Zones, Katsina State.

1.2 Project Components

The SAPZ has four components as captured by the Program Appraisal Report (PAR) and the Environmental & Social Management Framework (ESMF). The program components and key activities under each of them are:

Component 1- Infrastructure Development and Management for Agro- Industrial Hubs

The SAPZ program will comprise an Agro-Industrial Hub (AIH) and a number of Agricultural Transformation Centres (ATCs), strategically located within the production area to serve as aggregation points to accumulate products from the community to supply the Agro-Industrial Hub for further value addition or send to centres of great demand for distribution and retail to consumers. During this Phase, the FGN and AfDB will support the set-up of the AIHs. Support for this component is AfDB- led and fully developed in the AfDB's Programme Appraisal Report (PAR).

Component 2- Agricultural Productivity, Production, Market Linkages and Value Addition in SAPZ Catchment Areas

Under this component, SAPZ's objective is threefold: (i) support smallholder farmers and small operators to increase their productivity/production and capacity to add value to raw materials on a profitable and environmentally sustainable basis; and (ii) link them to the additional market outlets offered by the AIHs, off-takers supplying the local and national market who operate in the target area, and small processors/traders supplying the local markets, including primary processors operating in the ATCs; iii) enhance the resilience and adaptive capacity of smallholder farmers to climate change. Activities under component 2 will be organized around three sub-components: (2.1) Agricultural market linkages and value addition; (2.2) Smallholder productivity/production enhancement; and



(2.3) Access to finance and financial inclusion, including access to green agricultural investments facilitated through Inclusive Green Financing initiative (IGREENFIN) to support farmers in adopting and implementing climate change adaptation and mitigation best practices and solutions.

Component 3- Policy and Institutional Development Support

The objective of component 3 is to support the development of enabling policies, legislation, and regulation for SAPZs in Nigeria to create conducive business environment for private sector investment and to address inefficiencies and market failures in agricultural value chains. AfDB will support the development of enabling policies and regulatory framework for Agro-Industrial Zones. Through support for the setup of Commodity Alliance Forums, IFAD will focus on: i) facilitating local policy dialogue and influencing local investments for inclusive and conducive market linkages; ii) strengthening quality control, grading and standardization systems; and iii) supporting the establishment and strengthening of community conflict management mechanisms for sustainable investments. Under this component, IGREENFIN II funding will also promote policy dialogue and advocacy to support the creation of an adequate policy framework for green agriculture projects, to increase commercially bankable projects, and to ensure sustainability.

Component 4 - Programme Coordination and Management

This component will ensure that the programme is efficiently and effectively managed to achieve expected results.

1.3 The Proponent

Katsina State Government is the proponent of the proposed Special Agro-Industrial Processing Zones (SAPZ) Program driven by Katsina State Ministry of Agriculture and Livestock Development.



1.4 Geographic Location and Description of Katsina State

The location coordinates of Nigeria are latitude $9^{\circ}4'55.2''\text{N}$ and longitude $8^{\circ}40'31''\text{E}$. Katsina State is located in the Northwest geopolitical zone of Nigeria and takes the shape of a mushroom extending longitudinally from $7^{\circ}03'\text{E}$ to $9^{\circ}05'\text{E}$ in the northern part and from $6^{\circ}05'\text{E}$ to $7^{\circ}52'\text{E}$ in the southern part of the state. The State stretches between approximately latitude $11^{\circ}10'\text{N}$ and $13^{\circ}22'\text{N}$. The State was carved out of old Kaduna State in 1987 and is bounded to the East by Kano State, to the West by Zamfara State, in the South by Kaduna State and in the North by the Niger Republic. The capital city of Katsina State is Katsina Town (Figure 1.1).

The main Agro-Industrial Hub is proposed to be located at Kusa, Katsina Industrial Estate, Special Economic Zone (SEZ), which spread across an area of 800ha, while 200ha is allocated for the SAPZ project, in Jibia LGA of Katsina state. The land is elevated and sloped from north to south, rectangular in shape, and grazing ground. A small gully was observed on the northern part of the site. The main cause of this gully is flash flood coming from the eastern part of the site to the west, that converge around the uncompleted road construction within the site. The depth of the gully is estimated between 4 to 8 meters wide, and 5 to 10 meters deep located at within the project site Latitude $13^{\circ}02'35''\text{N}$, Longitude $7^{\circ}32'30''\text{E}$ coordinate. The site coordinates are longitude $7^{\circ}32'18''\text{E}$, Latitude $13^{\circ}02'13''\text{E}$. The site elevation is 1,683ft above the sea level with a savanna.



Fig. 1.1: Map of Nigeria Showing Location of Katsina State



Fig. 1.2: Map of Katsina State Showing LGAs and Project Locations



Figure 1.2: Satellite image of the proposed AIH Site



1.5 ESIA Objectives

The key objectives of this ESIA study are to generate environment and social baseline information within the study environment and affected communities before the implementation of this project implementation. In line with statutory requirements for environmental protection in Nigeria, the proposed ESIA study has been carried out to:

- To gather all necessary data from secondary sources, field survey and sampling on socio-economic, health, biophysical and cultural components of the host communities for establishing the environmental baseline condition of the project area.
- Satisfy Federal, State and Local Governments as well as stakeholders, that proactive environmental actions shall be incorporated in project design, installation, construction and operation phases of the project;
- Identify all environmental aspects of the proposed project that may interact positively or negatively with the environment;
- Make appropriate recommendations to prevent, reduce or control identified potential and associated impacts;
- Develop Environmental Management Plan (EMP) and procedures for effective and proactive environmental management of the environment throughout the project life cycle;
- To achieve a positive mutual trust and understanding between host communities and the proponent.
- To achieve positive public perception about this project through effective communication as a necessary tool to avoid conflicts (legal and physical).
- To comply with all the relevant sections of national and international environmental laws, regulations and guidelines on project development.
- Provide all necessary data/ evidence that will form basis for the preparation of the Environmental Impact Statement (EIS) of the project.



1.6 ESIA Scope of Work

The scope of study includes:

- Project screening and site visit;
- Preparation of Terms of Reference (ToR) in accordance with regulatory guidelines;
- Review of national and international environmental regulations guiding the project;
- Consultations with regulators and other relevant stakeholders concerned with the proposed project;
- Extensive and comprehensive literature review specific to the project site to obtain background information on the environmental characteristics of the area;
- Impact identification, prediction, interpretation and evaluation from project activities;
- Development of an effective mitigation/ ameliorative measures and monitoring programmes for significant impacts;
- Development of comprehensive Environmental Management Plan covering the project life cycle;
- Development of best conceivable plans for restoring the environment after decommissioning of the proposed project
- EIA reporting following Federal Ministry of Environment (FMEnv) guidelines and procedures as well as public disclosure.

1.7 Approach and Methodology

The methodology for preparation of the ESIA was in line with the Nigerian Environmental Assessment guidelines and procedures. The preparation of the ESIA was specifically guided by the Environmental and Social Management Framework (ESMF) prepared for the SAPZ project. A multidisciplinary approach was employed in order to holistically address all pertinent aspects of the proposed project on the bio-physical and socio-economic environment of the project area. A summary of blend investigative method used to acquire the socio-economic data is as follows:

- Review of Existing data;



- Reconnaissance survey to identify project affected communities and to alert community's leaders on the activities of the proposed projects;
- In-depth interviews with leaders of communities as well as key investors in the value chains segments project areas;
- Focus Group Discussion (FGDs) with men, women, youths and project affected persons in the focal communities;
- Field observations using strategic instruments and devices to record and note observations and detections by the consultants and interviewers;
- Structured questionnaire to acquire needed baseline information and perceptions of people using simple random sampling techniques;
- Population assessment using combined field survey and 2006 census figures by the National Population Commission (NPC).

Well designed and sectionalized questionnaires were administered to households within the project communities and from it the socio-economic status of the people was deduced after analysis. A typical questionnaire has plain questions, which comprises issues of existing livelihood opportunities, income, gender characteristics and other demographic, physical and social infrastructure. Series of consultations were also held with stakeholders on issues of traditional administrative system, existing formal and informal redress mechanisms; concerns of the project affected persons using Focused Group Discussion (FGD). The minutes of the consultations were written and presented in the Annexure. All the communities and villages affected by the projects were considered in the socio-economic studies.

1.8 EIA Procedural Guidelines

This procedure prescribes the steps to be followed in the EIA process from project conception to commissioning and post commissioning impact mitigation, to ensure that the project is implemented with maximum consideration for environment. This ESIA study was conducted in compliance with this guideline. The Federal Ministry of Environment (FMEnv) developed guidelines to be used by project proponents in conducting ESIA, in compliance with the EIA Act. Accordingly, the EIA process,

illustrated in figure 1.3 shall follow the following steps sequentially as outlined in the procedural guideline.

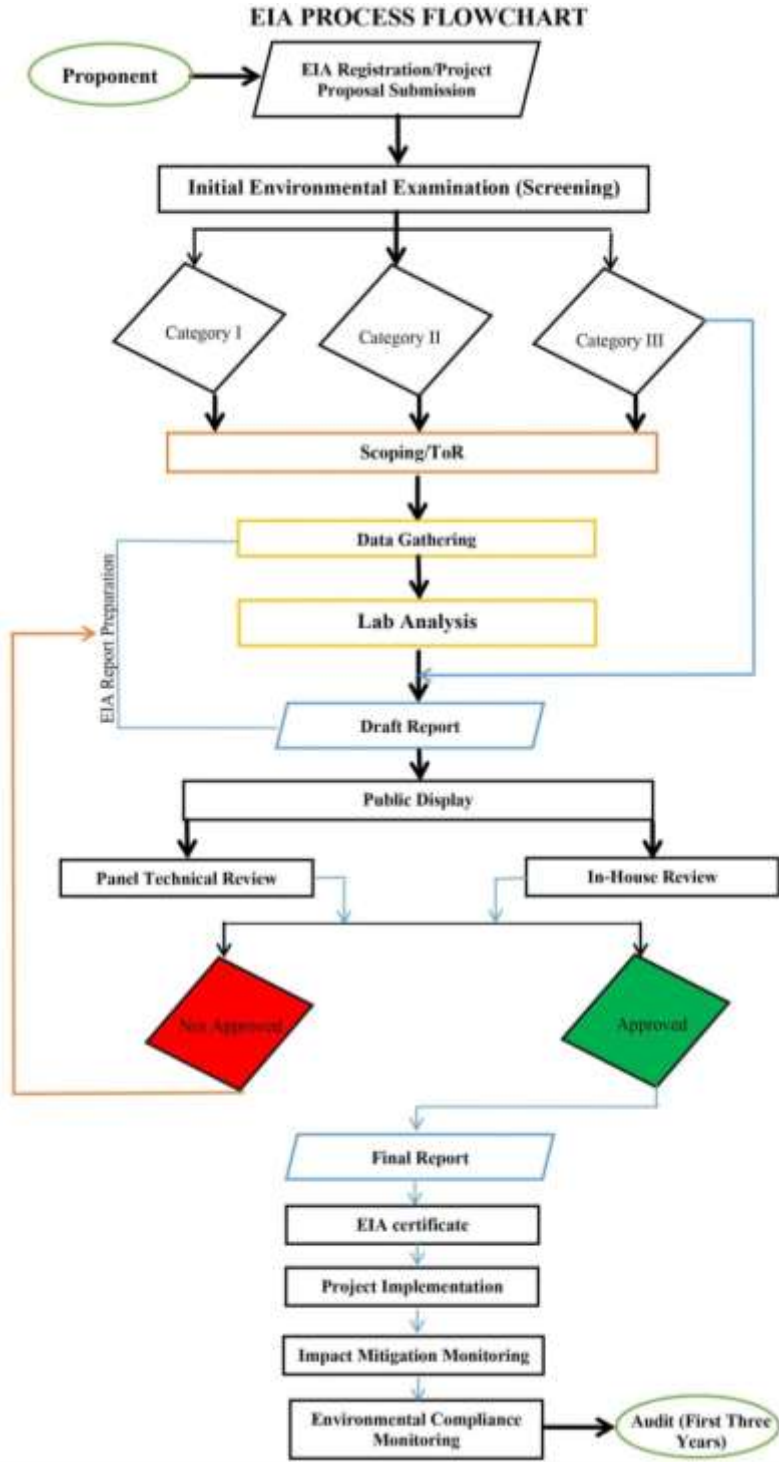


Figure 1.3: Overview of EIA Process in Nigeria



1.9 Administrative Institutions and Legal Framework

The study was carried out in accordance with the regulations, guidelines and standards of the Federal Ministry of Environment, Katsina State legislations on the environment and all other applicable National legislations, and International Agreement and Convention to which Nigeria is a signatory. The synopsis below is some of the legal and administrative instruments on which the preparation of this ESIA was premised.

1.9.1 National Environmental Legislation

In Nigeria, there are several national laws, regulations and standards, which seek to protect the natural environment and assure sustainable development in the country. A number of these regulatory instruments were developed following the Koko toxic waste episode of 1987, which led to the promulgation of the Harmful Waste Act No. 42 of 1988 and the establishment of the Federal Environmental Protection Agency (FEPA). Laws establishing some government agencies also contain provisions to ensure environmental protection as development progresses.

1.9.2 Federal Ministry of Environment Regulations

The Federal Government of Nigeria promulgated the Federal Environmental Protection Agency (FEPA) by Act No. 58, 1988, CAP. E12 L.F.N. 2004. The Act establishes the Federal Environmental Protection Agency with the responsibility of protecting and preserving the environment, monitoring and assisting in the enforcement of environmental laws and co-operating with relevant authorities on matters and facilities relating to environmental protection. The Federal Ministry of Environment, (FMEnv) upon establishment in 1999, took over the powers and functions of the Federal Environmental Protection Agency (FEPA).

The Minister for Environment is empowered to establish standards in certain environmental areas like water quality, effluent limitations, air quality, atmospheric protection, ozone protection, noise control, and control of hazardous and waste removal methods by virtue of the provisions of the defunct FEPA. In exercise of its power, the Ministry had since made about 20 Guidelines by way of Regulations for different aspects of environmental protection and preservation.



National Policy on the Environment

Environmental management in Nigeria is based on the National Policy on the Environment (1989), revised in 1999 and 2017. The Policy states that Nigeria is committed to safeguarding the country's natural and built environment for the use of present and future generations. This commitment demands that efficient resource use and the reduction of environmental impacts be a core requirement of all developmental activities. The strategic objective of the Policy is to coordinate environmental protection and natural resources conservation for sustainable development.

National Guidelines and Standards for Environmental Pollution Control in Nigeria, 1991

This represents the basic instrument for monitoring and controlling industrial and urban pollution.

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

This imposes restrictions on the release of toxic substances into the environment and stipulates requirements for pollution monitoring units, machinery for combating pollution and contingency plan by industries.

S.I.15 National Environmental Protection (Management of Solid and Hazardous Wastes) Regulations, 1991

This Statutory Instrument regulates the collection, treatment and disposal of solid and hazardous wastes from municipal and industrial sources and gives a comprehensive list of chemicals and chemical waste by toxicity categories

EIA Act CAP E12 LFN 2004

The EIA Act is the primary Act governing EIA studies in Nigeria. It was promulgated to enable the prior consideration of an EIA on specified public or private projects. The Act sets out the procedure to be followed and methods to be used in undertaking an EIA.

Section 2(2) of the Act requires that where the extent, nature, or location of the proposed Project or activity is such that it is likely to significantly affect the environment, an EIA must be undertaken in accordance with the provisions of the Act.



Section 55 of the EIA Act provides for the maintenance of a Public Registry to facilitate public access to records relating to environmental assessments. Public review to which interested members of the public are invited to provide comments on the EIA of a proposed project is a key part of the approval process by the Federal Ministry of Environment.

National Environmental Impact Assessment Procedural and Sectoral Guidelines

In response to the promulgation of the EIA Act, the Federal Ministry of Environment developed National EIA Procedural Guidelines and other sets of guidelines on various sectors of the national economy. Applicable to this study is the EIA Sectoral Guidelines for Agricultural Sector.

The guidelines have been developed by the Federal Ministry of Environment to assist proponents in conducting a detailed environmental and social assessment of all new major projects within the agricultural sector in Nigeria. This EIA study has taken into consideration the relevant provisions of the guidelines, including the applicable mitigation measures.

1.9.3 National Environmental Standards and Regulations Enforcement Agency (NESREA) Act, 2007

Administered by the Ministry of Environment, the National Environment Standards and Regulations Enforcement Agency (NESREA) Act of 2007, repealed the Federal Environmental Protection Agency (FEPA) Act. It is the embodiment of laws and regulations focused on the protection and sustainable development of the environment and its natural resources. The following sections are worth noting:

- Section 7 provides authority to ensure compliance with environmental laws, local and international, on environmental sanitation and pollution prevention and control through monitory and regulatory measures.
- Section 8 (1)(K) empowers the Agency to make and review regulations on air and water quality, effluent limitations, control of harmful substances and other forms of environmental pollution and sanitation.



- Section 27 prohibits, without lawful authority, the discharge of hazardous substances into the environment. This offence is punishable under this section, with a fine not exceeding, N1, 000,000 (One Million Naira) and an imprisonment term of 5 years. In the case of a company, there is an additional fine of N 50,000, for every day the offence persists.

This project will comply with NESREA regulations, including conducting EIA, environmental audit every three years after commissioning, obtain permit before disposing hazardous wastes, etc.

Regulations (under NESREA) - National Effluent Limitation Regulations

- Section 1 (1) requires industry facilities to have anti-pollution equipment for the treatment of effluent.
- Section 3 (2) requires a submission to the agency of a composition of the industry's treated effluents.
- National Environment Protection (Pollution Abatement in Industries and Facilities producing Waste) Regulations (1991).
- Section 1 Prohibits the release of hazardous substances into the air, land or water of Nigeria beyond approved limits set by the Agency.
- Section 4 and 5 requires industries to report a discharge if it occurs and to submit a comprehensive list of chemicals used for production to the Agency.

National Environmental Regulations

Section 34 of the NESREA Act, 2007 empowers the Minister of Environment to make regulations for safe and sustainable environment. In exercise of this power, the minister issued the national environmental regulations covering all sectors of development. The regulations relevant to the project are as follows:

- National Environmental Protection (Effluent Limitation) Regulations, 1999, makes it mandatory for industries to install anti-pollution and pollution abatement equipment on site. The regulation is specific for each category of waste generating facility with respect to limitations of solid and liquid discharges or gaseous emissions into the environment.



- National Environmental Protection (Management of Solid and Hazardous Waste) Regulations, 1999, defines the requirements for groundwater protection, surface impoundment, land treatment, waste piles, and landfills. It describes the hazardous substances tracking program with a comprehensive list of acutely hazardous chemical products and dangerous waste constituents. It also states the requirements and procedure for inspection, enforcement and penalty.
- Pollution Abatement in Industries Generating Wastes Regulations imposes restrictions on the release of toxic substances and stipulates requirements for pollution monitoring units, machinery for combating pollution and contingency planning by industries, submission of lists and details of chemicals used by industries to FMEnv, permits for the storage and transportation of harmful or toxic waste and the waste generator's liability.

The Act also provides regulations on strategies for waste reduction, permissible limits of discharge into public drains, protection of workers and safety requirements, environmental audit (or environmental impact assessment for new industries) requirements and penalties for contravention.

1.9.3.3 National Policy on Climate Change/ National Climate Change Policy for Nigeria 2021-2030

Given Nigeria's status as a fossil-fuel dependent economy with a large climate sensitive agricultural sector, the development of a climate change policy and response strategy is critical, as climate change presents a serious threat to poverty eradication and sustainable development in general. One of the key pillars of the Vision 20:2020 is investment in low carbon fuels and renewable energy. Achieving the goal of low carbon, high growth and resilient socio-economic system for equitable and sustainable socio-economic and environmental development faces some challenges which include stability and sustainability of the enabling environment, adequate institutional and human resource capacity and availability of adequate resources to address mitigation and adaptation initiatives to address climate change. Thus, the Government needs to ensure that economic growth, resource management and climate change mitigation and adaptation



can all happen simultaneously if this will be done effectively (Department of Climate Change 2017).

The National Climate Change Policy for Nigeria 2021-2030 was established to promote a low-carbon, climate-resilient and gender-responsive sustainable socio-economic development. The revised National Policy on Climate Change was to define a new holistic framework to guide the country's response to the development challenge of climate change.

1.9.4 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. The punishment under this section, is a fine not exceeding N10,000 (Ten thousand naira) and in the case of a company, a fine not exceeding N50,000.
- 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 permit from Katsina State Government.

1.9.5 Water Resources ACT, CAP W2, LFN 2004

The Water Resources Act is targeted at developing and improving the quantity and quality of water resources. The following sections are pertinent: Section 5 and 6 provides authority to make pollution prevention plans and regulations for the protection of fisheries, flora and fauna. Section 18 makes offenders liable, under this Act, to be punished with a fine not exceeding N2000 or an imprisonment term of six months. He would also pay an additional fine of N100 for everyday the offence continues.



1.9.6 Land Use Act of 1978 and Resettlement Procedures

The Land Use Act (Cap 202, 1990), now Cap L5 Laws of the Federation of Nigeria 2004, is the key legislation that has direct relevance to this project. Relevant sections of these laws that may relate to this project with respect to land ownership and property rights, resettlement and compensation are summarized in this section.

The Land Use Act is the applicable law regarding ownership, transfer, acquisition and all such dealings on Land. The provisions of the Act vest every parcel of Land, in every State of the Federation, in the Executive Governor of the State. He holds such parcels of land in trust for the people and government of the State.

The Act categorized the land in a State to urban and non-urban or local areas. The administration of the urban land is vested in the Governor, while the latter is vested in the Local Government Councils. At any rate, all land irrespective of the category belongs to the State while individuals only enjoy a right of occupancy as contained in the Certificate of Occupancy, or where the grants are “deemed”.

The concept of ownership of land as known in the western context is varied by the Act. The Governor administers the land for the common good and benefits of all Nigerians. The law makes it lawful for the Governor to grant statutory rights of occupancy for all purposes; grant easements appurtenant to statutory rights of occupancy and to demand rent. The Statutory Rights of Occupancy are for a definite time (the limit is 99 years) and may be granted subject to the terms of any contract made between the state Governor and the Holder.

The Local Government Councils may grant customary rights of Occupancy for agricultural (including grazing and ancillary activities), residential and other purposes. But the limit of such grants is 500 hectares for agricultural purposes and 5,000 for grazing except with the consent of the Governor. The local Government, under the Act is allowed to enter, use and occupy for public purposes any land within its jurisdiction that does not fall within an area compulsorily acquired by the Government of the Federation or of the relevant State; or subject to any laws relating to minerals or mineral oils.

The State is required to establish an administrative system for the revocation of the rights of occupancy, and payment of compensation for the affected parties. So, the Land



Use Act provides for the establishment of a Land Use and Allocation Committee in each State that determines disputes as to compensation payable for improvements on the land (Section 2 (2)

(c)).

In addition, each Local Government is required to set up a Land Allocation Advisory Committee, to advise the Local Government on matters related to the management of land. The holder or occupier of such revoked land is to be entitled to the value of the unexhausted development as at the date of revocation. (Section 6) (5). Where land subject to customary rights of Occupancy and used for agricultural purposes is revoked under the Land Use Act, the local government can allocate alternative land for the same purposes (section 6) (6).

If Local Government refuses or neglects within a reasonable time to pay compensation to a holder or occupier, the Governor may proceed to effect assessment under section 29 and direct the Local Government to pay the amount of such compensation to the holder or occupier. (Section 6) (7).

Where a right of occupancy is revoked on the ground either that the land is required by the Local, State or Federal Government for public purpose or for the extraction of building materials, the holder and the occupier shall be entitled to compensation for the value at the date of revocation of their unexhausted improvements. Unexhausted improvement has been defined by the Act as:

“anything of any quality permanently attached to the land directly resulting from the expenditure of capital or labour by any occupier or any person acting on his behalf, and increasing the productive capacity the utility or the amenity thereof and includes buildings plantations of long-lived crops or trees, fencing walls, roads and irrigation or reclamation works, but does not include the result of ordinary cultivation other than growing produce.”

Developed Land is also defined in the generous manner under Section 50(1) as follows: land where there exists any physical improvement in the nature of road development services, water, electricity, drainage, building, structure or such improvements that may enhance the value of the land for industrial, agricultural or residential purposes.



It follows from the foregoing that compensation is not payable on vacant land on which there exist no physical improvements resulting from the expenditure of capital or labour. The compensation payable is the estimated value of the unexhausted improvements at the date of revocation.

Payment of such compensation to the holder and the occupier as suggested by the Act may appear confusing as it raises the following question: Does it refer to holder in physical occupation of the land or two different parties entitled to compensation perhaps in equal shares? The correct view appears to follow from the general tenor of the Act.

First, the presumption is more likely to be the owner of such unexhausted improvements. Secondly, the provision of section 6 (5) of the Act, which makes compensation payable to the holder and the occupier according to their respective interests, gives a pre-emptory directive as to who shall be entitled to what.

Again, the Act provides in section 30 that where there arises any dispute as to the amount of compensation calculated in accordance with the provisions of section 29, such disputes shall be referred to the appropriate Land Use and Allocation Committee. It is clear from section 47 (2) of the Act that no further appeal will lie from the decision of such a committee. If this is so, then the provision is not only retrospective but also conflicts with the fundamental principle of natural justice, which requires that a person shall not be a judge in his own cause.

The Act must, in making this provision, have proceeded on the basis that the committee is a distinct body quite different from the Governor or the Local Government. It is submitted, however, that it will be difficult to persuade the public that this is so since the members of the committee are all appointees of the Governor.

Where a right of occupancy is revoked for public purposes within the state of the Federation; or on the ground of requirement of the land for the extraction of building materials, the quantum of compensation shall be as follows:

- *In respect of the land, an amount equal to the rent, if any, paid by the occupier during the year in which the right of occupancy was revoked.*
- *In respect of the building, installation or improvements therein, for the amount of the replacement cost of the building, installation or improvements to be assessed on the basis of prescribed method of assessment as determined by the*



appropriate officer less any depreciation, together with interest at the bank rate for delayed payment of compensation. With regards to reclamation works, the quantum of compensation is such cost as may be substantiated by documentary evidence and proof to the satisfaction of the appropriate officer.

- *In respect of crops on land, the quantum of compensation is an amount equal to the value as prescribed and determined by the appropriate officer.*

Where the right of occupancy revoked is in respect of a part of a larger portion of land, compensation shall be computed in respect of the whole land for an amount equal in rent, if any, paid by the occupier during the year in which the right of occupancy was revoked less a proportionate amount calculated in relation to the area not affected by the revocation; and any interest payable shall be assessed and computed in the like manner.

Where there is any building installation or improvement or crops on the portion revoked, the quantum of compensation shall follow that outlined in paragraph (ii) above and any interest payable shall be computed in like manner.

1.9.7 Harmful Waste (Special Criminal Provisions) ACT CAP H1, LFN 2004

The Harmful Waste Act prohibits, without lawful authority, the carrying, dumping or depositing of harmful waste in the air, land or waters of Nigeria. The following sections are notable:

- Section 6 provides for a punishment of life imprisonment for offenders as well as the forfeiture of land or anything used to commit the offence.
- Section 7 makes provision for the punishment accordingly, of any conniving, consenting or negligent officer where the offence is committed by a company.
- Section 12 defines the civil liability of any offender. He would be liable to persons who have suffered injury as a result of his offending act.

The project will generate wastes including construction wastes and transformer oils at substations and other harmful wastes. These wastes shall be handled, treated, and disposed of in accordance with the relevant requirements of this Act.



1.9.8 The Forestry Act

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 produces, forest growth or forest property. The project area does not fall within any protected or reserved forest.

1.9.9 The Endangered Species Act, CAP E9, LFN 2004

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 over exploitation. These sections are noteworthy:

- Section 1 prohibits, except under a valid license, the hunting, capture or trade in animal species, either presently or likely, 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.

Certain sections of the line route of this project, will pass through natural areas that serve as wildlife habitats which will be impacted by the project. Hence, the project activities shall be carried out to comply with relevant provisions of this Act.

1.9.10 Public Health Law CAP 103 LFN 1990

Public Health Law (L.N47 of 1955, Cap 103) provides justification for the execution of developmental projects under guidelines that promote health by protecting the environment and safeguarding the health of humans.

1.9.11 The Factories Act, 1987 (Factory Act cap 126, LFN, 1990)

The factories Act, as contained in the Laws of the Federation of Nigeria 1990, seeks to legislate, and regulate the conduct of health and safety in the Nigerian workplaces. It was enacted in June 1987 with the desire to protect the workers and other professionals against exposure to occupational hazards. The director of factories at the Federal Ministry of Employment, labor and productivity is responsible for the administration of the provisions or requirements of this Act. Section 13 allows an inspector to take emergency



measures or request that emergency measures be taken by a person qualified to do so, in cases of pollution or nuisances.

This Act deals with working conditions at work sites, including construction sites, such as the type to be undertaken under the Project. Hence, the occupational health and safety requirements applicable to construction sites, as well as other work sites to be used by the project shall be subjected to the provisions of this Act.

1.9.12 Fire Service Act CAP F29, LFN 2004

The provisions of the Fire Service Act, Cap. F29, Laws of the Federation of Nigeria, 2004 make provisions for the establishment of building safety measures, regulations and penalty for default. The bill seeks, among other things, to put in place a legal framework for the establishment of requisite prevention mechanisms and global best practices and safety world standards of measures, regulations, and penalty for default.

- Section 5 “give approval for building after thorough perusal of the submitted building plan and compliance with provision of necessary fire services prevention and management kits and supervision protocols.”
- Section 24 “Subsequent upon submission for an approval for a building compliance with the fire service protocol, the officials of the Fire service shall charge a particular fee to the intended developer and such funds shall be remitted to the covers of the Government of the Federation.
- Section 28 “Any person who contravenes or fails to comply with any of the provisions of this Act, or with any regulation or requirement made thereunder, for which no other penalty is specifically provided shall be guilty of an offence and on summary conviction thereof shall be liable to a fine not exceeding forty naira or to imprisonment for a term not exceeding two months or to both such fine and imprisonment”.
- Section 28 “Any person who contravenes or fails to comply with the provisions of Section 5 (e) of this bill, or with any regulation or requirement made thereunder shall be guilty of an offence and on summary conviction thereof shall be liable to a fine not exceeding One Million Naira or to imprisonment for a term not exceeding five months or to both such fine and imprisonment”.



1.9.13 Labour Act - CAP. L1 L.F.N. 2004

This Act deals with labour issues, including payment of wages, recruitment, discipline, employee welfare, employment of women and child labour. Sections 54 to 58 which deal with employment of women, prescribed period of absence from work for nursing mothers and allows her half an hour twice a day during her working hours to attend to the baby for a period of up to six months after she resumes work. Section 55 also exempted women from night work, except when they are employed as nurses. Sections 59-64 deal with employment of young people.

1.7.14 Penal Code (Northern States) Federal Provisions Act, CAP P3 LFN 2004

The Act contains the basic criminal law offences relating to endangering the life of people from various activities in the Northern region of Nigeria. These include offences relating the public health, safety and convenience, amongst others.

1.9.15 Workers' Compensation Act, 1987

The Act to make provisions for the payment of compensation to workmen for injuries suffered in the course of their employment. The compulsory insurance covers employees for injury or death resulting in the course of work or in work places. All types of workers are covered including working under a contract of service or apprenticeship with an employer, whether by way of manual labour, clerical work or otherwise, and whether the contract is expressed or implied, is oral or in writing. The project will employ both skilled and non-skilled labour and shall be subject to this law as applicable.

1.9.15 Child Rights Act 2003

The Child's Rights 2003 was enacted by the National Assembly of the Federal Republic of Nigeria, 31st July 2003. It Is 'AN ACT TO PROVIDE AND PROTECT THE RIGHTS OF A NIGERIAN CHILD; AND OTHER RELATED MATTERS.' Focuses mainly on survival which includes the rights of the child to life, good health, balance nutrition and related matters, Key Household Practices (KHHP).

- **Development**, which include the development of the child, spirit, soul and body
- **Protection**, which include protection of the child from child labour, child trafficking, ritual killing, sexual, physical, emotional abuses and neglect.



- **Participation**, which include the right of the child to be involved in matters that concerns them.

1.9.16 National Gender Policy 2006

The main goals of this policy are:

- Commitment to gender mainstreaming as a development approach and tools for achieving the economic reform agenda, evidence based planning, value re-orientation and social transformation.
- Recognition of gender issues as central to and critical to the achievement of national development goals and objectives and a requirement for all policies to be reviewed to reflect gender implications and strategies as contained in the gender policy and implementation modalities specified in the National Gender Strategic Framework;
- Realization that effective and results focused policy implementation demands a cooperative interaction of all stakeholders. Promotion and protection of human rights, social justice and equity.

1.9.17 Federal Ministry of Agriculture and Food Security (FMAFS)

The Federal Ministry of Agriculture and Food Security (FMAFS), formerly known as the Federal Ministry of Agriculture and Rural Development (FMARD), was established in 1966 with a clear vision to ensure food security and promote agricultural sustainability in Nigeria. With a focus on empowering farmers, facilitating market access, and promoting sustainable practices, we strive to cultivate a resilient and prosperous agricultural sector.

The Federal Ministry of Agriculture and Food security is responsible for the formulation and implementation of policies and strategies in the Nigeria's agricultural sector, to sufficiently provide food for an increasing population, adequate supply of raw materials to a growing industrial sector, effectively expand the market for crop, livestock, agro and agro-allied products, continually create employment opportunities, and to widely diversify the economy, for national development.

The Ministry provides resources to the sector for the implementation of various projects and programmes. The efforts is complemented with the support and funding from donor



partners in the implementation of various agricultural projects and programmes in the country.

1.9.18 Federal Ministry of Agriculture and Rural Development (FMARD)

The Federal Ministry of Agriculture and Rural Development (FMARD) has the administrative power to regulate agricultural research, agriculture and natural resources, forestry and veterinary research all over Nigeria. Since its establishment in 1966, the Ministry has been mandated to optimise agriculture and integrate rural development for the transformation of the Nigerian economy, attain food security, and position Nigeria as a net food exporter for socio-economic development.

To carry out its mandate, the Ministry develops and implements policies that are directed toward the key areas of interest in the agricultural sector. These policies are the synthesis of the framework and action plans of the Government designed to achieve overall agricultural growth and development.

The current agricultural policy being adopted by FMARD is the Agriculture Promotion Policy (2016-2020).

Agriculture Promotion Policy (2016-2020)

The Agriculture Promotion Policy (APP), also referred to as The Green Alternative, is the outcome of an intensive consultative process between November 2015 and April 2016, which involved multiple stakeholders.

The Agriculture Promotion Policy (APP) Policy is founded on the following guiding principles:

- Agriculture as a business— focusing the policy instruments on a government-enabled, private sector-led engagement as the main growth driver of the sector.
- Agriculture as key to long-term economic growth and security—focusing policy instruments to ensure that the commercialization of agriculture includes technologies, financial services, inputs supply chains, and market linkages that directly engage rural poor farmers because rural economic growth will play a critical role in the country's successful job creation, economic diversity, improved security and sustainable economic growth.



- Food as a human right – focusing the policy instruments for agricultural development on the social responsibility of government with respect to food security, social security and equity in the Nigerian society; and compelling the government to recognize, protect and fulfil the minimum degree of freedom of the people from hunger and malnutrition.
- Value chain approach – focusing the policy instruments for enterprise development across successive stages of the commodity value chains for the development of crop, livestock and fisheries sub-sectors, namely input supply, production, storage, processing/utilization, marketing, and consumption.
- Prioritizing crops – focusing policy on achieving improved domestic food security and boosting export earnings requires a measure of prioritization.
- Market orientation– focusing policy instruments on stimulating agricultural production on a sustainable basis, and stimulating supply and demand for agricultural produce by facilitating linkages between producers and off-takers, while stabilizing prices or reducing price volatility for agricultural produce through market-led price stabilization mechanisms (commodity exchanges, negotiated off-take agreements, extended farm-gate price undervalue chains coordination mechanisms, agricultural insurance, etc.).
- Factoring Climate change and Environmental sustainability – focusing policy instruments on the sustainability of the use of natural resources (land and soil, water and ecosystems) with the future generation in mind while increasing agricultural production, marketing, and other human activities in the agricultural sector.
- Participation and inclusiveness – focusing instruments on measures to maximize the full participation of stakeholders, including farmer's associations, cooperatives, and other groups, as well as Non-Governmental Organizations (NGOs), Community Based Organizations (CBOs), Civil Society Organizations (CSOs), development partners and the private sector.
- Nutrition-sensitive agriculture– focusing policy instruments on addressing the issues of stunting, wasting, underweight and other manifestations of hunger and malnutrition with particular reference to the vulnerable groups, which include



children under 5, nursing mothers and persons with chronic illness and disabilities.

- Agriculture's Linkages with Other Sectors– focusing policy instruments on the connected relationship between agriculture and other sectors at federal and state levels, particularly industry, environment, power, energy, works and water sectors.

1.9.18 National Agricultural Land Development Authority Act, 1992

This Act established the National Agricultural Land Development Authority with the following objectives:

- Provide strategic public support for land development which presently constitutes a major infrastructural development bottleneck hindering the development of viable economic farm holdings;
- Promote and support optimum utilization of Nigeria's rural land resources for accelerated production of food and fibre;
- Encourage and support economic-size farm holdings and promote consolidation of scattered fragment holdings to generate net income from agriculture which is aimed at sustaining living standards above the poverty line and thereby narrow rural-urban income inequalities;
- Provide gainful employment opportunities for rural people, raise rural incomes and improve on the general living standards in rural areas;
- Expand productive capacity in agriculture and regain export capability in traditional and non-traditional crops;
- Contribute significantly towards the attainment of a national food and fibre self-reliance, self-sufficiency and national food security through optimum utilization of available abundant land resources which ensures minimum soil and environmental degradation, while simultaneously promoting sustainable agriculture;
- Facilitate appropriate cost-effective mechanization of agriculture.



1.9.19 Standards Organization of Nigeria (SON) Act CAP 412 LFN 1990

This organization was established to do the following:

- to organize tests and do everything necessary to ensure compliance with standards designated and approved by the Council;
- to undertake investigations as necessary into the quality of facilities, materials and products in Nigeria, and establish a quality assurance system including certification of factories, products and laboratories;
- to ensure reference standards for calibration and verification of measures and measuring instruments;
- to compile an inventory of products requiring standardization;
- to comply Nigerian standards specifications;
- to foster interest in the recommendation and maintenance of acceptable standards by industry and the general public;
- to develop methods for testing of materials, supplies and equipment including items purchased for use of departments of the Government of the Federation or a State and private establishments;
- to register and regulate standards marks and specifications;
- to undertake preparation and distribution of standards samples;
- to establish and maintain such number of laboratories or other institutions as may be necessary for the performance of its functions under this Act;

1.9.20 Nigerian Free Trade Zone Act No. 63, 1992

In 1992, the Nigerian Free Zone Act (Act No. 63 of 1992) was passed establishing the Nigerian Export Processing Zone Authority (FMAFS). Free Trade Zones (FTZ), are expanses of land with improved ports and/or transportation, ware housing facilities, uninterrupted electricity and water supplies, advanced telecommunications services and other amenities to accommodate business operations. Under the FTZ system, enterprises are exempt from customs duties, local taxes, and foreign exchange restrictions, and qualify for incentives—tax holidays, rent-free land, no strikes or lockouts, no quotas in European Union (EU) and United States (US) markets, as long as end products are exported (although some portion can be sold in the domestic market). The FMAFS is



responsible for the regulation of FTZ operations. Its tasks involve policy formulation, licensing and monitoring. The zones are governed by the FTZ Act which stipulates that an extensive EIA must be carried out before the commencement of any major projects.

Under Section 8 of the Act [Nigeria Export Processing Zones Act 63, 1992], approved enterprises operating within Free Zones shall be exempt from all Federal, State and Local Government taxes, levies and rate. Section 18 (1) further provides that all legislative provisions pertaining to taxes shall not apply within Free Zones.

1.9.21 Nigeria Export Processing Zones Act (CAP N107 LFN 2004)

The institutional framework that governs the establishment of Special Agro-Industrial Processing Zones falls under the jurisdiction of Nigeria Export Processing Zones Authority. “In exercise of the power conferred upon it by section 27 of the Nigeria Export Processing Zones Act, CAP N107 LFN 2004 and of all other power enabling it in that behalf, Nigeria Export Processing Zones Authority with the approval of the Honorable Minister of Industry Trade and Investments”. The objectives of these regulations will apply to the Special Agro-Industrial Processing Zones

- Complement and enhance the provisions of the Nigeria Export Processing Zones Act, 2004
- Provide details of regulatory and supervisory requirements necessary to promote efficient and profitable operations in Nigeria’s Free Trade Zones
- Facilitate the attainment of goals for which Free Trade Zones are established in Nigeria.
- These regulations shall take precedence over the Investment Procedures, Regulations and Operational Guidelines for free zones in Nigeria, 2004

1.9.22 Federal Ministry of Women Affairs and Social Development

Promote actions to achieve the National Gender Policies, and a gender budget among policymakers. The goals of the gender policy among others include among others:

- Eliminate cultural/ religions gender-based biases and harmful cultural and religious practices which rise to inequalities in gender-role relations in the Nigerian society. A culture which is amendable to development must be dynamic.



- Tap the potential of women for development;
- Eliminate all forms of gender-based violence.
- Ensure equal access to women, boys and girls to both formal and informal education. Women education is a priority because it is the key to gender equity, justice and poverty reduction, improved skills and technological knowledge, as well as the general socioeconomic development of the nation.

1.9.23: National Climate Change Policy for Nigeria (2021 – 2030)

The Federal Executive Council approved a comprehensive strategy policy on climate change: the overarching objective of the policy is to promote low-carbon, high-growth economic development and build a climate-resilient society through the achievement of the following targets.

- Implement mitigation measures that will promote low carbon as well as sustainable and high economic growth;
- Enhance national capacity to adapt to climate change;
- Raise climate change-related science, technology and R&D to a new level that will enable the country to better participate in international scientific and technological cooperation on climate change;
- Significantly increase public awareness and involve private sector participation in addressing the challenges of climate change; and
- Strengthen national institutions and mechanisms (policy, legislative and economic) to establish a suitable and functional framework for climate change governance



1.9.21: National Action Plan on Gender and Climate Change (2020)

This National Action Plan, based on a series of informed consultations with different stakeholders, using inclusive participatory approaches (Government Ministries, Departments and Agencies, women, youth, farmers, persons with disability, elderly persons), moves from the need to guide the implementation of gender and climate change-related policies, strategies, programmes, negotiations and actions at Federal, State and Local Government levels, as the negative impact of climate change is considered a serious threat to the social and economic realities of people, especially women, living in Nigeria.

This Action Plan covers the period 2020-2025 and its priority sectors include: Agriculture, Forestry and Land Use; Food Security and Health; Energy and Transport; Waste Management; Water and Sanitation. The implementation of the Action Plan will be governed by a participatory research involving the government at all levels, academic and research institutions, women and youth groups, private sector and other non-state actors, as well as development partners. In line with Nigeria's intention to empower and respond to the needs of women in the context of climate change, this National Action Plan focuses on effective strategies for integrating gender into the implementation of national climate change initiatives, including the Paris Agreement and the Nationally Determined Contributions (NDC). The Action Plan presents milestones for ensuring that in building a climate-resilient Nigeria, the important and critical roles of women, youth and other vulnerable groups are carried along in the implementation of relevant national policies and strategies.

Concerning the implementation of the linkage between gender issue and climate change in its priority sectors, the Plan defines specific objectives, action steps and timeline, indicators, responsible institutions and outcomes. Main objectives regarding Agriculture, Forestry and Land Use are: improving agriculture related infrastructure to adapt to the effects of climate change; enhancing local communities' participation in forestry and agricultural sector; encouraging women to acquire education in agriculture and forestry and increasing their access to land; ensuring gender responsive budgeting. Food Security and Health's objectives focus on: integration of gender and climate change in national



health policy and programs; ensuring alternative livelihood opportunities for women affected by climate change in urban and rural settings; promotion of gender sensitive health care delivery services related to climate change; improving disease surveillance programs. Energy sector points out: the need for awareness on the relationship between climate change, energy and gender; the importance of supporting women to gain knowledge in energy technologies; the reduction of emissions of greenhouse gases and the increasing of budget allocation on climate change and gender programs. Waste Management objectives are: integrate climate change and gender in waste management system; promote effective waste management practices in communities; create access to finance women participation in waste management business. Water and Sanitation aims at: building technical capacity of women in water management; increase access to safe drinking water in rural and urban communities; development of gender-based programs for integrated water resources management.

1.9.24 State Legislations

Katsina State Environmental Protection Agency (KSEPA) Edict 1988

The edict states the functions of agency which are to:

- Liaise routinely and ensure effective harmonisation with the FMEnv in order to achieve the objectives of the National policy on environment;
- Co-ordinate the activities of ministries, parastatals, local government councils, departments, statutory bodies and research organisations on matters relating to environmental protection and conservation;
- Identify the ecological problems of the State including the devastating erosion and flood, brief the government on their sources and effects and find solutions to them;
- Monitor and determine degradations of coastlines, river basins and estuaries and carryout measures to protect and remedy their ecosystems;
- Identify water, air and soil pollution and their sources and carryout measures to prevent them;
- Monitor the implementation of the EIA and environmental audit report guidelines and procedures on all policies and projects within the State; and



- Carry out other activities as are necessary or expedient for the protection and sustainable development of the environment and for the full discharge of functions of the agency.

Katsina State Land Use Gazette KT. S.L.N. NO.1, 2015

The gazette discusses revised statutory land compensation rates payable for farmlands and economic trees as it relates to Katsina State. It stipulates the compensation rates for:

- Farmland per hectare in:
 - Katsina State Capital city (Katsina).
 - Local Government Headquarters of the state.
 - All rural areas (villages); and o Fadama Areas.
 - Economic trees per piece.

Katsina State Waste Management Act

This Acts provides for the effective development and maintenance of sanitation in all areas of the State. The law further provides for proper disposition of excavated silt or earth and other construction materials after any construction project or repair works. Open burning of wastes is prohibited with stipulated penalties.

1.9.22 State Institutions

Katsina State Ministry of Resource and Development

This Ministry was set up to protect and develop the general environment of the State. Other objectives are to facilitate good governance in the protection, restoration, conservation, development and management of the environment and natural resources for equitable, sustainable socio-economic development.

Katsina State Ministry of Lands and survey

The ministry ensures efficient and effective land resource management which promotes equitable access, enabling environment for land delivery, land information and ability to contribute to sustainable socio-economic development of the state. Its objective is to acquire, develop, hold, manage, sell, lease and let any properties within the State.



Improving the quality of life for citizens through efficient and effective utilization of available resources for the advancement of Human Settlement.

Katsina State Ministry of Women Affairs

The Ministry is charged with the development of women through education, training as entrepreneurs and creating a platform where issues of sexual harassment and discrimination are critically examined and steps are taken to stop such act.

Katsina State Local Government & Chieftaincy Affairs

This Ministry was created for the purpose of complementing the effort of the State Government to create an environment where the tradition and customs of the community are adhered to and also increase development of the community at the local government level.

1.9.23 International Guidelines and Conventions

In addition to the national laws/regulations, Nigeria is signatory or party to several international conventions and treaties that support the use of EIA as the key tool for achieving environmentally sustainable development. The EIA shall be guided by the international environmental and social regulations from IFC/World Bank where applicable. All other relevant international guidelines and conventions, and industry best management practices shall also apply, including the international financing community. The international conventions, to which Nigeria is a signatory, relevant to this project are as follows:

- African Convention on the Conservation of Nature and Natural Resources
- Convention on Biological Diversity
- Endangered Species (Control of International Trade and Traffic)
- Conservation of Migratory Species of Wild Animals (1973)
- Convention to Combat Desertification (1994)
- United Nation Framework Convention on Climate Change (UNFCCC) 1992.
- International Union for Conservation of Nature and National Resources (IUCN) Guideline, 1996.
- The “Equator Principle”



- World Bank Operational Policies.
- Public Health Legislations and Regulations.
- The Rio Declaration on Environment and Development
- The Kyoto protocol, Montreal Protocol on Substances that Deplete the Ozone Layer, 1987.
- The African Convention on the Conservation of Nature and Natural Resources, 1968.
- Convention on the Elimination of All Forms of Discrimination against Women (CEDAW)
- Human and Peoples' Rights on the Rights of Women in Africa in 2005
- Civil and Political Rights Covenant
- Economic, Social and Cultural Rights Covenant
- Convention on the Elimination of All Forms of Violence against Women
- ILO Occupational Safety and Health Convention, 1981

1.9.23.1 ILO Conventions and Core Labour Standards

The International Labour Organization (ILO) is a tripartite organization consisting of trade unions, governments and companies, and is part of the United Nations system. In 1998, the ILO produced the Declaration on Fundamental Principles and Rights at Work. In the Declaration, ILO member states including Nigeria agreed that they should all respect, promote, and realize core labour standards (whether they have been ratified or not).

The core labour standards consist of five standards, laid out in eight conventions:

- Freedom of association and the effective recognition of the right to collective bargaining (Convention No. 87 & No. 98)
- The elimination of all forms of forced and compulsory labour (Convention No. 29 & No. 105)
- The effective abolition of child labour (Convention No. 138 & No. 182)
- The elimination of discrimination in respect of employment and occupation (Convention No. 100 & No. 111)



KTSG as well as its contractors shall comply with these requirements, as well as the following internationally recognized labour rights: the right to a living wage based on a regular working week that does not exceed 48 hours; humane working hours with no forced overtime; a safe and healthy workplace free from harassment; and a recognized employment relationship with labour and social protection.

1.9.23.2 The African Development Bank Group's (AfDB) Integrated Safeguards System

In 2013 the African Development Bank Group updated their policy on Involuntary Resettlement and created an Integrated Safeguards System (ISS) to improve clarity, coherence and consistency as well as overall operational effectiveness. Resettlement is covered under Operational Safeguard 2 (Involuntary Resettlement: Land Acquisition, Population Displacement and Compensation), which includes comprehensive notions of livelihood and assets, accounting for their social, cultural, and economic dimensions. It also adopts a definition of community and common property that emphasises the need to maintain social cohesion, community structures, and the social interlinkages that common property provides. It furthermore stresses the importance of improving living conditions for PAPs through a RAP. OS 2 has the following specific objectives to:

- avoid involuntary resettlement where feasible, or minimize resettlement impacts where involuntary resettlement is deemed unavoidable after having explored all other alternative project designs;
- ensure that displaced people are meaningfully consulted and given opportunities to participate in the planning and implementation of resettlement programmes;
- ensure that displaced people receive significant resettlement assistance under the project, so that their standards of living, income-earning capacity, production levels and overall means of livelihood are improved beyond pre-project levels;
- mitigate the negative impacts of displacement and resettlement, actively facilitate social development and establish a sustainable economy and society; and
- set up a mechanism for monitoring the performance of involuntary resettlement programs and remedying problems as they arise so as to safeguard against ill-prepared and poorly implemented resettlement plans.



African Convention on the Conservation of Nature and Natural Resources

The African Convention on the Conservation of Nature and Natural Resources was adopted in Algiers, Algeria, on September 15, 1968, and entered into force on June 16, 1969. The Convention stipulates that the contracting States shall undertake to adopt the measures necessary to ensure the conservation, utilization and development of soil, water, flora and fauna resources in accordance with scientific principles and with due regard to the best interests of the people.

Convention Concerning the Protection of the World Cultural and Natural Heritage

The Convention was adopted in Paris, France on October 17, 1972. The Convention sets aside areas of cultural and natural heritage for protection. It places obligations to each State Party to recognize that the duty of ensuring the identification, protection, conservation, presentation and transmission to future generations of the cultural and natural heritage situated on its territory, belongs primarily to that State.

Convention on the Conservation of Migratory Species of Wild Animals

This Convention also known as the Bonn Convention was adopted in 1979 and entered into force in 1983. It stipulates actions for the conservation and management of migratory species including habitat conservation.

Vienna Convention for the Protection of the Ozone Layer

The Vienna Convention was adopted in 1985 and entered into force on September 22, 1988. It places general obligations on countries to take appropriate measures to protect the environment against adverse effects resulting from human activities which tend to modify the ozone layer.

The Montreal Protocol on Substances that Deplete the Ozone Layer

The Protocol was adopted on September 16, 1987, as an international treaty to eliminate ozone-depleting chemicals production and consumption.

Basel Convention on the Control of Trans-boundary Movement of Hazardous Wastes and their Disposal



The Convention was adopted on March 22, 1989, and entered into force on May 1989. It focuses attention on the hazards of the generation and disposal of hazardous wastes. The Convention defines the wastes to be regulated and controlled in order to protect human and environmental health against their adverse effects.

The United Nations Convention on Biological Diversity

The convention was adopted in 1994. The objectives of the Convention include 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.

The United Nations Framework Convention on Climate Change

The Convention on Climate Change was adopted in 1992 during the Rio Earth Summit in Rio De Janeiro, Brazil and entered into force in 1994 to limit Greenhouse Gas (GHG) emissions which cause global warming. Nigeria being a signatory to this framework has made it develop its Nationally Determined Contribution (NDC) which shows its global commitment towards embracing sustainable development measures that limit the rate of global warming and negative impacts of climate change. It shows the country's climate targets and measures to be adopted in actualizing them.

Solemn Declaration on Gender Equality in Africa 2004

The Solemn Declaration on Gender Equality in Africa was adopted by the AU Assembly in 2004, calling for member states' continual action toward achieving gender equality and reinforcing their commitment to international and regional women's rights instruments. In addition to calling for wider ratification of the Protocol to the African Charter on Human and Peoples' Rights on the Rights of Women in Africa, it also addresses state responsibility for tackling violence against women and gender-based discrimination.

Protocol to the African Charter on Human and Peoples' Rights on the Rights of Women in Africa, 2003

The Protocol to the African Charter on Human and Peoples' Rights on the Rights of Women in Africa, better known as the Maputo Protocol, is an international human rights instrument established by the African Union was adopted in Maputo in July 2003 and



went into effect in 2005. It guarantees comprehensive rights to women including the right to take part in the political process, social and political equality with men, and improved autonomy in their reproductive health decisions.

Convention on the Elimination of All Forms of Discrimination Against Women (CEDAW), 1979

Adopted December 18, 1979, and entered into force on September 3, 1981, the Convention on the Elimination of All Forms of Discrimination Against Women (CEDAW) is an international legal instrument that requires countries to eliminate discrimination against women and girls in all areas and promotes women's and girls' equal rights.

1.9.23.3 International Finance Corporation (IFC)

The IFC's Performance Standard 5: Land Acquisition and Involuntary Resettlement recognizes that project-related land acquisition and restrictions on land use can have adverse impacts on communities and persons that use this land and has the following key objectives:

- To avoid, and when avoidance is not possible, minimize displacement by exploring alternative project designs;
- To avoid forced eviction;
- To anticipate and avoid, or where avoidance is not possible, minimize adverse social and economic impacts from land acquisition or restrictions on land use by (i) providing compensation for loss of assets at replacement 1 and (ii) ensuring that resettlement activities are implemented with appropriate disclosure of information, consultation, and the informed participation of those affected;
- To improve, or restore, the livelihoods and standards of living of displaced persons, and
- To improve living conditions among physically displaced persons through the provision of adequate housing with security of tenure at resettlement sites.



Involuntary resettlement in IFC PS 5 refers both to physical displacement (relocation or loss of shelter) and to economic displacement (loss of assets or access to assets that leads to loss of income sources or means of livelihood) as a result of project-related land acquisition. Resettlement is considered involuntary when affected individuals or communities do not have the right to refuse land acquisition which results in displacement. Where it is unavoidable, appropriate measures to mitigate adverse impacts on displaced persons and host communities must be carefully planned and implemented.

IFC Performance Standards for Investment

The Eight Performance Standards established by IFC for the life of an investment include:

Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts

Performance Standard 2: Labour and Working Conditions

Performance Standard 3: Resource Efficiency and Pollution Prevention

Performance Standard 4: Community Health, Safety, and Security

Performance Standard 5: Land Acquisition and Involuntary Resettlement

Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources

Performance Standard 7: Indigenous Peoples

Performance Standard 8: Cultural Heritage

1.9.23.3 European Investment Bank (EIB) Environmental and Social Handbook

The EIB's Environmental and Social handbook was updated in December 2013. Section 6 - Volume 1 covers Involuntary Resettlement and Section 7 has a focus on Vulnerable People. The principles of EIB are broadly consistent with those of AfDB and IFC. There is specific emphasis on citizens' rights to justice and access to information, in line with the Aarhus Convention. EIB also expressly states the principle of choice, namely that the project proponent is "required to offer to the affected persons an informed choice of either compensation in kind (land-for-land; land plot and house to replace affected land plot and house) or monetary compensation at the outset."



Comparison of Relevant National Legislation and International Standards

Table 1.1 provides a broad comparison of the EIB, AfDB and IFC standards for resettlement with the relevant Nigerian legislation.



Table 1.1: Comparison of Nigerian Law and Good International Practice of the AfDB, IFC and EIB for Resettlement

Category	Nigerian Legislation	AfDB ISS	IFC PS5	EIB E&S Handbook
Minimise Land Take And Involuntary Resettlement	Explore all viable alternative project design options to ensure minimization of impacts (Land Use Act of 1978)	Project proponent to consider feasible alternative project designs, including re-siting and re-routing, to avoid or minimize physical or economic displacement.	Avoid, and when avoidance is not possible, minimize displacement by exploring alternative project designs.	Project-induced involuntary resettlement should be avoided by analysing alternative project designs and locations.
Consultation and Disclosure	A notice of acquisition is usually prepared by the Ministry of Lands, in conjunction with the survey description. This notice is then published in two newspapers (one national and one local and the government gazette.	Open, inclusive and effective consultation with local communities is required.	RAPs must be implemented with appropriate disclosure of information, consultation, and the informed participation of those affected.	Informed and meaningful consultation and participation of PAPs is required throughout the resettlement process.
Eligibility	Under Nigerian legislation, all land rights constitute occupancy rights rather than ownership rights and accordingly eligibility for compensation for loss of land is not provided for. Anyone possessing a statutory or customary right of occupancy to affected land is entitled to compensation for unexhausted improvements made to that land. Encroachers are not recognized as an eligible group, and are thus not entitled to any compensation provisions.	AfDB identifies three groups of displaced people that shall be entitled to compensation or resettlement assistance for loss of land or other assets taken for project purposes: <ul style="list-style-type: none"> - Those who have formal legal rights to land or other assets recognized under the laws of the country concerned. - Those who may not have formal legal rights to land or other assets at the time of the census / asset survey but can prove that they have a claim that would be recognized under the customary laws of the country. - Those who have no recognizable legal right or claim to the land they are occupying in the project area of influence, and who do not fall into either of the two categories described above, but are entitled to resettlement assistance in lieu of compensation for land to improve 	All occupants (including squatters) using or living on the land prior to the cut-off date are eligible for compensation.	Any person with formal land title, land use rights, customary or traditional rights to the land as well as those who occupy / use the land but have no formal title for objective reasons are eligible for compensation for land. People who occupy the land but have no formal or informal claim to it, such as squatters, shall be provided resettlement assistance in lieu of compensation for the land they occupy.



		<p>their former living standards (compensation for loss of livelihood activities, common property resources, improvements (structures and crops) etc.), provided that they themselves or witnesses can demonstrate that they occupied the project area of influence for a reasonable time (at least six months) prior to a cut-off date established by the borrower or client and acceptable to the Bank.</p>		
<p>Census and Asset Inventory</p>	<p>A survey is required to record the position and dimensions of the land parcels to be acquired, the spatial relation to properties in the area, and a list of all the communities on the property. The enumeration process is asset driven and not household driven. There is no particular format which is currently used by the Land Department. The process mostly comprises of generic questions that are administered orally, and on the basis of factual information and observations, the entitlement for the families is suggested.</p>	<p>A census and comprehensive socio-economic survey is required with gender disaggregated information.</p>	<p>A census and socio-economic survey are required to collect baseline data and identify PAPs.</p>	<p>A census and socio-economic baseline survey are required. The census should include an inventory of losses (assets, access to resources or services, etc.), a detailed measurement survey and valuation of lost assets. It is to cover the total affected population.</p>
<p>Resettlement Site and Host Community</p>	<p>No provisions</p>	<p>The borrower or client carries out a detailed analysis of host communities to avoid adverse impacts.</p>	<p>Engagement with host communities is required. The resettlement site must offer improved living conditions.</p>	<p>Engagement with host communities is required. EIB also lists several criteria for the resettlement site such as it must not displace other people in the process, not be situated on polluted land, not be located in zones identified as potentially subject to disaster risk followed by a natural hazard; not be threatened by (imminent)</p>



				eviction, be available and have the capacity to absorb the influx of resettled persons at acceptable density levels, i.e. resettlement should not lead to new resettlement.
Livelihoods	No provisions	Strategies to improve livelihoods of PAPs are required.	Strategies to improve livelihoods of PAPs are required.	Strategies to improve livelihoods of PAPs are required.
Gender	No provisions	<p>Special consideration has to be paid to the needs and rights of women. In the context of gender vulnerability, the client must give careful consideration to actively facilitating consultation with, and participation by both women and men in ways that are sensitive to the social and political constraints and barriers that women and men may face.</p> <p>The RAP must include a specific protocol specifying safeguards for the quality and quantity of land to be allocated to women, especially widows and divorcees, to ensure their means to generate income and achieve food security.</p> <p>Land titles at the resettlement site are to be in the name of both spouses or of single heads of household, regardless of gender, if this does not conflict with the borrower or client's own laws and legislation.</p> <p>Compensation payments to families are made to both husbands and wives when this is technically feasible and socially acceptable.</p>	<p>The consultation process must ensure that women's perspectives are obtained and that their interests are factored into all aspects of resettlement planning and implementation.</p> <p>Addressing livelihood impacts may require intra-household analysis in cases where women's and men's livelihoods are affected differently. Women's and men's preferences in terms of compensation mechanisms, such as compensation in kind rather than in cash, should be explored.</p>	<p>The project proponent must ensure that compensation and income restoration measures are implemented without discrimination. Regarding gender, the promoter must ensure equal treatment of women during compensation and income restoration processes, especially with regard to women's rights and interests in land, property, assets, and compensation and relocation assistance, even where these are not recognised in formal law. Within household units, it is encouraged that titles of replacement land and structures</p>
Cut- off date	Though a cut-off date is not written into Nigerian legislation, discussions with the Ministry of	There is a requirement to establish a cut-off date for eligibility that is acceptable to the Bank. The borrower	The client is required to establish a cut-off date for eligibility. Information	The client is required to establish a cut-off date for eligibility. Information regarding



	Lands suggest that there is a six week notice period given for land to be acquired by a Project. This is not, however, a formal cut-off date.	or client documents the cut-off date(s) and disseminates information about it (them) throughout the project area of influence in a culturally appropriate and accessible manner, before taking any action on clearing land or restricting local community access to land.	regarding the cutoff date is to be well documented and disseminated throughout the project area.	the cutoff date is to be well documented and disseminated throughout the project area. The cut-off date is specified in the RAP and discussed and agreed with the EIB as part of the RAP preparation process.
Timing of Compensation	No provisions	Compensation is to be made before PAPs move; before land and related assets are taken; and, if the project is implemented in phases, before project activities begin for each particular phase.	In general compensation needs to be given to all those affected before taking possession of the land.	All affected persons need to be paid fair compensation in good time for expropriated assets.
Compensation	Cash compensation is generally made based upon market value. Whilst in principle there is allowance for in-kind compensation or replacement of assets, cash compensation is common practice.	PAPs are compensated for all their losses at full replacement cost. PAPs can be offered a range of different compensation packages, resettlement assistance, and livelihood improvement options. Engagement is key to determining the appropriate compensation packages.	PAPs are compensated for all their losses at full replacement cost. PAPs can be offered a range of different compensation packages, resettlement assistance, and livelihood improvement options. Engagement is key to determining the appropriate compensation packages.	PAPs are compensated for all their losses at full replacement cost. PAPs can be offered a range of different compensation packages, resettlement assistance, and livelihood improvement options. Engagement is key to determining the appropriate compensation packages; choices must be offered to PAPs.
Security of Tenure	Security of tenure is not provided to affected people under Nigerian legislation.	Required.	Required.	Required.
Communal Resources	No provisions.	Page 32 of the ISS mentions compensation for the loss of communal resources.	Compensation is required if communal property and natural resources such as marine and aquatic resources, timber and non-timber forest products, freshwater, medicinal plants, hunting and gathering grounds and grazing and cropping areas are impacted.	No provisions.
Resettlement	No provisions	Displaced people are provided with	Displaced people are	Regardless of the circumstances



assistance		targeted resettlement assistance with the aim of ensuring that their standards of living, income-earning capacity, production levels and overall means of livelihood are improved beyond pre-project levels.	provided with targeted resettlement assistance with the aim of ensuring that their standards of living, income-earning capacity, production levels and overall means of livelihood are improved beyond pre-project levels.	and without discrimination, the promoter will ensure that affected persons or groups identified in the census, especially those who are unable to provide for themselves, have, during and after resettlement, safe and secure access to: (a) essential food, potable water and sanitation; (b) basic shelter and housing; (c) appropriate clothing; (d) essential medical services; (e) livelihood and subsistence sources; (f) fodder for livestock and access to common property resources previously depended upon; and (g) education for children and childcare facilities.
Vulnerable Groups	Many Nigerian policies address the needs of vulnerable people, such as the Gender Policy, Child Act or NEEDS framework. However, there are no specific provisions related to resettlement.	Special attention needs to be paid to vulnerable groups and special provisions required in the RAP process.	Special attention needs to be paid to vulnerable groups and special provisions required in the RAP process.	Special attention needs to be paid to vulnerable groups and special provisions required in the RAP process.
Grievances	Section 30 of the Land Use Act 1990 6 v: “Where there arises any dispute as to the amount of compensation calculated in accordance with the provisions of section 29, such dispute shall be referred to the appropriate Land Use and Allocation Committee.”	There is a requirement to establish a culturally appropriate and accessible grievance and redress mechanism to resolve, in an impartial and timely manner, any disputes arising from the resettlement process and compensation procedures. PAPs must be informed about the mechanism.	The client is required to establish a grievance mechanism as early as possible in the project development phase. This will allow the client to receive and address specific concerns about compensation and relocation raised by displaced persons or members of host communities in a timely fashion, including a recourse mechanism designed to resolve disputes in an	The promoter is required to set up and maintain a grievance mechanism that is independent, free and in line with the requirements set out in Standard 10. It must allow for prompt addressing of specific concerns about compensation and relocation from PAPs and host communities and other directly involved entities. The mechanism should be easily accessible, culturally appropriate, widely publicised,



			impartial manner.	and well-integrated in the promoter's project management system. It should enable the promoter to receive and resolve specific grievances related to compensation and relocation by affected persons or members of host communities, and use the grievance log to monitor cases and improve the resettlement process.
Monitoring	No provisions	An independent third party is required to monitor the implementation of large-scale or complicated RAPs, with regular feedback from PAPs. For largescale resettlement operations quarterly reviews are recommended, and in-depth reviews of midterm progress, consistent with the overall project scheduling, are critical.	The client is required to establish procedures to monitor and evaluate the implementation of a Resettlement Action Plan or Livelihood Restoration Plan.	The promoter is required to set up necessary systems to monitor the implementation of a RAP on a regular basis and take corrective action as necessary. Affected persons will be consulted as part of the monitoring activities. The implementation and effectiveness of the resettlement action plan shall be subject to monitoring and review by qualified resettlement specialists and/or other independent third parties as appropriate and commensurate to the scale and risks involved in the resettlement.



1.9.23.4 AfDB Integrated Safeguards Systems

The AfDB’s Integrated Safeguards System (ISS) is a set of policies, procedures, and guidelines established to identify, assess, and mitigate potential E&S risks and impacts associated with the Bank's funded projects and programs. The ISS were designed to ensure that the Bank's investments promote sustainable development and do not harm people or the environment. The updated ISS (April 2023) are comprised of the following:

- AfDB’s Vision for Sustainable Development
- AfDB’s E&S Policy
- Ten E&S Operational Safeguards (OS)
- E&S Guidance Notes (ISS Guidance notes)

There is a significant overlap between the AfDB operational safeguards and the IFC PSs; nevertheless, as the AfDB safeguards are also relevant to this Project the assessment of E&S performance is also assessed against these. A summary of the AfDB Safeguards is provided in Table below:

AfDB Safeguard	Description
E&S OS 1 (Assessment and Management of Environmental and Social Risks and Impacts)	<p>The aim of this overarching OS, along with the nine other Oss that complement it, is to mainstream E&S considerations; including those related to climate change vulnerability; into Bank operations and thereby contribute to sustainable development in Africa.</p> <p>An ESIA study carried out under this OS helps to determine the scope and extent to which other OSs are addressed. It sets out the Borrower’s (or Project’s) responsibilities for assessing, managing, and monitoring E&S risks and impacts associated with each stage of an operation/project supported by AfDB.</p> <p>This OS, together with OS10 (Stakeholder Engagement and Information Disclosure) provide the overall process framework for the E&S assessment and management of AfDB financed operations at project level.</p>
E&S OS 2 (Labour and Working Conditions)	<p>The objectives of OS2 are as follows: protect workers’ rights; promote safety and health in the workplace; promote the fair treatment, non-discrimination, and equal opportunity of project workers; protect project workers, including vulnerable workers; prevent the use of all forms of forced labour and child labour; support the principles of freedom of association and collective bargaining of project workers, provide project workers with accessible means to raise workplace concerns; and enquire that the Bank, and national competent authorities as appropriate, be informed promptly of any material adverse impacts and events relating to labour protection and health and safety at the workplace. The applicability of this OS is established during the ESIA described in OS1.</p>
E&S OS 3 (Resources Efficiency and Pollution Prevention and Management)	<p>OS3 sets out the requirements to address resource efficiency and pollution 36 prevention and Management throughout the project life cycle in a manner consistent with Good International Industry Practice (GIIP). Throughout the different phases of the project’s lifecycle—planning and design, construction, commissioning, operations, and decommissioning—the project is required to assess and evaluate resource-efficiency and pollution-prevention techniques and implement them, taking into consideration their technical and financial feasibility and cost-effectiveness. The</p>



	applicability of this OS is established during the ESIA described in OS1.
E&S OS 4 (Community Health, Safety and Security)	This OS addresses potential risks and impacts on communities that may be affected by project activities. Occupational health and safety (OHS) requirements for project workers are set out in OS2, and measures to avoid or minimize impacts on human health and the environment due to existing or potential pollution are set out in OS3. The applicability of this OS is established during the ESIA described in OS1.
E&S OS 5 (Land Acquisition, Restrictions on Access to Land and Land Use, and Involuntary Resettlement)	The objectives of OS5 are to: avoid involuntary resettlement where feasible, or minimize resettlement impacts where involuntary resettlement is deemed unavoidable after all alternative project designs have been explored; ensure resettlement plans and activities are informed by social assessments (including gender issues); avoid forced evictions; mitigate unavoidable adverse social and economic impacts from land acquisition or restrictions on land use; improve living conditions of poor or vulnerable persons who are physically displaced by the project; establish a mechanism for monitoring the performance and effectiveness of involuntary resettlement activities which result from project activities; conceive and execute resettlement activities as sustainable development programs; and ensure that resettlement activities are planned and implemented with appropriate disclosure of information, meaningful consultation, and the informed participation of those affected. The applicability of OS5 is established during the ESIA described in OS1
E&S OS 6 (Habitat and Biodiversity Conservation & Sustainable Management of Living Natural Resources)	This OS outlines the requirements for the Project to (i) identify and implement opportunities to conserve and sustainably use biodiversity and natural habitats, and (ii) observe, implement, and respond to requirements for the conservation and sustainable management of priority ecosystem services. The applicability of OS6 is established during the ESIA as described in OS1.
E&S OS 7 (Vulnerable Groups)	OS7 contributes to poverty reduction and sustainable development by ensuring that projects supported by the Bank enhance opportunities for vulnerable groups to participate in, and benefit from, the development process in ways that do not threaten their unique cultural identities and well-being. The applicability of OS7 is established during the ESIA as described in OS1
E&S OS 8 (Cultural Heritage)	This OS sets out general provisions on risks and impacts to cultural heritage from project activities. OS7 sets out additional requirements for cultural heritage in the context of vulnerable groups and highly vulnerable rural minorities including Indigenous Peoples (IPs). The applicability of this OS is established during the ESIA described in OS1.
E&S OS 9 (Financial Intermediaries (FIs))	The objectives of this OS are to: set out how the FI will assess and manage environmental and social risks and impacts associated with the subprojects it finances; promote good environmental and social management practices in the subprojects the FI finances; o promote good environmental and sound human resources management within the FI; support the adoption of best practice standards in corporate governance, business management and corporate responsibility by enterprises supported by the Bank based upon the requirements of OSs 1 through 10, as appropriate; and encourage the consideration of environmental and social governance issues in capital market institutions such as development finance entities and stock exchanges.
E&S OS 10 (Stakeholder Engagement and Disclosure of Information)	This OS therefore recognizes the importance of open and transparent engagement between the project and project stakeholders as an essential element of good international practice. Effective stakeholder engagement can improve the environmental and social sustainability of projects, enhance project acceptance, and make a significant contribution to successful project design and implementation. OS10 applies to all Bank Group’s funded operations. The project will engage with stakeholders as an integral part of the project’s ESIA and project design and implementation, as outlined in OS1



1.10 Terms of Reference

The project proponent, FMAFS recognises the importance of a detailed environmental analysis viz-a-viz its responsibilities to the success of this project and is desirous to implement this EIA study in order to understand the environmental sensitivity of the project area and the need to address the impacts, where significant. The main thrusts of the TOR are as follows:

- Conduct baseline studies that are required to characterize the existing environment;
- Assess the types of project alternatives to be considered;
- Undertake consultations with relevant stakeholders via Stakeholder consultation;
- Assess the significance of both positive and negative impacts by weighting them against local conditions and established limits to acceptable change (defined by legislation, by recognized experts, stakeholders etc.) which the proposed development should not exceed, and the trend of change in the area if no development takes place; implemented environmental and social analysis of all the necessary issues to be considered before project implementation, bearing in mind the necessary interactions with other sub-consultants and consideration of alternatives.
- Assess detailed project descriptions, including general layout & physical descriptions, and project implementation strategies
- Carry out detailed descriptions of the existing environmental and socio-economic situation that incorporates stakeholder consultations, literature reviews and field study.
- Undertake health & safety, environmental and socio-economic impact assessments that include qualitative and quantitative risk assessments among other tools and techniques.
- Propose mitigating and ameliorating measures as applied to the construction and operation of the project.
- Develop Environmental Management Plan that appropriately incorporate monitoring, mitigation and management systems that are consistent with identified impacts and that provide a contingency for unforeseen impacts.



- Preparation of a detailed EIA report which will form the basis for the issuance of Environmental Impact Statement (EIS) by Federal Ministry of Environment and other approving authorities where applicable.

1.11 Structure of EIA Report

The format of this report is essentially in line with the recommended format and guidelines by the Federal Ministry of Environment (FMEnv). Accordingly, the report is organised into the nine main chapters (1-9) as follows:

- **Preliminary Sections:**

These include Table of Contents, List of Tables, Figures, Plates, and Executive Summary

- **Chapter One: Introduction**

This chapter provides background information about the proposed project and highlights objectives, scope of work for the environmental assessment as well as the applicable legal and administrative framework for the project.

- **Chapter Two: Project Justification**

This chapter outlines the project justification, including the need; value / benefits of the project and project development options.

- **Chapter Three: Project and Process Description**

This chapter describes the proposed project location, project activities and processes involved including construction & installation, project operation and maintenance and schedule.

- **Chapter Four: Description of Existing Environment**

This chapter describes the existing (baseline) environmental conditions of the project area including the socio-economic and health status of the inhabitants in the area. Also included are records of consultations held with the stakeholders notably the elders and youths in the host communities.

- **Chapter Five: Potential and Association Impacts**

In this chapter, potential and associated environmental impacts of project activities are identified and evaluated.

- **Chapter Six: Impact Mitigations/Measures**

This chapter proffers mitigation and ameliorative measures that would be adopted to



eliminate or reduce to acceptable levels significant adverse impacts identified.

- **Chapter Seven: Environmental and Social Management Plan (ESMP)**

This chapter presents the Environmental and Social Management Plan (ESMP) that will be adopted throughout the project life cycle. It also includes the Environmental Management System (EMS) plan that will ensure the effectiveness of the mitigation measures and the remediation plan after decommissioning.

- **Chapter Eight: Decommissioning Plan**

This chapter briefly presents the details of decommissioning plan at the end of the project life cycle.

- **Chapter Nine: Stakeholder Engagement and Grievance Redress Mechanism**

- **Chapter Ten: Conclusions**

This chapter presents conclusions.

- **References**

This section contains all the cited references and bibliographies referred to in the report.

- **Appendices**

As much as possible, materials presented in the report are highlights, mostly the most important findings and results for clarity and to make the report easy reading and friendly. Other information sources, including some raw data are presented as appendices.



CHAPTER TWO

2.0 PROJECT JUSTIFICATION

2.1 Introduction

This chapter describes the project needs, benefits and development options as well as its sustainability.

2.2 Need for the Project

Nigeria is the most populous country on the African continent with over 223,000,000 million people, and a population growth estimated at 2.41% per year. Like other middle-income countries, Nigeria faces significant and persistent poverty and inequality. Major factors contributing to rural poverty include low agricultural production and productivity, limited opportunities for value-addition, challenges of marketing capacity, poor yields in quality and quantity, and significant deficits in support systems such as infrastructure, access to productivity-enhancing inputs, financial backing, commercial orientation, and effective policies, as well as environmental degradation and the effects of climate change. These challenges limit prospects for rural households. With competing needs on the national budget, this situation threatens national food security. Over 70% of Nigeria's population cannot afford a nutrient-adequate diet. The high sensitivity of the agricultural sector to increasing climate change and climate variability combined with high poverty rates are the main sources of Nigeria's vulnerability to food insecurity and malnutrition.

In 2011, the Federal Government of Nigeria (FGN) developed its Agricultural Transformation Agenda, which aims to achieve a hunger-free Nigeria through an agricultural sector that drives income growth, accelerates achievement of food and nutritional security, generates employment, and transforms Nigeria into a leading player in global food markets to grow wealth for millions of farmers. In the context of its agricultural transformation strategy, the FGN is tackling two main interrelated challenges: (i) Meet domestic food requirements by stepping up local sourcing to reduce its food import bill; as well as (ii) Modernize its farming model to reduce poverty levels in rural areas. The FGN's strategy is to turn the country's huge food deficit into a market and employment opportunity for smallholders and small operators.



With the launch of the Special Agro-industrial Processing Zone (SAPZ) programme, Nigeria can, in less than a decade, banish food insecurity, while radically improving export earnings from agriculture, creating millions of lucrative agro-industrial jobs and opportunities for its citizens. The SAPZ is the flagship for Nigeria’s agriculture, which entails the development and operation of agro-industrial processing clusters in areas of high food production across the country, to engender the competitiveness in agro-industrial production and processing that is critical to further unlock the potentials of Nigeria’s agriculture, to improve food and nutrition security, to reduce post-harvest losses, create jobs for women and youth, as well as create wealth for the rural community.

The Federal Government of Nigeria has therefore requested the joint support of AfDB and IFAD in the materialization of its transformation agenda. The FGN seeks to leverage AfDB-IFAD complementary expertise, experience, and comparative advantage in the setting-up of SAPZs to: (i) sustainably meet the domestic food supply gap for key food products; (ii) create exportable surpluses; (iii) provide income and employment opportunities for rural poor households; and (iv) produce a replicable climate resilient and low emission model for further investments. Focus lies on high potential climate resilient pro-poor value chains that can be scaled-up and have relevance to the industry and off-takers operating in Agricultural Industrial Hubs (AIHs) and Agricultural Transformation Centres (ATCs), as well as on significantly improving livelihoods and generating decent employment, especially for women and youth. With regards to the demand and uptake of agricultural products, the FGN and AfDB will focus on attracting private sector agribusinesses to set up processing plants in zones of high food production, to process commodities into food products. In addition, the FGN and AfDB will create an enabling environment for the private sector by putting in place appropriate fiscal policies and incentives, investment, and infrastructure policies for SAPZ.



2.3 Benefits of the Project

There are several significant benefits to gain from the construction of the project. The beneficiaries include the project proponent, the State and Federal Governments, the local community and importantly the local economy. The development is expected to benefit the location by creating an economic hub thereby creating local employment and raising the standards of living. The employment in turn is expected to train manpower towards skilled and un-skilled job requirements. Employment opportunities will be generated by the project. Based on these considerations, the following benefits have been considered:

- Meeting the development needs and policies of the Federal Government of Nigeria and Katsina State.
- Revenue generation for Government through industrial, residential, commercial and social zones and other service charges and tax payment.
- Creating both direct and indirect employment opportunities for the local population and fostering sustainable inclusive economic growth;
- improving value-addition opportunities and creating surplus for export of products;
- Increased of incomes, reduce wastages, ensure value addition, generate employment opportunities as well as export earnings.
- Development of tremendous impact on the economy of the Katsina State through job creation, security, socio-political stability effective economic growth and attainment of sustainable development.

2.4 Value of the Project

The African Development Bank (AfDB), with support from other development partners, has launched \$520 million Special Agro-Industrial Processing Zones (SAPZs) in Nigeria with seven States as pioneer beneficiaries. The African Development Bank is providing \$210 million for the development of the SAPZs in Nigeria, in partnership with the Islamic Development Bank (IsDB) which is co-financing with \$150 million, and with the International Fund for Agricultural Development (IFAD), which is co-financing with \$160 million.



2.5 Envisaged Sustainability

The proposed project shall be sustained in broad and diverse ways. There shall be harmonization between the proposed project and social, environmental, economic and technical aspects of the project. The proponent intends to achieve the project sustainability in the following ways:

2.5.1 Technological Sustainability

Katsina State Government has set up a highly technical multi-disciplinary project team which includes Architects, town planners, geologist, soil scientist, civil engineers, electrical engineers, structural and mechanical engineers, to prepare the engineering design of the development, which shall give rise to building construction, plumbing, electrical installations, roofing and painting, in an environmentally friendly manner. Equipment and machineries to be put in place for this project are those whose operation shall not have adverse effect on the environment in terms of release of noxious gases, noise and vibration. This project shall be undertaken using the best available technology in construction and building industry (from ground work to the finishing). It shall comply with environmental regulations and urban development laws of Nigeria and Katsina State. All the structures and every associated infrastructural facility shall be constructed using modern, locally and internationally accepted materials to achieve public health, safety, security and environmental aesthetic requirements. Equipment and systems that save resources including energy, water conservation shall be given first priority without compromises on cost. The equipment and vehicles shall have highest levels of combustion efficiency through ensuring proactive maintenance culture.

Asphalt mixers, crushers and other construction equipment and machineries will be incorporated with pollution control devices like dust arrestors/precipitators, emission control, noise abatement devices and desulfurization devices. The equipment and vehicles will have highest levels of combustion efficiency, capability to use cleaner fuels like bio-diesel and will have enhanced safety features.



2.5.2 Economic Sustainability

This project will be sustained economically by way of improving trade relations between Nigeria and the rest of the world; bringing in foreign investments into the country usage, and expanding local markets and trades in Katsina State which in turn will increase foreign exchange inflow as well as generate revenue for the government. A move towards a solution-based business model will be undertaken, whereby a new perception of value is established, that will enhance material gain, eliminating the concept of waste as part of the production cycle.

It is planned that the proposed project will employ directly almost 6,000 workers. In different sectors, these skilled and unskilled workers will be part of all the socio-economic activities that will take place at SAPZ proposed project and assist the development of Nigeria. Besides, SAPZ proposed project will create a considerable amount of indirect employments in neighboring States of North Eastern Nigeria. Most importantly, residents will leave in more organized, civilized and well-disciplined commercial and residential District mostly established by foreign investors and their Nigerian counterparts. Direct payments for land spaces, goods and services will bring returns to the investors and governments.

2.5.3 Environmental Sustainability

The project will be environmentally sustained by incorporating into project design, practical mitigation measures or controls proffered for the identified environmental impacts of the proposed project (see Chapter Six). Also by implementing the environmental monitoring and management programmes as recommended in the EMP (Chapter Seven). Implementing these actions would also ensure that the project meets and/or exceeds the requirements of the Nigerian Federal Ministry of Environment and World Bank/ IFC regarding minimizing the environmental and social impacts. The proposed project shall comply with environmental regulations and standards locally and internationally.



2.5.4 Social Sustainability

The project has secured its first social license – the host communities’ acceptance of the proposed project their eagerness to see it succeed. The project will attract a lot of improvements in the social wellbeing of communities neighbouring the project area. Some category of jobs including some sub-contracting services shall be employed from the communities, resulting in financial upliftment and reduction in the number of unemployed indigenes and Nigerians. Katsina State holds a comparative advantage in terms of availability of labour. In addition, KTSG is committed to effective and continuous stakeholders’ engagements and consultations and compliance with applicable national social laws, relevant international conventions and World Bank social safeguard policies.

2.6 Project Development Options

2.6.1 No project option

The “no-project option” implies that the construction of the proposed SAPZ project will not be achieved. This option is considered if there is economic, technical or human capacity deficiencies or that the proponents are unwilling to commence the project or that the regulatory authorities are unwilling to approve the project; thus leading to a “no project option”. This option will translate to non-beneficiary by the people and government of Katsina State in particular and the nation as a whole. This will also mean that the envisaged positive socio-economic impact on the people and government of Katsina State and the nation will not be achieved. This alternative was rejected because it is not viable. Also associated with this option are; loss of resources already committed to the project, depriving employment opportunities that can be accrued from the project. This is not good for socio-economy, population growth, poverty alleviation, health, expansion and development of the nation. This option was not considered, therefore, the need for the project.



2.6.2 Delayed project option

This option implies that the execution of this project will be delayed until a much later date. Such option is usually taken when conditions are unfavourable for project implementation, such as in a situation where there is war, or host community is deeply resentful of the project. Also, if the economics of the project are unacceptable or unattractive at the time, then a delay may be feasible. But none of these conditions are applicable. In fact, on the contrary, both the economics and the political environment are most favourably disposed towards the project. Therefore, the implication of delaying the project will include the fact that all contractors, workers and equipment that have been mobilized for this project, and procurement, will have to be demobilized. Also, because of the inflationary trends in Nigeria, such a delay may result in unanticipated increase in project costs, leading to a decrease in final profit accruable from the project. These, and other related problems make it impossible to adopt the delayed project option.

2.6.3 Project Implementation Option

The third option considered was the execution of the proposed project as planned. This option was accepted because the project will uplift the socio-economic activities of the host communities through its Corporate Social Responsibility (CSR). Further, it will generate employment opportunities for thousands of Nigerians and stimulate the springing up of ancillary industries that will also provide more job opportunities to the teeming unemployed youth in the country thereby increasing their standards of living. The SAPZ project is expected to achieve significant milestones, including reducing the country's current food import bill through import substitution, boosting revenue from agricultural exports, creating wealth for rural farming communities, creating new sustainable jobs, especially for women and youths. These prospects will elude Nigerians if the project is not encouraged.



2.6.4 Alternative site/location option

The proposed site for the project was selected based on specific criteria for the selection of an appropriate site for the establishment of the proposed Agro-Industrial Hub centre. The project site is about 30km to Niger Republic border for movement of goods and services from neighbouring countries. Close proximity to Army barracks about 3.5km and several other security checkpoints along the project site. The site was carefully selected to meet the criteria for selection of an appropriate site for project of this magnitude which include; minimum possible infringement, availability of adequate space, avoidance of historic sites and environmental sensitive areas. The project site has been surveyed and all necessary site details, site layout drawings, site plan and approvals have been processed. Thus, alternative site/location is not considered.



CHAPTER THREE

3.0 PROJECT DESCRIPTION

3.1 Background of the Project

The proposed Special Agro-Industrial Processing Zones (SAPZ) project is an integrated development initiative designed to concentrate on agro-processing activities within areas of high agricultural potential to boost productivity, integrate production, processing and marketing of selected commodities. The SAPZ Program goal is to increase household incomes, foster job creation in rural agricultural communities, especially for youth and women, and enhance food and nutritional security in Nigeria. The development objective is to support inclusive and sustainable agro-industrial development. The main project activities associated to the development of the SAPZ project include pre-construction works and mobilization of equipment and machineries, site clearance, excavation and earth works, construction of roads, green spaces, specialized infrastructure, zone specific infrastructure, industrial zone for target sectors, specialized agro-infrastructure zone, logistic zone, institutional zone, residential zone, multi-facility complex, amenities and utilities zone, transportation and logistics zone and greenery and walkways.

The SAPZ will be made up of two building blocks which include:

1. Agricultural Transformation Centre (ATC)
2. Agro-Industrial Hub (AIH)

1. Agricultural Transformation Centre (ATC)

The ATCs are designed to link smallholder farmers to the agro-processing hub and are centres strategically located in high production areas, with the aim of serving as aggregation points to accumulate products from the community to supply the agro-processing hub for further value addition, or to send them to centres of great demand for distribution and retail to consumers. The ATC is a rural based development institution to implement integrated initiatives for the rural communities and at selected locations for facilitating agro commodities procurement. ATC is one of the rural development initiatives of SAPZ which would not only promote inclusive rural development but would



also serve as a backward linkage to the AIH in terms of raw material sourcing and supplying and forward linkage to agro production zone.

2. Agro-Industrial Hub (AIH)

The Agro-Industrial Hub will be supported by a network of compact and efficient Agricultural Transformation Centres (ATCs) that will coordinate farmers, their cooperatives and clusters' production (land preparation, planting and input supply), harvesting, agglomeration (primary on-farm storage, preservation and processing), and marketing, activities. The hub will include the installation of various crop processing factories for several commodities. The food processing facilities will be equipped with the mechanical capacity to manage the entire production process from input reception to packaging of the final products in order to meet domestic and international demand. Target crops include Sesame, Rice, Sorghum, Millet, Groundnut, Cassava and Acha. The agro-industrial processing complex will also provide shared facilities to ensure excellent support to stakeholders within the zone. The infrastructure available in the hub will provide an opportunity for stakeholders to develop their individual projects and facilities within the park. As a result, stakeholders will be able to set up their processing plants and benefit from the available power distribution, water supply, wastewater treatment, Information Communication Technology (ICT) connectivity, waste management etc. within the hub.

3.2 Description of Project Location (AIH)

The project site is located at Kusa, Katsina Industrial Estate, Special Economic Zone (SEZ), which spread across an area of 800ha, while 200ha is allocated for the SAPZ project, in Jibia LGA of Katsina State. The land is elevated and slop from north to south, rectangular in shape, and grazing ground. A small gully was observed on the northern part of the site. The main cause of this gully is flash flood coming from the eastern part of the site to the west, that converge around the uncompleted road construction within the site. The depth of the gully is estimated between 4 to 8 meters wide, and 5 to 10 meters deep located at within the project site Latitude 13°02'35"N, Longitude 7°32'30"E



coordinate. The site coordinates are longitude 7°32'18"E, Latitude 13°02'13"E. The site elevation is 1,683ft above the sea level with a savanna.

3.3 EXISTING INFRASTRUCTURES AT THE PROPOSED AGRO-INDUSTRIAL HUB (AIH) SITE

The proposed AIH is situated in Natsinta village in Jibia Local Government Area (LGA) of Katsina State along Niger Republic Border Road, Katsina. It is about 44km to the Niger Republic Border. The proposed site is a government gazette land with a vast range of landscapes including the sceneries such as ongoing critical infrastructural installation like drainage gutters, electric power utility pole, access gate, perimeter fencing, electric control room, as shown in Plate 3.1 below. Katsina State government has earmarked a total land cover of 200 hectares for phase 1 of the Katsina-SAPZ project. There is the Nasaini Training Institution sharing boundary with the project site. From the project site it is about 30km to Niger Borderline. Other surrounding features along the project road are 35 Battalion Army barrack about 4.5km, Prison yard about 2.5km, NTA office is about 1.5km and an abandoned landfill belonging to Ministry of Environment about 1.3km. There are 10 security checkpoints intervals before getting to the project site from ring road roundabout about 4.5km. The security checkpoints are the Nigeria Customs, the Nigerian Police, the Nigerian Army, the DSS, the Immigration, Civil Defiance among others who continue to display exceptional services in various intervals along the project road. Being a Border Road that leads to the boundary between Nigeria and Niger Republic, the government of Nigeria is doing everything possible to secure the area against transborder crimes and promote national security.



Entrance gate



Proposed AIH project site (200 ha)



Administrative building (Front view)



Back View

Water Drainage

The proposed project site has a good water drainage within the facility for channeling water to flow freely through the waterway. This is part of plan to maintain adequate erosion control measures.



Open Drainage Line

Electricity

There is evidence of massive installation of concrete power utility pole in progress to connect the site to the National Grid. Sub-transmission lines, which carry higher voltage power between substations, and distribution lines, which distribute lower voltage power to customers.



Electricity Pole installation

Perimeter fence

There is also a perimeter fence as physical security measures needed to deny unauthorized access or possible intrusion to the project site. The perimeter fencing is built with two different dimensional. Barbed Wire fencing type in one side, the other side at the front view along the Jibia Border Road as well as the remaining other sides was built with wall cement concrete slab fencing type.



Perimeter fencing

Road network within the premises

The project site has in place good road network design within the premises which is under construction and in progress in some sections to enable movement of vehicles and equipment. The road construction is about 50% near completion. The foundational bottom layer of base course has been laid in some sections of the road. The access road interconnecting major expressway along the popular Katsina border road. The project site has one main access driveway entrance road leading from the main gate directly to various locations within the study area. The gate as well as the access road is wider enough to incorporate any overhead obstruction.



Sections of road under construction

Electrical Control room/substation

The electrical Control Room is situated in about 300m away from the main entrance gate. The electrical control room is the control room where the entire project equipment and machines will be switch on and off. The control panel is used to provide support and monitoring of the overall operation and processing of the project operations. The supportive components of the control room shall include electrical contractor and electrical panels.



Electrical control room/sub-station

Plate 3.1: Infrastructural activities on the proposed AIH site



Figure 3.1: Google earth imagery of the proposed project site



3.4 Description of ATCs Location

The sustenance of the proposed AIH is solely dependent on the continuous inflow of raw materials. An aggregation centre that shall serve as an input feeder for every ATC shall be strategically located in four LGAs places within the radius of influence/procurement of that ATC apart from having its collection facilities for the benefits of the farmers in the near vicinity. The proposed ATCs centers are distributed in five (5) Local Government Areas with their value chain commodities as highlighted in Table 3.1. The proposed ATC centers are identified and based on the availability connectivity in the identified locations.

Table 3.1: Proposed ATCs location and Priority Value Chains

S/N	Community	LGA	Priority value chains
1.	Are	Rimi LGA	Soybeans
2.	Samarin Kabomo	Bakori LGA	Cotton
3.	Suduje	Daura LGA	Maize
4.	Makera	Dutsinma LGA	Soybeans
5	Rimaye	Kankia LGA	Maize

Source: Field work, 2024

3.5 Project Components

The Agro-Industrial Hub is designed to encompass a diverse array of facilities and services. It is planned to include Industrial use (multi-products processing zone, clustered processing zone); Logistics and Warehousing (warehouse, cold storage, open yard, truck parking); non-Industrial use (residential, commercial, social amenities, offices, support services). Additionally, it will feature a wastewater treatment facility, a solid waste facility area, two areas dedicated to administrative and social facilities, truck parking lots, and technical infrastructure areas. Also, provision of range of services including electricity, heat, utility water for irrigation, wastewater treatment, telecommunications, and solid waste management.



3.5.1 Infrastructural Design of the proposed AIH

The description of the AIH, product mix and facility configuration

- Water Treatment Plant (WTC), Solid Waste Management (SWM), compressor/chiller/boiler networks, gas distribution, sewer network, communication network, street lighting, wastewater network, electrical substation, etc.
- Logistics (loading and unloading yards, packaging halls, transportation hubs, cargo handling centres, raw material collection and storage halls, finished goods storage, packaging and labeling, procurement centre, etc), quality control labs, QA/QC labs; and
- Institutional (fuel station, retail space, custom and security, weigh bridge, canteen, fire station, etc).



Figure 3.2: SAPZ Layout



Figure 3.3: Site Layout/zoning



3.5.2 Internal Roads

In order to attain smooth daily traffic flow inside the SAPZ, internal road network was designed according to the classification of major and minor roads. Major roads are supposed to enhance mobility while minor roads maximize accessibility to each factory. Access road to the SAPZ is directly connected to major roads.

The major road should be two lanes for vehicular traffic with drainages and sidewalks on both sides. While the minor roads should be single lane with side drainages on both sides.

In anticipation of high level of activities in the SAPZ, the surfacing should be Asphalt over a lateritic base and sub-base courses. These surfacing will reduce cost of maintenance and rehabilitation. Based on the SAPZ Layout the internal road details are presented in the Table below:

Table 3.2: Internal roads specifications

S/No	Description	Length (m)	Number of Lane	Width of Lane	Materials
1	Major Road	3000	2	10m + 10m	Asphalt
2	Minor Road	9500	1	10m	Asphalt

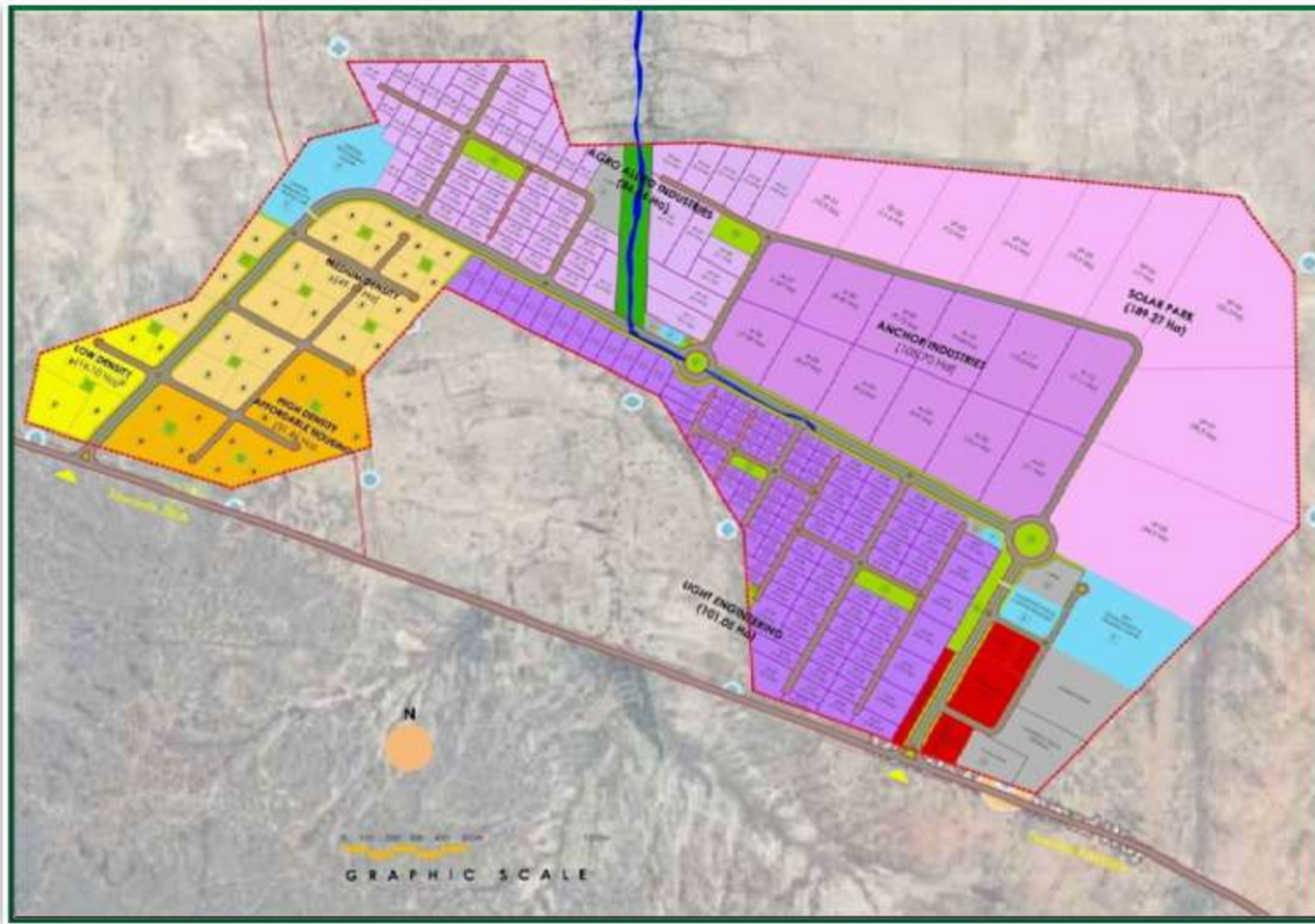


Figure 3.4: Site Layout/zoning



Figure 3.3: Site Layout/zoning



3.5.3 Water Storage Tank

Storage tanks serve to store the water needs of population. They are sized so as to meet one of two values:

- (1) 25% of daily peak demand, and
- (2) 50% of average daily demand.

Selection of volume can follow the following criteria: a surface storage tank may be sized close to 25% of daily peak demand and overhead water tank for 50% of daily average, by considering extension problems and marginal price difference on execution. Another factor is due to pumping by generator that requires ensuring a more comfortable storage for compensating more extended pump stopping. Reservoir capacity required for specifically firefighting is 1% of daily demand

The Preliminary design of surface tank and the overhead water tank was carried out and the drawings and details are presented in the Appendix.

3.5.4 Water Distribution Lines

Water distribution facilities consist of water supply tank and distribution pipelines. Storage capacity of water tank was designed, taking into account the hourly water demand fluctuation, necessary water amount for firefighting and emergency (cut-off of water supply) situations. Diameter of water distribution pipes will be to accommodate the required hourly maximum water consumption.

The pipeline networks may be classified in three categories:

- (1) Conveyance pipes: this type of pipeline links up supply points treatment plant and pumping stations
- (2) Transmission pipes link up pumping stations with water storage tanks, and
- (3) Distribution pipes: starting from water storage tanks or connection points in case of gravitational network up to distribution points.

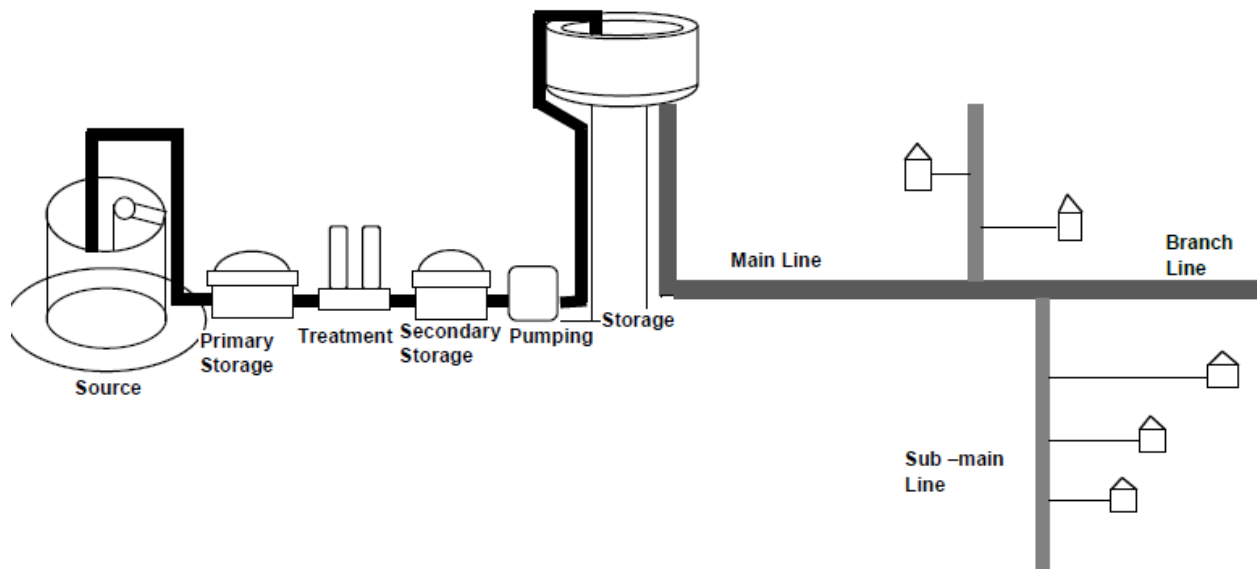


Figure 3.6: Water supply schematic diagram

3.5.5 Power Demands

Overhead power distribution lines (33 kV) from the National grid would be extended to each tenant enterprise inside the SAPZ. Installation of step-down transformers will be planned for small and medium power consumers, while 33 kV line will be directly extended to big power consumers. Provision for the use of renewable energy to complement will be utilized. Table below indicated a load estimation as follows.

Table 3.3: Energy load estimation

S/NO	DESCRIPTION	REMARKS	ALLOCATED LAND SIZE(m ²)	ESTIMATED POWER LOAD (KW)	CUMLATIVE ESTIMATED POWER LOAD(kw)
1	COMMODITY SERVICE CENTER 1-90w 2-150w	-Has lighting load -Has small power load for meat storage	100M2	9 +15	24
2	RESIDENTIAL AREAS 1-90w 2-150w	-Has lighting load -Has small power load for ventilation and cooling.	334M2	30.06+50.1	80.16
3	Market and Banks areas 1-90w 2-150w	-Has lighting load Has small power load for ventilation and cooling	200m2	18+30	48
4	Health center 1-90w 2-150w	-Has lighting load Has small power load for ventilation and cooling	87m2	7.83+13.050	20.88



5	Processing Centre 1-90w 2-150w	-Has lighting load Has small power load for ventilation and cooling	529m2	47.6+79.35	126
6	Communityvoc Centre 1-90w 2-150w	-Has lighting load Has small power load for ventilation and cooling	529m2	79.35+47.61	126.96
7	Fire station 1-90w	-Has lighting load	828m2	74.520	75
8	Vet clinic 1-90w	-Has lighting load	85m2	7.65	7.65
9	Admin block 1-90w 2-150w	-Has lighting load Has small power load for ventilation and cooling	598m2	53.82+89.7	143
10	Agric Equipment Centre 1-90w 2-150w	-Has lighting load Has small power load for ventilation and cooling	437m2	39.33+65.55	104
11	Recreational Centre 1-90w 2-150w	-Has lighting load Has small power load for ventilation and cooling	3501m2	315,09+525.150	840.24
12	Cold storage 1-90w 2-150w	-Has lighting load Has small power load for ventilation and cooling	150m2	13.5+22.5	36
13	Trucks parking 1-90w	-Has lighting load	150m2	13.5	13.5
14	Medium scale industrial zone 1-90W 2-150w 3-180w	-Has lighting load -Has small power load consumption machines. -has medium power consumption machines.	3675M2	330.75+551.25+661.5	1543
15	Large scale Industrial zone(D) 1-90w 2-150w 3-180w 4-200w	-Has lighting load -Has small power load consumption -has medium power consumption machines -Has high consumption machines	2292m2	206.28kw+343.8kw+ 412.56+458.4	1.421mw
16	Small scale industrial zone 1-90w 2-150w 3-180w	-Has lighting load -Has small power load consumption machines -	500m2	45+75+90	210kw
17	QA & QC LAB 1-90w 2-150w	-Has lighting load Has small power load for testing machines and test sample cold storage.	100m2	9+15	24
18	Commodity processing Centre 1-90w 2-150w	-Has lighting load Has small power load for water & fuel pumping machines	77m2	6.93+11.55	18.48
19	Solid waste management.	40m2	-Has lighting load Has small	3.6+6	9.6kw



			power load for sewage pumps		
20	Power facilities 1-90w 2-150w	-Has lighting load Has small power load for water & fuel pumping machines	77m ²	6.93+11.55	18.48kw
21	Sewage effluent treatment plant. 1-90w 2-150w	-Has lighting load Has small power load for sewage pumps	50m ²	4.5kw+7.5	12kw
22	Security street lighting 1-90w	-Has lighting load	3000m ²	270kw	270
23	Total estimated load for the whole district				10.98MW

3.5.6 Proposed Solar Power Estimation of this SAPZ

The total estimated power load of this SAPZ was estimated and found to be about 10.98 Megawatt, based on thumb power estimation rule, to enable utilization of green energy for the proposed project we set aside 10% of this estimated load for the solar energy provision.

10% of 10.98mw=1.098mw.

So 1.098mw was set aside for solar installation for this study, and the proposal to compose of the following:-

- Solar power hybrid
- With a capacity of 1.098mw.
- With 3137 solar pv panels
- With pv combiners
- Connecting control breakers
- Ring main unit
- Step up transformer –(1mva) 415v/11kv.
- Earthing
- Armoured cablings
- Alluminium conductors
- Hybrid sensors power source



All roads will be provided with streetlights. There should be solar street lights.

3.5.7 Wastewater Treatment System

The wastewater collection facilities are planned to collect pre-treated effluent from each factory, and sewage from other facilities, in accordance with the following basic concepts:

- Separate system, which is a system for transporting wastewater and storm water separately, while stormwater drainage is planned to utilize drain ditch beside the internal road network,
- Industrial wastewater and sewage from toilet are collected into the same pipe to avoid duplication of facilities, and
- Wastewater is transported as free flowing basically by gravity to avoid the possibility of choking in pipes as well as to reduce the cost of construction and maintenance of the pumping system.

The domestic sewage to be generated has been assumed to be 80% of the domestic water consumption.

Based on the domestic sewage demand of 80% of water demand which is 5600m³/day, a packaged waste water treatment plant is designed.

3.5.8 Solid Waste Treatment Facilities

Solid waste generated in the SAPZ is likely divided into the four types:

- i) recyclables such as paper, glass, metal and plastics,
- ii) food processing waste,
- iii) wood from pallets for transport products, and
- iv) dewatered sludge generated in the wastewater treatment facility.

Each type of waste shall be segregated and put in respective containers. Especially, food processing waste is diverted to compost through several processes. Outside the SAPZ, recyclables are sold, while sludge and other wastes are transported to a designated landfill site. Refuse dumps structures will be provided in the SAPZ at the appropriate locations.



3.6 Proposed ATCs Site Specific Description

This section deals with the description of each of the proposed ATC sites. The ATCs sites identified are spread across four (4) LGAs as presented in Table 3.4. Map and details of these ATC sites are presented by figure 3.7.

Table 3.4: Detail of ATC sites and their coordinates

S/N	Site Address	LGA	Coordinates	
			Latitude (⁰ N)	Longitude (⁰ E)
1.	Are community along Kano-Kankia-Katsina road, Katsina State	Rimi	12°46'13"N	7°41'59"E
2.	Samarin Kabomo community along Bakori-Malumfashi road, Katsina State	Bakori	11°35'12"N	7°26'35"E
3.	Suduje community, along NALDA road off tambu road, Katsina State	Daura	12°56'43"N	8°15'59"E
4.	Makera community, Katsina	Dutsinma	12°20'44"N	7°29'12"E

Source: Field work, 2024

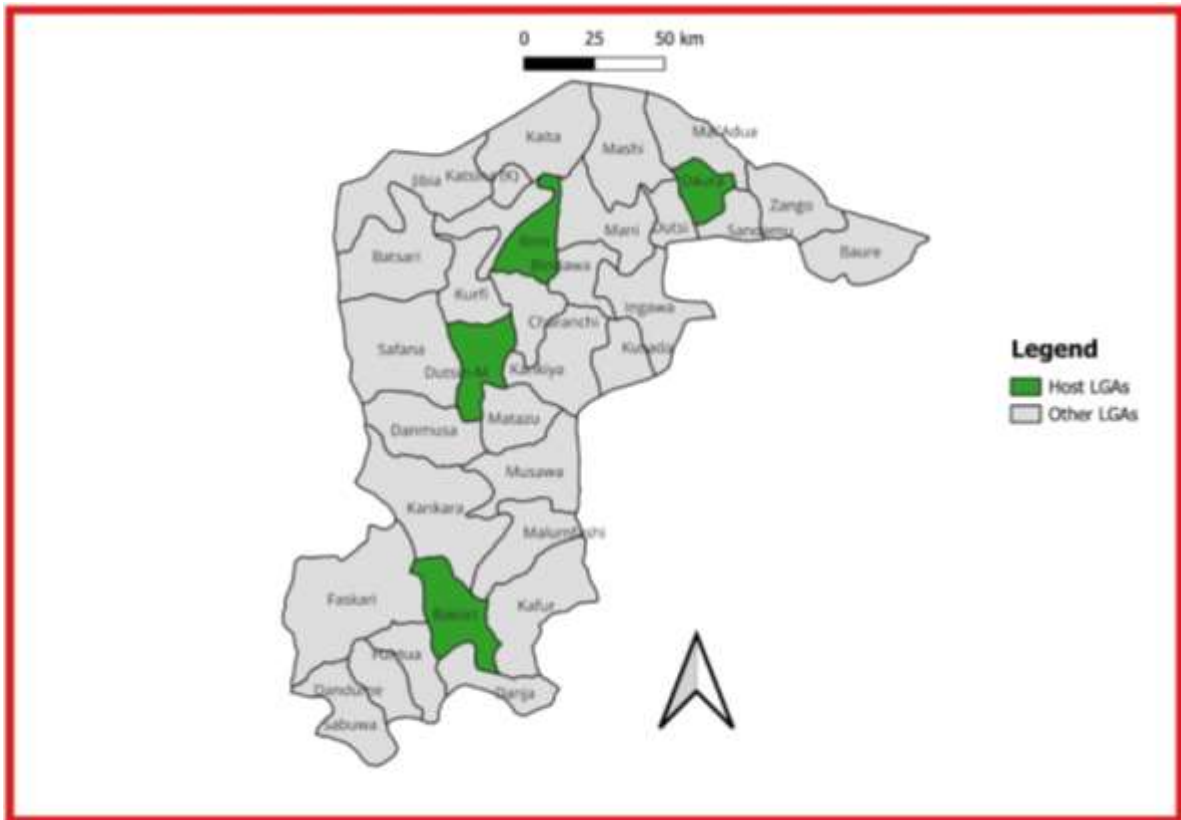


Fig. 3.7: Administrative Map of Katsina State highlighting the proposed ATC LGAs and locations



3.6.1 Kwanar-Are ATC - Rimi LGA

The project site is located at Are community along Kano-Kankia-Katsina road, in Rimi LGA of Katsina state with coordinates; longitude $12^{\circ}46'13''N$, Latitude $7^{\circ}41'59''E$, and elevation 1,722ft above the sea level with savanna climate. The proposed project site is Kwanar-Are dam that its catchment spread across an area of over 138ha, and a relatively flat basin area. The dam is about 100m from the proposed project site. It is bounded by five communities, on the east is Beguwa community at 1.5km, on the west Bukasawa at 1.4km, south-west is Kadandani community at 2.5km, south-east is Are community at 1km and across the dam on the north is Faluwa community at 2.5km from the project site. The total 138ha contains infrastructures such as administrative building, farm structures, vast agricultural land and fruit market. (Plate: 1.0). The host community is predominantly an agrarian community where majority of the population are farmers and some fishermen due to the existence of dam. They practice all year-round farming with livestock and orchards, where they grow mango and cashew in large quantities and the fruit market serve as aggregation centre where farmers brought their produce to sales.

The surrounding of the site location is not much an active build-up residential or commercial area, but more of farm settlement. However, among the communities around the site, the two closest with some active residential and commercial activities is Are and Kadandani community, both with an estimated population of 800-1200. Secondary and Primary school is located in these two communities, Are primary school and community day secondary school Kadandani. Other infrastructures within these two communities are Health center, shopping mall, Mosque, and block built residential houses with zinc and some aluminium roofs. There is also a settlement located opposite the project site with an estimated population of 50-100. The project site land is been used for farm and grazing purpose as result of the dam, which suppliers it with enough water. The source of ground water within and around the project site is borehole and water.

Are ATC – Rimi LGA

Rimi local government area is found in Katsina state, North-west geopolitical zone of Nigeria with the headquarters of the LGA residing in the town of Rimi. Towns and villages that make up Rimi LGA include Fardami, Magama, Tzegero, Rimi, Masabo, Karare, Eka, and Abukar. The estimated population of Rimi LGA is put at 183, 098 inhabitants with the area mostly populated by members of the Fulani ethnic group. The Fulfulde language is commonly spoken in the LGA while the religion of Islam is extensively practiced in the area. Notable landmarks in Rimi LGA include the Katsina wind farm with the area being a part of the Katsina Emirate.

Rimi LGA occupies a total area of 452 square kilometres and has an average temperature of 34 degrees centigrade. The LGA witnesses two distinct seasons which are the dry and the rainy seasons with the dry seasons lasting for longer periods of the calendar year than the rainy seasons.

Rimi LGA is a hub for the rearing and sales of a variety of domestic animals such as cows, horses, camels, goats, and rams. The LGA also has a rich agricultural heritage with the area known for the cultivation of a number of crops such as millet, sugarcane, and rice. Other important economic activities undertaken by people of Rimi LGA include trade, crafts making, pottery, and hunting.



Market place



Farming area within the project site and drainage system



Farming and grazing activities around Kwarna-Are dam



Engagements with the farmers within and around the project site

Plate 3.2: Infrastructures activities inside the project site

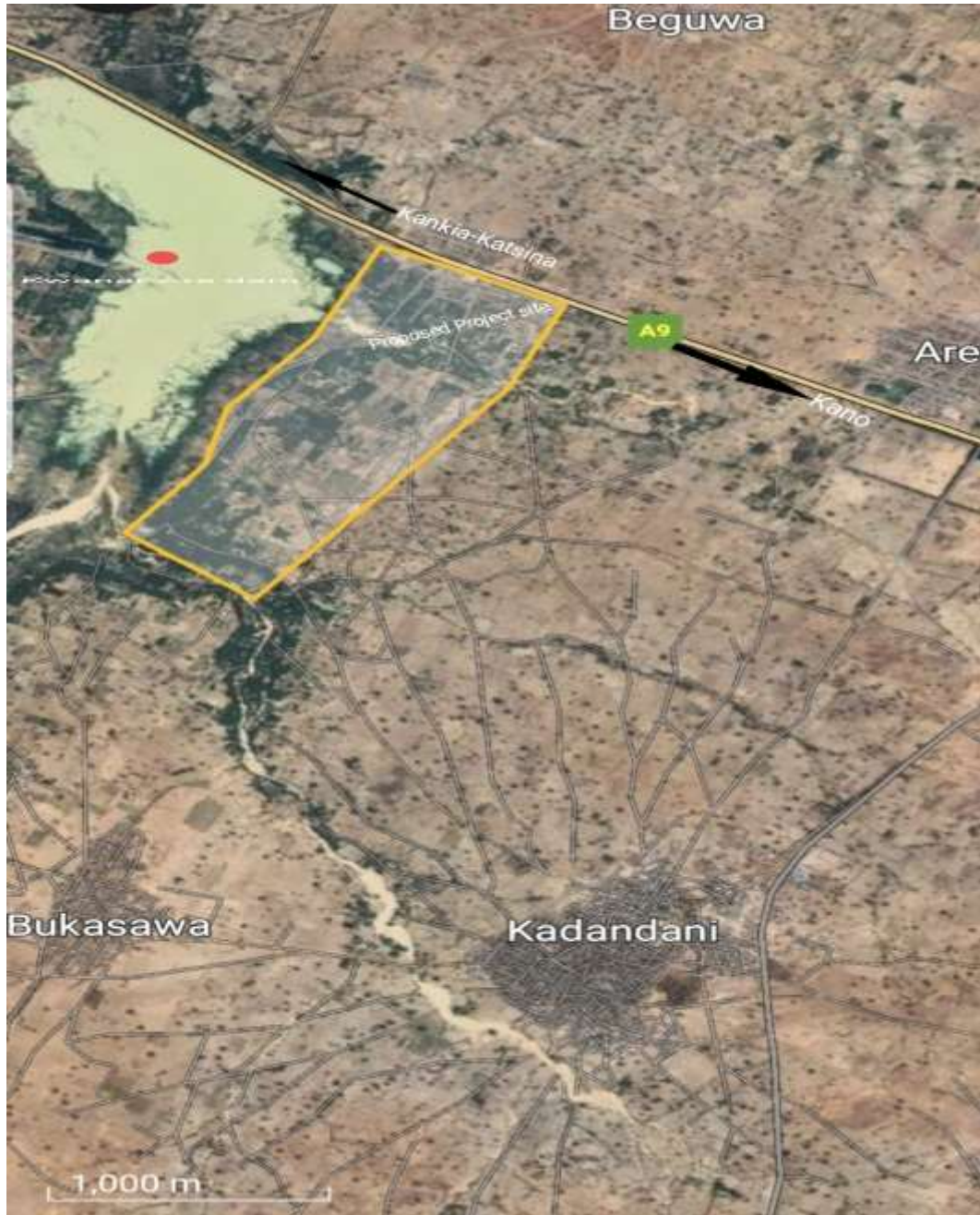


Figure 3.8: Google earth imagery of the proposed project site



3.6.2 Kabomo ATC –Bakori LGA

Kabomo ATC project site is located at Samarin Kabomo community along Bakori-Malumfashi road, Bakori LGA, Katsina within longitude 11°35'12''N and Latitude 7°26'35''E. The proposed site will be situated at Beef Improvement Centre Kabomo, Department of Livestock and Grazing Reserves. The centre is endowed with seasoned research and technical staff across different fields (Animal Nutrition, Animal Production Systems, Veterinary Medicine, Animal Physiology, Animal Breeding and Genetics and Agricultural Economics). This in addition to facilities for research and production across livestock enterprises such as poultry (broilers, layers, cockerels, and Muscovy ducks), ruminants (cattle, sheep and goats), and micro livestock (rabbits, grasscutter and snails). The programme is also into pasture management with attention placed on production of pasture legume seeds and consultancy to livestock farms of different scales for the attainment of sustainable growth of the livestock industry and food security.

The population of Bakori LGA is put at 107,213 inhabitants with the major tribes being the Hausa and the Fulani. Islam is the commonly practiced religion in Bakori LGA while the ffulde and Hausa languages are widely spoken in the area. Bakori LGA is home to the Bakori Emirate with the Emir superintending over the traditional affairs of the area.

Agriculture is the major economic enterprise of the people of Bakori with crops such as millet, rice, and sorghum grown in the area. Cattle rearing is also an important economic activity with a sizeable percentage of the area's male dwellers being nomads and herdsmen. Trade also contributes to the economy of Bakori LGA with the area having a number of markets such as the Kasuwar Sama market. Bakori LGA consist of other communities which includes Kakumi, Kandarawa, Kurami/Yankwani, Tsiga, Kabomo, Jargaba, Guga, Dawan Musa, Magaji, Kwantakwaram, Gazara and Barde to make up the local government.

Project site

The centre has been abandoned with little or no activities on the site. The total land area is 150hectares out of which 10hectares will be provided for cotton farming for the proposed ATC. During the study, only dilapidated buildings were found on site and a

cattle ranch as presented in below. There is a Dam located about 200m within the project site with a capacity of about 1,000,000m³ used by the animals as source of drinking water with an open well as an alternative source of water. There are paddocks for pasture production designed for rotational grazing with abundant range land for open grazing.

Kabomo community estimated population between 500-1000. The closest community to the project site is Rakka community on the south about 1.5km and Hado about 300m to the west with an estimated population between 80-150. The only primary health center close around the project site is located at Bakori, less than 3km to the site where the local government headquarter is located. There is a dry port located at Funtua town about 15km from the project site which is an added advantage to the project.



Entrance to the project site



Admin. office





Abandoned buildings



dilapidated buildings



Dam within the project area



dilapidated building



Hand dug well



cow ranch



Proposed 10 hectares ATC site



cow grazing at the site



Engagements with the farmers within and around the project site and their farm products



Stakeholder meetings at the project site



Figure 3.9: Google earth imagery of the proposed project site



3.6.3 Proposed Suduje ATC Site – Daura LGA

Site description

The project site is National Agricultural Land Development Authority (NALDA) located at Suduje community, along NALDA road off tambu road, in Daura LGA of Katsina state with coordinates; longitude 12°56'43''N, Latitude 8°15'59''E, and elevation 1,573ft above the sea level. The proposed project site is integrated farm estate that spread across an area of 87ha. It is bounded by four communities, Banduboki 800m East, Madobi 700m South, Tambo 3.5km North, Sharawa 800m west.

The total estimated 87ha project land contains many infrastructures such as, administrative building, other office blocks, 40 poultry pens, fish ponds, cow and goat pens of 500 animal space, rabbit breeding pens, bee apiary with 540liter capacity and crop farmer land space. The surrounding of the site location is not much of an active build-up residential or commercial area, but other settlements that are mostly residential close to the project site such as NALDA estate at Madobi 700m, Banduboki settlement 400m and Sharawa 600m. The population of these three settlements are estimated at 100-1500. Schools are located at Madobi and Sharawa community and people of these communities are mostly farmers, fisher men and traders, but practice all year-round farming.

There are other infrastructures around the project site such as, 171 Nigerian Army Battalion 2km, Daberam Dam, Suduje Government Secondary School 1km, Suduje primary Health Care Clinic is 500m away from the ATC. The ground water source within and around the project site is borehole, hand pump and water well. Some part of the project site land is been used for farming purposes.

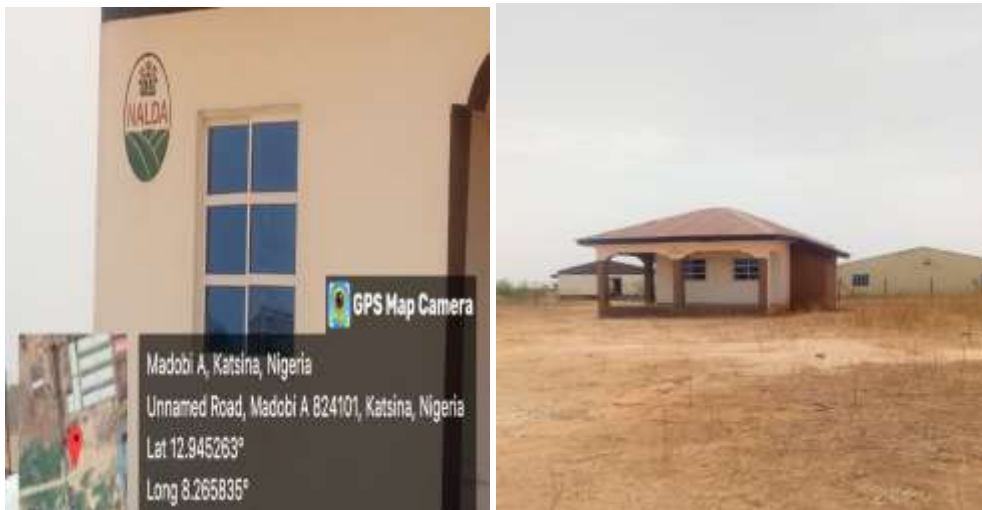
Daura Local Government Area

Daura local government area is situated within Katsina state which is in the Northwest geopolitical enclave of Nigeria. Towns and villages that make up Daura LGA include Unguwar Tanawa, kanti, Rahmaima, Tudun Wada, Kofar Arewa, Kofar baru, and Unguwar Da'u. The population of Daura LGA is estimated at 146, 890 inhabitants with the major tribal affiliations being the Fulani and the Hausa. Daura LGA is home to the Daura Emirate and has the Emir overseeing the traditional affairs of the area. The popular

languages spoken in Daura LGA include the Ffulde and the Hausa languages while Islam is the widely practiced religion in the area. A number of festivals are marked in Daura LGA and these include the Durbar festival.

Daura LGA has an estimated elevation of 474 meters above sea level with the humidity of the area averaging 14 percent. The average temperature of the area is 32.5 degrees centigrade while the average wind speed is 10 km/h. Daura LGA experiences two distinct seasons annually and these are the rainy and the dry seasons.

Daura LGA is in the town of Daura with an area council covering other communities like Daberam, Gurjiya, Sharawa Daura, Maji Yawa, Yarogel, Ganga, Suduji, Bauni, Zari, Bojo, Daura, Don-Nakola Garjiya, Dunu, Lambu-Tudu, Jambu, Kalgo, Kamfawa, Kurneji etc.



Infrastructures within the project site: Administrative building; Office blocks; Farm house



Parts of Doberam dam



Settlement around the project site



Consultation with the community leaders

Plate 3.4: Infrastructures activities inside the project site



Figure 3.10: Google earth imagery of the proposed project site



3.6.4 Makera ATC – Dutsinma LGA

The proposed Makera ATC site is located at Makera village of Dutsinma Local Government Area, Katsina State within longitude 12°20'44''N and latitude 7°29'12''E. The people of Makera village are predominantly farmers and fishermen due to the existence of Zobe Dam. Their major farm produce/crop are: Rice, Maize, Soybean, Sorghum and Millet. Dutsin Ma LGA comprises several towns and villages which include Garhi, Unguwar Zakara, Dutsin Ma, and Makera. The population of Dutsin Ma LGA is estimated at 141,661 inhabitants with the dominant tribes in the area being the Hausa and the Fulani. The Hausa and the Ffulde languages are extensively spoken in the area while Islam is the widely practiced religion in the LGA. The popular landmarks in Dutsin Ma LGA include the Federal University Dutsin Ma and the Zobe dam.

The proposed Makera ATC site is situated at Songhai Farm with a total landtake of 300ha. Songhai Farm is an agricultural scheme designed to alleviate poverty, tackle problem of unemployment among youths in the State, and guarantee food security and self-sufficiency. The scheme was set up to provide training on modern techniques of both production and processing of cash crops and food crops, including maize, sorghum, millet, beans, cassava, rice, wheat, and different kinds of fruits by adding value to them. For this purpose, three farms were established at Zobe, Mairuwa and the Sabke dam on over 5,000 hectares of land. Structures were built and instructors deployed by the to teach and guide prospective farmers towards embracing agriculture as a business.

The motives of the scheme then were honey production, honey processing, honey packaging, fisheries production, fishery management, poultry and livestock production, animal husbandry, crops and cereals production. Other aspects of the initiative include trainings on modern techniques of breeding and rearing of different animals, including sheep, cows, goats, guinea fowls, grass cutter, and turkey.

The scheme is designed in such a way that over 50,000 youths all-year round are to be engaged in agriculture-related activities to earn a living. The structures at the site of the Songhai project, which was established by the former governor of the state, Ibrahim Shema, in 2014, include a conference hall, accommodation, restaurant, staff quarters, and students' hotels. Unfortunately, the project, which functioned only for a few years, was abandoned.



In March 2018, the Katsina State Government approved 10 years lease of Songhai facility to Dangote Industries Limited. The agreement was signed by His Excellency, Rt. Hon. Aminu Bello Masari, CFR the former Governor, on behalf of Katsina State Government while Alh. Aliko Dangote signed on behalf of Dangote Industries Limited.

The Lessee made an initial request for twenty years with an offer of N50,000,000 annually. The government offered a ten-year lease at an annual value of N50,000,000 with an advanced payment of five years. In line with this, the government approved the handing over of the Songhai facility to Dangote Industries Limited for the 10 years lease period. With expiration of the advance payment, the Lessee decided to terminate the lease through their letter dated June, 2023(see attached MOU).

Project site

Makera ATC site is bounded by Zobe Dam on the north about 850m, Makera community on the east about 900m, and the closest community on the west is Salihawa village at about 2.5km along Kankara-Birchi Katsina road. The total land area spread across 300hectares which 50ha contains infrastructures such as administrative building, poultry feed mill, quail house, brooding house, layers house, fish pond, abattoir, biogas, soybean processing mill, groundnut processing mill and processing of all kinds of juice and bottle water. The site also houses worship centre, classrooms, training centre, conference hall, hotel, canteen, staff quarters (single rooms/two bedrooms), laboratory, and many other facilities including power generator, power transformer, water treatment plant and water reservoirs. The project site was selected to revitalized the Songhai Farm and as a built-up area with all the infrastructures and facilities located within the site. At the time of this study, the Songhai farm has been abandoned at its deteriorating state as depicted in the pictures below:



Administrative block



Entrance gate



Project surrounding



Processing area



Quail house



Feed mill



Brooding house



Layers house



Fish pond section



Processing section



Staff quarters



Class room



Training centre



Overhead water tank



transmission line



Community engagement at Songhai Farm



Figure 3.11: Google earth imagery of the proposed project site



3.7 Project Activities

The project activities will broadly cover the following areas:

Pre-construction activities include

- Site Preparation,
- Engineering Design
- Materials Delivery, etc.

Construction activities include

- Land clearing
- Civil Works
- Electrical works
- Installations

Operational activities include

- Operation of the Agro-Processing facilities
- Movement of raw materials in and finished products out of the Hub.
- Maintenance of the Agro-Processing facilities and

The decommissioning activities include

- Demolition and removal of Agro-processing hub components for relocation or sale

3.7.1 Associated Facilities

The project will also involve installing associated facilities that are crucial for the operational efficiency and sustainability of the agricultural zone. This includes the construction of administrative/technical/social facilities, energy transmission lines / transformer centers, connection/access roads, a wastewater treatment facility, a fuel station and truck parking lots. Additionally, as part of future plans to further enhance sustainability and self-sufficiency, the project intends to incorporate renewable energy sources like wind, solar, and biogas systems into the SAPZ project. Project's future expansions or modifications will involve additional studies that should be conducted by preparing document(s) for these associated facilities and/or updating the ESMP prepared within the scope of the project to reflect the current situation.



3.7.2 Project Workforce

The project aims to support investments that contribute to increasing employment in rural nonarable lands and boosting the national exports of agricultural products. The projected employment impact is substantial, with an estimated 6,000 individuals expected to be employed with about 35% will be women. Moreover, during the construction and drilling activities, it is anticipated that several hundred individuals will be employed.

In the project area, it has been decided not to construct any accommodation facilities for the employees. Instead, round-trip transportation will be arranged for them using shuttle services. This approach is designed to minimize the project's footprint and simplify logistics related to employee housing. However, there is a contingency plan in place should the need arise to establish a camp site for the Project. If a camp site becomes necessary, it will be developed in strict accordance with the standards for worker accommodation as outlined by the International Finance Corporation (IFC).

3.7.3 Implementation Schedule

The project activities will be carried out on a phase-by-phase basis as follows;

- Site Survey
- Site Leveling
- Leveling & Grading
- Marking for Mounting Structures
- Pier Foundations
- Structure Erection
- Structure & Model Alignment

The proposed schedule for the engineering, procurement and construction is provided in table 3.5 below.



Table 3.5: Proposed Project Timeline

S/N	Activities	Q1 2024	Q2 2024	Q3 2024	Q4 2024	Q1 2025	Q2 2025	Q3 2025	Q4 2025	Q1 2026	Q2 2026	Q3 2026	Q4 2026
1.	Initial Conception												
2.	Site survey & mapping												
3.	Grid & load flow survey												
4.	Feasibility studies												
5.	ESIA												
6.	Financial Closure												
7.	Engineering & Construction												
8.	Interconnection & commissioning												→
9.	Start operation												→



CHAPTER FOUR

4.0 DESCRIPTION OF EXISTING ENVIRONMENT

4.1 Introduction

This chapter presents the current ecological conditions of the location where the proposed Agro-Industrial Hub (AIH) project will be located. It also presents the socioeconomic and health profiles of the affected communities. The physico-chemical environment (meteorology, geology, sediment/soil type and distribution, surface/groundwater characteristics), biological environment (location and distribution of benthos, plankton, fisheries, flora and fauna characteristics), as well as socio-economic and health conditions of the project affected communities were among parameters described in this chapter. Also described in the socio-economic section of this chapter are the demographic structure, culture, heritage sites, social and health status of the people and their environment, including outcomes of consultations held.

Information summarized in this report on baseline conditions of the proposed AIH were sourced from combination of relevant literature (see relevant sections) and field data sampling collected within the proposed project site boundary (1km radius). The data gathered shall be utilized to inform future decisions about environmental management and to track any changes that may occur to the environmental elements.

4.2 Study Approach

The baseline status of the project area was obtained through consultations with the relevant stakeholders as well as from field studies covering the following:

- Reconnaissance survey;
- Field studies including air, surface water, sediment, soil and vegetation sampling;
- Geophysical investigation and groundwater sampling;
- Field analysis and sample preservation;
- Laboratory analysis of samples;
- Socio-economic and health studies;
- Data processing, analysis and interpretation; and
- Reporting



4.2.1 Area of Influence

Sampling stations were established within the proposed AIH project site with control station established outside this site for soil, air quality and noise. This is to guarantee that the impact of the proposed AIH facility is measured against the sample taken from the control station in order to make decisions about environmental monitoring and management in the future. The entire area of influence for the development of the proposed AIH project in Katsina State is a 200 hectare land allocated to the proposed project within the an 800 hectare land allocated for the development of Green Special Economic Industrial Zone. The area is located within Kusa area, along Jibia Road, Jibia Local Government Area (LGA), Katsina State. The nearest communities of Kusa, Mudassir and Liman Musa were considered for the purpose of this study. Groundwater sampling, Socio-economic and health survey were conducted in the communities. The scope of this study does not cover surface water. This is due to surface water body was not found within 1km radius of the proposed project site.

Statutorily, the Federal Ministry of Environment (FMEnv) from prior engagements and recent technical review sessions has required a 10km radius zone of influence for Category 1 projects EIA field sampling design. However, based on the expert judgment and understanding of the dynamics of aquatic systems, the EIA consultant only extended to 10km for socio-economic survey in Kusa, Liman Musa and Mudassir communities which are located 4.4km Northwest, 2.5km East and 3.4km North respectively away from the proposed AIH project site.

Environmental factors considered when selecting sample points were sensitivity of physical and biological receptors (e.g. location of flora and fauna, settlements) as well as geographical dynamics of the study area such as wind direction, upstream/downstream system and topography of the area. Receptors within the study area include; shrubs, climbers, Jibia road, Flora, Fauna and Soil.

4.2.2 Baseline Data Acquisition Methods

Basically, measurements, field data collecting, and sample collection of representative populations were utilized in the data acquisition process to determine the environmental parameters of the study area. This exercise involved a multi-disciplinary approach and



was executed within the framework of a quality, health, safety and environment (QHSE) management system approach. Using the best available equipment, resources, and personnel, this method guarantees that the necessary data and samples were collected in accordance with established (scientific and regulatory) requirements. Elements of this approach include:

- review of existing reports that contain environmental information on the study area;
- designing and development of field sampling strategies to meet work scope and regulatory requirements;
- pre-mobilization activities (assembling of field team, sampling equipment / materials calibrations/checks, review of work plan and schedule with team, and job hazard analysis);
- mobilization to field; fieldwork implementation - sample collection (including positioning and field observations), handling, documentation and storage protocols and procedures; and
- demobilization from field; transfer of sample custody to the laboratory for analyses.

The methodology/procedures for collecting field data are described in the succeeding sub-sections. Also, baseline environmental conditions of the proposed AIH project's area as recorded during field study are described in succeeding sections below. The detailed documentation of the fieldwork execution including descriptions of the laboratory analytical methods and procedures, the detection limits for the various parameters analyzed as well as an overview of the general QHSE plan adopted for field data gathering and laboratory analysis is presented.

4.2.3 Consultation with Regulators and Stakeholders

Prior to field sampling, meetings were held with the relevant stakeholders to intimate them of the project and seek their consent to carry out the field data gathering. Consultation is an important element of socio-economic assessment and an integral component of the entire EIA process. This is because appropriate and adequate consultations will ensure smooth project implementation and guarantee economic and



commercial sustainability of the proposed project. It involves information dissemination and interaction/dialogues with the host communities and other stakeholders on the EIA of the proposed project. The key objectives of consultation on the ESIA for the proposed AIH project are to:

- Ensure that the communities and all stakeholders are given early and adequate information on the ESIA and the proposed AIH project activities;
- Provide a framework for improving the understanding of the potential impacts of the proposed project on the socio-economics and biophysical environment;
- Include stakeholders' views and concerns as part of the ESIA execution especially as it concerns the potential impacts;
- Identify contentious issues in the proposed project execution;
- Establish transparent procedures for carrying out the proposed projects; and
- Create accountability and a sense of local ownership during project implementation, thus minimizing communities' conflicts and project delays that may result thereof.

4.2.4 Reconnaissance Survey and Delineation

Site visits were carried out from 29th to 30th April 2024, to collect primary data relevant to the site assessment and for the generation of baseline information used in assessing potential impacts. The areas visited were the proposed Agro Industrial Hub at Natsinta and the ATCs in Are, Samarin Kabomo, Suduje and Makera communities in Katsina State. During the site visit, site assessment was carried out (strengthened by secondary data gotten from desk studies), samples for environmental assessment were collected, socio-economic data was collected through administration of questionnaires and conduction of semi-formal interviews, and stakeholder meetings were held. Plans for community consultations were also made which were eventually carried out. Information gotten from all these activities are presented in this chapter. Plate 4.1 show images of the site visitation team on site.



Plate 4.1: Site visit exercise with FMEnv team and consultants at the AIH project site

4.2.5 Desktop Studies

Desktop studies involved the acquisition of relevant background information on the environment of the study area. Approved reports from earlier environmental studies conducted in the region, as well as books, articles, maps, and other materials about the proposed AIH project area and environs similar to it, were among the materials studied. The list of materials consulted is specified in relevant sections.

4.2.6 Field Sampling/Measurement

To accurately describe the ecology and meteorology of the study area and ascertain seasonal variations of particular environmentally relevant characteristics, field data gathering exercise was conducted for dry season sampling on April 29th to 30th, 2024. The specific objectives of the ecological field sampling were to determine:

- Ambient air quality and noise level of the study area;
- Physico-chemical and microbiological characteristics of the soil within the study area;
- Physico-chemical and biological characterization of water and sediment samples within the study area;
- Hydrobiology and fisheries resources of the study area;



- Wildlife abundance and diversity of the study area and environs;
- Vegetation characteristics of the area; and
- Establish the socio-economic and health status of the project affected communities.

Ecological samples and data (water, soil, sediment etc.) were collected as appropriate.

The exercise involved in situ measurement of unstable parameters where possible or they were preserved for laboratory analysis.

a. Field Study and Sampling Design

Field data gathering is designed to typically cover the proposed AIH project area. Soil sample stations were established to ensure the major soil types that characterise the proposed AIH project site are adequately covered. Also, groundwater sampling, air quality and noise level measurement stations were distributed to ensure the entire project site is representatively covered. On the whole, the following sample requirements were established:

- Soil samples obtained from fifteen (14 + 1 control) stations, with samples collected from 0-15cm for top soil and from 16-30cm for subsoil;
- Air quality measured at fifteen (14 + 1 controls) stations;
- Noise level measured at fifteen (14 + 1 controls) stations;
- Groundwater sampling at two (2) stations (hand-dug well and borehole);
- Vegetation and wildlife

The sampling locations were selected as waypoints using the Geographic Positioning System (GPS), and subsequently plotted in a sampling map (Figure 4.1a and 4.1b) that was utilized during field study. Locations for biophysical sampling considered ecological types around the project areas, vulnerable environmental attributes with regards to the potential and associated impacts of the environment and control or buffer zones. Socio-economic and health survey on the other hand, considered human communities (Kusa, Mudassi and Liman Musa), infrastructures, cultural heritage sites and prevailing health conditions of people within the sphere of influence to the proposed AIH project area.

Table 4.1 presents an inventory of the biophysical and socio-economics/health details collected during field studies.

Table 4.1: Inventory of Biophysical and Socio Samples

S/N	Environmental Component	Parameter	No. Of Samples as requested by FMEEnv	Remark
1	Groundwater	Physico chemical and microbial	2	-
2	Soil	Physico chemical and microbial	30 + 1 Control (for both 0-15cm and 16-30cm)	Top and Sub soil
3	Ambient air quality	Criteria pollutants	15 + control	-
4	Noise	Sound level	15 + control	-
5	Geology/ Geography	Static water level, Stratigraphy, Flow direction	-	-
6	Meteorology	Temperature, Relative Humidity,	-	-
7	Biodiversity	Taxa	-	-
8	Socio economics and health	Human and infrastructures	-	-

Source: Fahamu Fieldwork, 2024

Table 4.2: Sampling Stations and Geo-position

S/N	Identification	Lat	Long	S/N	Identification	Lat	Long
Air Quality & Noise Level				Soil Sampling			
1	Aq.KT-01	13° 2'40.88"N	7°32'37.85"E	1	S.S-01	13° 2'41.87"N	7°32'36.93"E
2	Aq.KT-02	13° 2'38.80"N	7°32'41.63"E	2	S.S-02	13° 2'39.91"N	7°32'41.58"E
3	Aq.KT-03	13° 2'35.94"N	7°32'46.89"E	3	S.S-03	13° 2'37.06"N	7°32'47.43"E
4	Aq.KT-04	13° 2'38.03"N	7°32'35.66"E	4	S.S-04	13° 2'33.18"N	7°32'45.13"E
5	Aq.KT-05	13° 2'35.69"N	7°32'40.67"E	5	S.S-05	13° 2'36.10"N	7°32'40.14"E
6	Aq.KT-06	13° 2'34.05"N	7°32'45.18"E	6	S.S-06	13° 2'38.37"N	7°32'35.11"E
7	Aq.KT-07	13° 2'35.16"N	7°32'33.53"E	7	S.S-07	13° 2'35.70"N	7°32'32.95"E
8	Aq.KT-08	13° 2'33.09"N	7°32'38.94"E	8	S.S-08	13° 2'33.50"N	7°32'38.44"E
9	Aq.KT-09	13° 2'29.80"N	7°32'43.27"E	9	S.S-09	13° 2'30.89"N	7°32'43.63"E
10	Aq.KT-10	13° 2'25.31"N	7°32'40.65"E	10	S.S-10	13° 2'26.35"N	7°32'41.04"E
11	Aq.KT-11	13° 2'27.90"N	7°32'36.48"E	11	S.S-11	13° 2'28.88"N	7°32'36.55"E
12	Aq.KT-12	13° 2'30.61"N	7°32'31.03"E	12	S.S-12	13° 2'31.57"N	7°32'30.75"E
13	Aq.KT-13	13° 2'25.90"N	7°32'28.35"E	13	S.S-13	13° 2'26.25"N	7°32'27.72"E
14	Aq.KT-14	13° 2'22.83"N	7°32'33.34"E	14	S.S-14	13° 2'23.36"N	7°32'32.97"E
15	Aq.KT-Cntrl	13° 2'20.78"N	7°32'40.76"E	15	S.S-Cntrl	13° 2'19.63"N	7°32'40.18"E
Groundwater sampling							
1	G.W-01	13° 2'37.86"N	7°31'17.35"E				
2	G.W-02	13° 2'36.17"N	7°31'43.11"E				

Source: Fahamu Fieldwork, 2024



Plate 4.2: Sampling Materials

b. *Analytical Methods*

Samples collected from the field were analysed using various methods in Abuja Environmental Protection Board (AEPB) Laboratory at Asokoro District of Abuja Municipal Area Council (AMAC) in the Federal Capital Territory (FCT).

This study employed analysis techniques approved by the Federal Ministry of Environment. Some international analytical procedures were also adopted for this study. Those of APHA, EPA, and ASTM analytical procedures for soil, sediment, and water quality were among analytical procedures adopted and used in the course of this study (Table 4.3). To ensure the reliability and integrity of some unstable physico-chemical parameters, in-situ measurement of pH, conductivity, Total Dissolved Solids (TDS), and temperature were carried out in the field. All field instruments were regularly cleaned and recalibrated after each use.

The Quality Assurance and Quality Control (QA & QC) for laboratory analyses is in accordance with FMEnv recommended method, and include blank analyses to establish analyte level, duplicate analyses to establish analytical precision, spiked and blank sample analyses to determine analytical accuracy.



Source: Fahamu Fieldwork 2024

Figure 4.1: Generalized sampling map for all Environmental components studied at the proposed AIH project area

4.3 CLIMATE AND WEATHER

Climate is a complex system that includes the long-term trends--normally 30 years--of wind, precipitation, humidity, temperature, and other atmospheric parameters in a specific area. Sunlight, greenhouse gasses, terrain topography, ocean currents, and human activity are some of the variables that affect it. The climate of the proposed AIH area is characterized by two regimes: the dry and wet seasons. These seasons are dependent on two prevailing air-masses blowing over the area at different times of the year: the north-easterly air mass of Sahara origin (the tropical continental air mass) and the humid maritime air-mass blowing from the Atlantic (the tropical maritime air mass). The two air masses blowing from nearly opposite directions meet along a slanting surface (the Inter-Tropical Front). The area about this front, where the air masses to some extent mix, is called the Inter-Tropical Discontinuity (ITD) or the Inter-Tropical Convergence Zone (ITCZ).

The entire area of the proposed AIH falls under the subtropical steppe climate. This is a factor of its latitude, terrain, altitude, as well as nearby water body and their currents. All these are natural factors that cannot be impacted by human (anthropogenic) activities. However, human activities in practice in the area such as vehicular movement, agriculture, overgrazing, desertification and energy generation have the capacities to impact on the climate.

Weather on the other hand refers to the atmospheric conditions in a specific place at a particular time. It measures parameters such as temperature, humidity, precipitation, wind speed, and atmospheric pressure. Unlike climate, which describes long-term patterns and averages of these conditions, weather is dynamic and can change rapidly, sometimes within hours or days. It is influenced by solar radiation, air pressure systems, ocean currents, geography, and human activities.

With an elevation of 512.06meters above sea level, the proposed AIH project area experiences a tropical climate that is both wet and dry, similar to that of a savanna and experiences a yearly temperature 30.89°C. For the purpose of this EIA study, thermometers, hygrometer and anemometers were employed to monitor the weather condition at site. Results acquired were used to buttress secondary data acquired.

4.3.1 Rainfall

Katsina receives an average yearly rainfall varied from 51.61 mm. In March, area receives a minimum amount of rainfall, recording an average of 0.4mm; while recording the highest average rainfall (192.75mm) in the month of July and recording 186.03mm in the month of August (Figure 4.2). The dry months are between November and April.

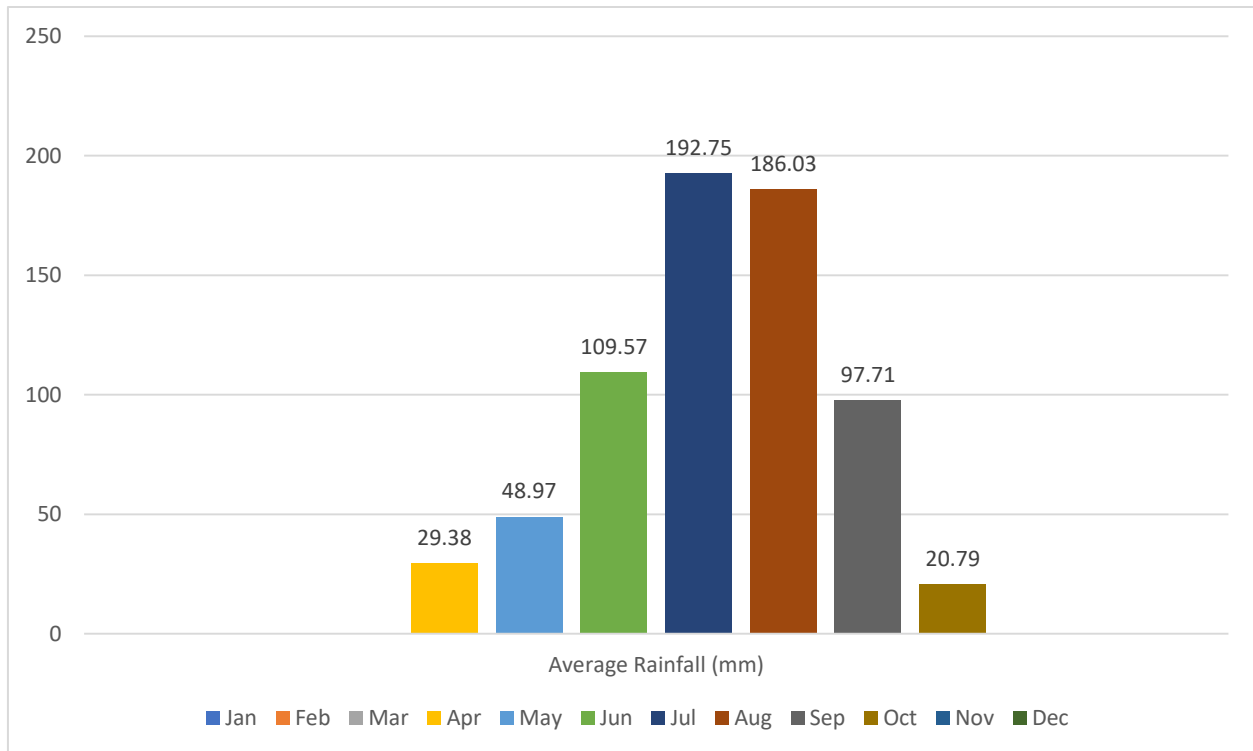


Figure 4.2: Mean Monthly Rainfall in Katsina State
 Source: Nigerian Meteorological Agency (NIMET), 2020

4.3.2. Temperature

Figure 4.3 below illustrates the mean yearly maximum and minimum temperatures for Katsina State throughout the same climatic period as reported by NIMET. The maximum monthly average is 37.12°C, recorded in the month of April. During field work, temperature was as high as 42.7°C with the lowest being 34.9°C (Figure 4.4). These results can be associated to climate change effect over the proposed AIH project which brought about variations on atmospheric temperature and other climatic parameters. As shown in the chart temperatures increases with time as the area receives more heat from solar radiation.

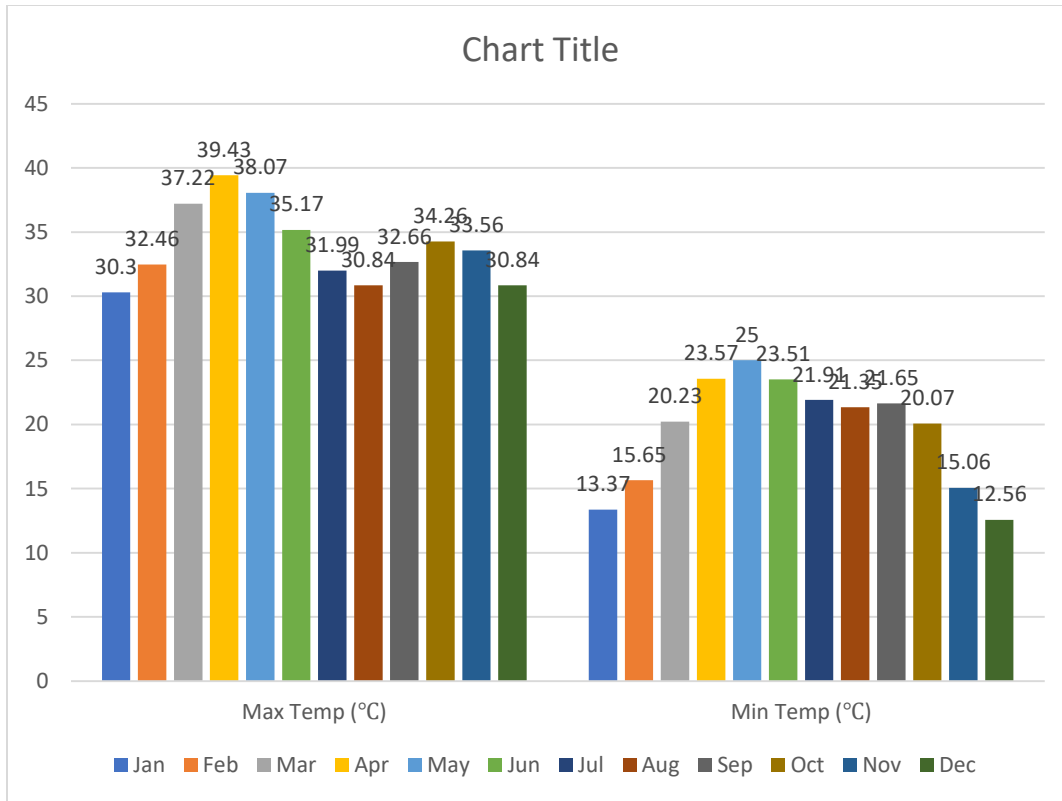


Figure 4.3: Mean Monthly Minimum and Maximum Temperatures for Katsina State

Source: Nigerian Meteorological Agency (NIMET), 2020

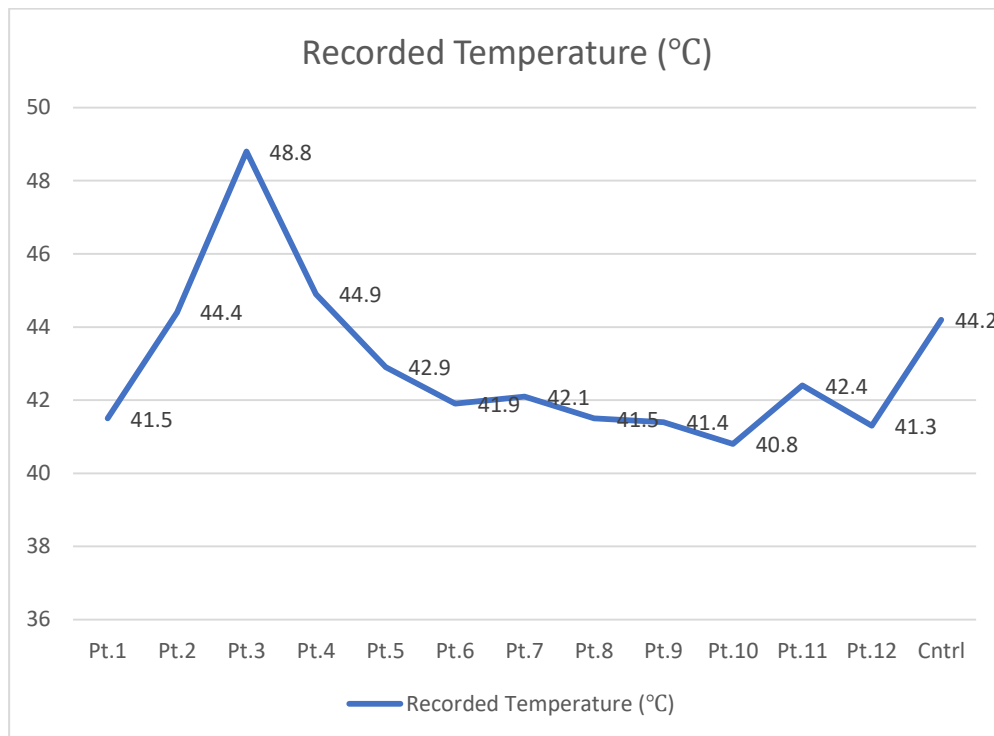


Figure 4.4: Results of Temperature recorded at the site for the proposed AIH project

Source: Fahamu Nig. Ltd. Field work, 2024

4.3.3 Solar Radiation

Data obtained from NIMET indicate that solar radiation received in the proposed AIH project area is 6,500Wh/m² per day (figure 4.5). This high value is likely linked to the clear sky days (few clouds and little dust) often experienced in the area which result to temperature as high as 43°C. The brighter period of the year lasts for 2.7 months between January and April, with an average daily incident shortwave energy per square meter above 6.3kWh. The brightest month of the year is March, with an average of 6.3 kWh. The darker period however lasts from July to September, with an average daily incident shortwave energy per square meter below 5.2 kWh. The month of August happens to be the darkest in the period, with an average of 4.9kWh. This resources posses great potential to be tapped on to supply renewable energy to the proposed AIH during operation, thereby limit its impact on the environment through burning of foil fuel to generate energy.

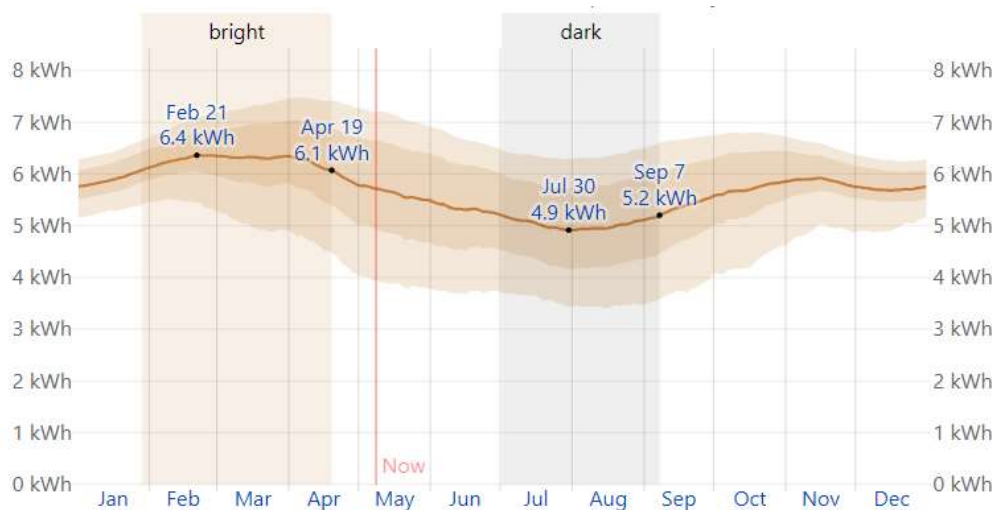


Figure 4.5: Mean Daily Incident Shortwave Solar Energy in the proposed AIH Project Area
 Source: Nigerian Meteorological Agency (NIMET), 2020

4.3.4 Wind Speed

The mean monthly wind speed for the proposed AIH project area ranged between 4.82mph and 10.36mph. The highest wind speed was recorded in the months of January and July, during which values was as high as 10.03mph and 10.36mph respectively (Figure 4.6).

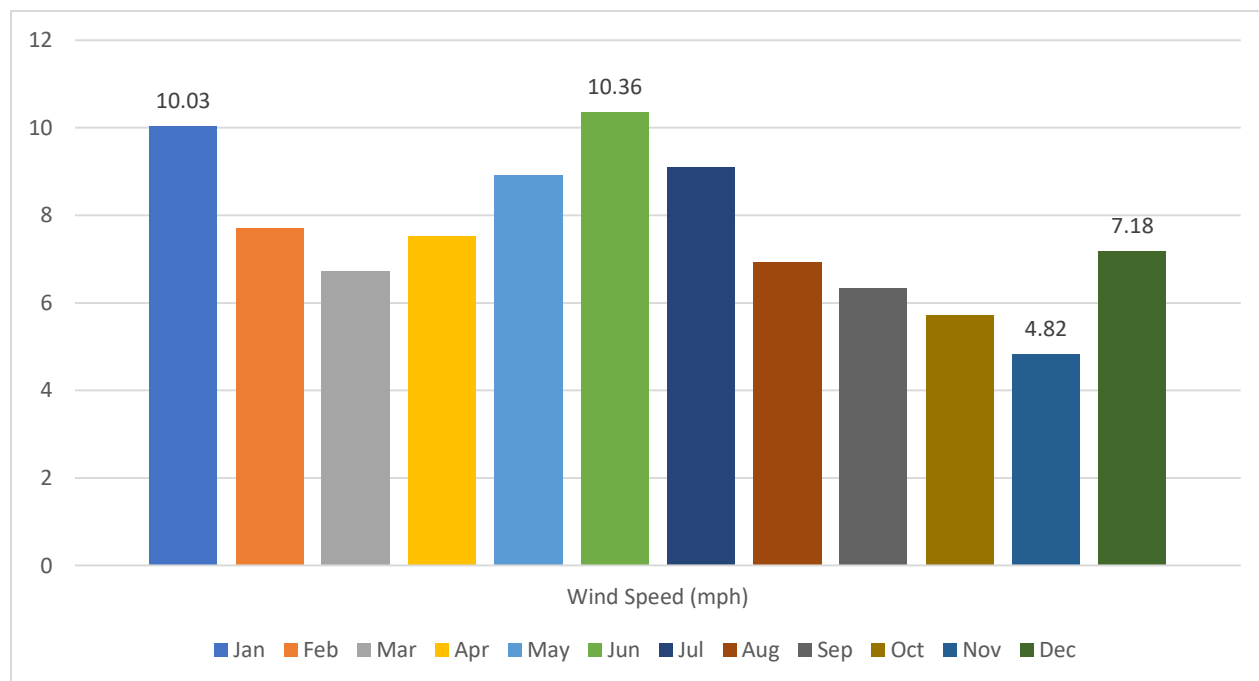


Figure 4.6: Average Monthly Wind speed of the proposed AIH project area

Source: Nigerian Meteorological Agency (NIMET), 2020

4.3.5. Wind Direction

Data obtained with the aid of Weather-hawk (Windmate^R) revealed that eastlie and southwestlie winds were prevalent in the study area (Table 4.3). The wind direction varied from the northeastlie to southwestlie.

Table 4.3: Monthly wind direction of the project area

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2010	E	NE	E	E	SW	SW	SW	S	SW	S	E	E
2011	E	NE	E	SW	SW	SW	SW	SW	S	E	NE	NE
2012	NE	NE	NE	S	SW	SW	SW	SW	SW	E	E	NE
2013	E	E	E	E	W	SW	SW	SW	W	E	E	E
2014	E	E	E	W	W	W	W	W	W	E	E	E
2015	E	E	E	W	W	W	SW	SW	W	E	E	E
2016	E	E	E	W	W	W	W	W	NW	NW	SE	SE
2017	E	NE	S	S	SW	SW	SW	S	S	S	NE	NE
2018	NE	NE	NE	SW	S	W	SW	SW	SW	SW	NE	NE
2019	NE	NE	SW	SW	S	S	S	SW	SW	SW	E	E

2020	NE	NE	NE	SW	SW	SW	S	SW	SW	SW	NE	NE
------	----	----	----	----	----	----	---	----	----	----	----	----

Source: Nigerian Meteorological Agency (NIMET), 2020

4.3.6 Relative Humidity

Relative humidity is the ratio of the amount of water vapour in the air at a specific temperature to the maximum amount that the air could hold at that temperature, expressed as a percentage. Relative humidity experienced in the proposed AIH project area was generally below average, with the highest being 44.5% the lowest value recorded and above 50%. Values recorded ranged between 37.7% and 44.9%, and having a mean value of 38.5%. Lower values were recorded during the morning hours when the heat of sunlight is low. As the sunlight increases, thereby increasing the ambient temperature, it reduces the atmospheric water vapour which thereby result in lower relative humidity. The values recorded at site buttresses the values acquired from the Nigerian Meteorological Agency (Figure 4.7).

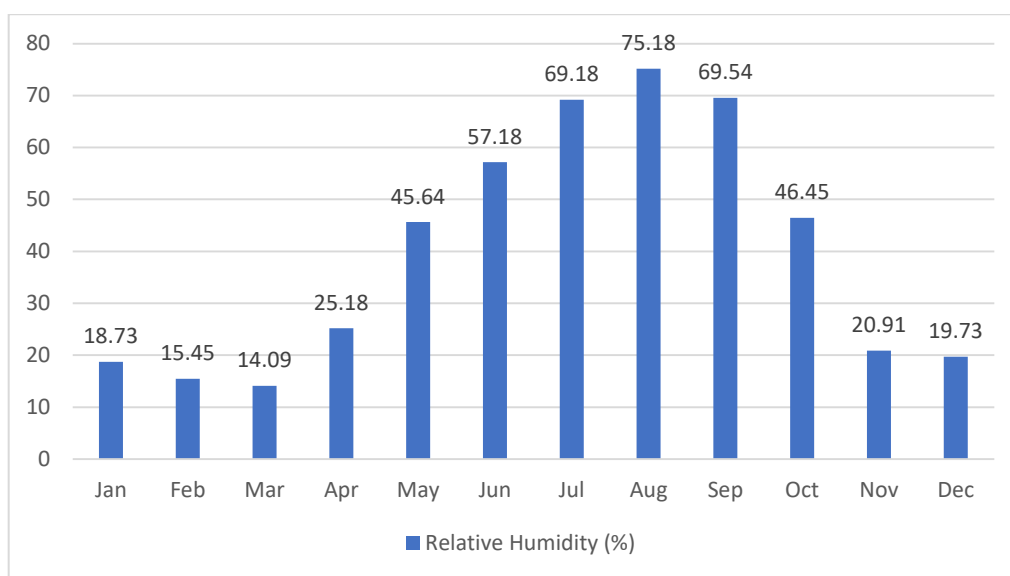


Figure 4.7: Relative humidity of the sampling locations in the project Area

Source: Nigerian Meteorological Agency (NIMET), 2020

4.4 AMBIENT AIR QUALITY AND NOISE LEVEL MEASUREMENT

4.4.1 Methodology

On-site ambient air quality measurements were performed using an up-to-date calibrated equipment: JLDG Multifunctional Air Quality Tester and 9-in-1 Air Quality Meter. With the air of these equipment concentrations such as PM_{2.5} and PM₁₀, SO₂, H₂S, CO, CO₂, CH₄, and VOCs were determined.

Extech digital sound level meter was employed to conduct noise level measurement.

Noise level was measured in dB(A) weighted band, to express the relative loudness in air as perceived by the human ear and also at a slow time weighting, which gave the average noise level per sampling location. Calibration of the sound level meter was up-to-date.

Table 4.4: List of Air and Noise Quality Equipment used in the study

Parameter	Equipment	Detection Limit
Particulate Matter: Total Suspended Particles	9-in-1 Air Quality Meter	0 - 1000µg/m ³
Particulate Matter: PM _{2.5} and PM ₁₀	9-in-1 Air Quality Meter	0 - 1000µg/m ³
Carbon II oxide	JLDG Multifunctional Air Quality Tester	0 – 200ppm
Sulphur IV oxide	JLDG Multifunctional Air Quality Tester	0 – 100ppm
Hydrogen Sulphide	JLDG Multifunctional Air Quality Tester	0 – 100ppm
Methane	9-in-1 Air Quality Meter	0 – 10000ppm
Total Volatile Organic Compounds (TVOCs)	9-in-1 Air Quality Meter	0 – 50ppm
Noise Level	Extech Digital Sound Level Meter	30 – 130 dB(A)

Source: Fahamu Limited Laboratory, 2024

Fifteen different locations including control were considered for measured of air quality, both within and outside the proposed AIH project site. Photographs were taken (Plate 4.3) of the field officers at different points of the proposed project site as part of the measurement procedure. Measurements were conducted on the 29th of April 2024, which is for dry season. Ambient noise level measurements were also carried out. These measurements were done in situ using Extech Digital Sound Level Meter at fifteen points including control.



Plate 4.3: On-field Measurement of Air Quality Parameters and Noise Levels

4.4.2 Results and Analysis of Air Quality

Suspended Particulates

Particulates are airborne mixtures of solid, liquid, or solid and liquid particles. These particles appear as haze or smoke. They endanger human health because they affect the cardiovascular and respiratory systems in both acute and long-term ways. Particles may carry any or all of the other pollutants dissolved in or adhering to their surfaces. Particles ranging from aggregate of a few molecules to pieces of dust, readily visible to the naked eye are commonly found in the atmosphere. Aligning with the assertion of San and El (2012) that particulates cause acute and chronic effects to the respiratory and cardiovascular systems, CCDI (2001) revealed that high concentrations of suspended particulate matter (SPM) are known to irritate the mucous membranes and may initiate a variety of respiratory diseases. Fine particulates may cause cancer and aggravate morbidity and mortality from respiratory dysfunctions.

Particulates in sizes of P.M2.5 and P.M10 were detected in all the locations measured (Table 4.5). the concentrations ranged between 7ppm and 12ppm, and recording a mean value of 8.9ppm for P.M2.5; and between 9ppm and 14ppm and recording a mean value of 10.9ppm. PM2.5 is more likely to travel into and deposit on the surface of the deeper parts of the lung, while PM10 is more likely to deposit on the surfaces of the larger airways of the upper region of the lung. Particles deposited on the lung surface can

induce tissue damage, and lung inflammation. Measured concentrations of both PM_{2.5} and PM₁₀ were within withing the FMEnv limit of 250ppm at all the points measured.

Sulphur IV Oxide

Airborne sulfur dioxide is mostly caused by operations related to burning fossil fuels (coal, oil), such as smelting copper in power plants. Breathing causes exposure, which affects the lungs. High exposure levels can cause breathing difficulties, severe airway blockages, burning in the nose and throat, and other symptoms. Sulphur iv oxide is known to be a harsh irritant, and is capable of aggravating asthma, bronchitis and emphysema and promoting impaired functions in the human system (CCDI, 2001).

SO₂ not detected at all the sampling points, which results in the proposed AIH project area free from the pollutant, as its concentration were less than the limit, 0.01ppm FMEnv recommended limit for its atmospheric concentration.

Carbon Monoxide

Carbon monoxide (CO) is a poisonous, colorless, odorless and tasteless gas resulting from the incomplete burning of material containing carbon such as natural gas, gasoline, kerosene, oil, propane, coal, or wood (OSHA, 2012). Adverse health effect has been observed with CO concentrations of 12 - 17ppm for 8 hours (Canter and Hill, 1977) while prolonged (45 minutes to 3 hours) exposure to concentrations of CO between 200ppm and 800ppm often results in severe headache, dizziness, nausea and convulsions (CCDI, 2001). CO concentrations was not detected at all the sampling points during the measurement time, which were below FMEnv permissible limited.

Methane

Methane, CH₄, is a colorless, odorless gas with a wide distribution in nature. It is the principal component of natural gas. Anaerobic bacterial decomposition of plant and animal matter, such that occurs under water produces marsh gas, which is another name for methane. It is non-toxic when inhaled, but it can produce suffocation by reducing the concentration of oxygen inhaled (SCIFUN, 2017). CH₄ was recorded in all measurement points with concentration level ranging from 5.54 to 15.1mg/m³ and a mean value of

9.7mg/m³. Neither Nigeria nor the World Bank has recommended limit for emitting CH₄ gas.

Hydrogen Sulphide (H₂S)

Hydrogen sulphide is a colourless, flammable gas with a characteristic odour of rotten eggs. It is produced naturally, a few of which are anaerobic bacterial reduction of sulphates and sulphurcontaining organic compounds, and also as a result of human activity. Nasal olfactory lesions were reported in Sprague-Dawley CD, as rats were H₂S at 42 or 110 mg/m³; the no-observed adverse- effect level (NOAEL) was 14 mg/m³ (WHO, 2003). H₂S was not detected at all the points measurement was conducted, leaving the area free of the pollutant and less that FMEnv permissible limit of 0.01ppm.

Carbon iv Oxide (CO₂)

The concentration of CO₂ in the atmosphere has risen from close to 280 parts per million (ppm) in 1800, at first slowly and then progressively faster to a value of 367 ppm in 1999, echoing the increasing pace of global agricultural and industrial development. Current anthropogenic emissions of CO₂ are primarily the result of the consumption of energy from fossil fuels (IPCC, 2018). CO₂ is a naturally occurring gas, a by-product of burning fossil fuels and biomass and a result of land-use changes and other industrial processes. It is the principal anthropogenic gas that is thought to affect the Earth's radiative balance (Florides and Christodoulides, 2008 citing IPCC, 2007). CO₂ was detected at all the points sampled, with concentration level ranging from 383ppm to 596ppm, with a mean value 528.1ppm.

Volatile Organic Compound

Volatile organic compounds (VOCs) are a large group of organic chemicals that include any compound of carbon (excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates, and ammonium carbonate). VOCs are of interest in part because they participate in atmospheric photochemical reactions that contribute to ozone formation, they play a role in formation of secondary organic aerosols, which are found in airborne particulate matter, and because many individual VOCs are known to be harmful to human health. VOCs are emitted from a variety of sources, including motor

vehicles, chemical manufacturing facilities, refineries, factories, consumer and commercial products, and natural (biogenic) sources (mainly trees), and health effects vary by pollutant (EPA, 2018). VOCs was detected in all the points sampled, with concentration levels ranging from 0.01–0.44 mg/m³ and having a mean value of 0.12mg/m³. The measured concentrations are well below FMEnv permissible limit of 0.5mg/m³ and 0.60mg/m³ recommended by the National Environmental Air Quality Control Regulation (NEAQCR) 2014.

Table 4.5: Results of Air Quality and Nose levels at the Proposed AIH Project site

Sample Point	Latitude	Longitude	Time	P.M. 2.5 (ppm)	P.M. 10 (ppm)	CO (ppm)	CO ₂ (ppm)	VOC (mg/m ³)	CH ₄ (mg/m ³)	SO ₂	H ₂ S
Aq.KT-01	13° 2'40.88"N	7°32'37.85"E	11:00am	9	11	-	385	0.01	7.42	-	-
Aq.KT-02	13° 2'38.80"N	7°32'41.63"E	11:20am	8	10	-	392	0.04	10.5	-	-
Aq.KT-03	13° 2'35.94"N	7°32'46.89"E	11:40am	11	13	-	399	0.01	15.0	-	-
Aq.KT-04	13° 2'38.03"N	7°32'35.66"E	12:00pm	10	12	-	383	0.01	15.1	-	-
Aq.KT-05	13° 2'35.69"N	7°32'40.67"E	12:20pm	12	14	-	596	0.19	8.04	-	-
Aq.KT-06	13° 2'34.05"N	7°32'45.18"E	12:40pm	9	11	-	587	0.1	7.02	-	-
Aq.KT-07	13° 2'35.16"N	7°32'33.53"E	1:00pm	8	10	-	585	0.11	6.15	-	-
Aq.KT-08	13° 2'33.09"N	7°32'38.94"E	1:20pm	10	12	-	586	0.15	11.28	-	-
Aq.KT-09	13° 2'29.80"N	7°32'43.27"E	1:40pm	7	9	-	570	0.44	6.05	-	-
Aq.KT-10	13° 2'25.31"N	7°32'40.65"E	2:00pm	11	13	-	575	0.07	9.17	-	-
Aq.KT-11	13° 2'27.90"N	7°32'36.48"E	2:20pm	8	10	-	572	0.14	5.54	-	-
Aq.KT-12	13° 2'30.61"N	7°32'31.03"E	2:40pm	8	10	-	572	0.18	8.23	-	-
Aq.KT-13	13° 2'25.90"N	7°32'28.35"E	3:00pm	7	9	-	577	0.11	13.11	-	-
Aq.KT-14	13° 2'22.83"N	7°32'33.34"E	3:20pm	7	9	-	574	0.1	13.04	-	-
Aq.KT-Cntrl	13° 2'20.78"N	7°32'40.76"E	3:40pm	9	11	-	569	0.17	9.65	-	-
Mean				8.9	10.9	-	528.1	0.12	9.7	-	-
Minimum				7	9	-	383	0.01	5.54	-	-
Maximum				12	14	-	596	0.44	15.1	-	-
Equipment Detection Limit											
FMEnv Limit				250ppm	250ppm				-	0.01	0.01

Source: Fahamu Fieldwork, 2024

4.4.3 Noise Level

Noise is an airborne pressure variation (wave) that produces excessive or undesired sound and may cause hearing loss or irritation. Physical manifestation of noise is a pressure wave which is caused by vibrating surfaces Patrick and Peter (2006). Apart from causing disturbance to the affairs of man, long term exposure to excessive noise can damage health and have psychological effects (SIEP, 1995; Oguntoke *et al.*, 2015; Oguntoke *et al.*,2019). The aggravation and nuisance that high noise levels, whether short- and long-term, generate are the main effects of noise on affected communities (both human and natural). Additionally, animal disturbance is of concern, particularly, during breeding, and noise also scare the wildlife species, thereby causing migration and reducing biodiversity.

WHO (1999) listed hearing impairment caused by noise, speech communication interference, sleep and rest disturbance, psychophysiological, mental-health, and performance effects, effects on residential behavior and annoyance, and interference with intended activities as the negative health effects of noise exposure. The range of sound pressures that can be experienced is quite wide, so in order to keep the values in reasonable ranges, noise levels are expressed in decibels (dB), which have a logarithmic scale. The majority of laws and measurements use the "A" frequency weighting, dB(A), which spans the frequency range that human ears can hear (20 – 20000Hz). Acoustic pressure, sometimes known as sound pressure, is the local pressure difference brought on by a sound wave between the ambient (average, or equilibrium) air pressure. Sound pressure in air can be measured using a microphone, and in water using a hydrophone. The SI unit for sound pressure p is the Pascal (symbol: Pa). Sound pressure level (SPL) or sound level is a logarithmic measure of the effective sound pressure of a sound relative to a reference value. It is measured in decibels (dB) above a standard reference level. The regulatory limit for noise provided by the FMEnv [90dB (A)] is specific to the workplace. However, noise due to construction and installation activities are expected to rise.

The IFC, WHO and FMEnv limits shall be used to benchmark the ambient noise levels measured in the project area. Table 4.6 presents the WHO guidelines for community noise.

Table 4.6: WHO Guidelines for Community Noise

Specific Environment	Critical Health Effect(s)	LAeq(dB)	Time base (hours)	Lamax, fast (dB)
Outdoor living area	Serious annoyance, daytime and evening. Moderate annoyance, daytime and evening.	55 50	16 16	- -
Dwelling, indoors	Speech intelligibility and moderate annoyance at daytime and evening.	35	16	
Inside bedrooms	Sleep disturbance at night.	30	8	45
Outside bedrooms	Sleep disturbance, window open (outdoor values).	45	8	60
School classrooms and pre-schools, indoors	Speech intelligibility, disturbance of information extraction, message communication.	35	During class	-
Pre-schools bedrooms, indoors	Sleep disturbance	30	Sleeping time	45
School, playground outdoors	Annoyance (external source)	55	During play	-
Hospitals, wardrooms, Indoors	Sleep disturbance at night time Sleep disturbance at daytime and evenings.	30 30	8 16	40
Hospitals, treatment rooms, indoors.	Interference with rest and recovery.	#1	-	-
Industrial, commercial shopping and traffic areas, indoors and outdoors.	Hearing impairment	70	24	110
Ceremonies, festivals and entertainment events.	Hearing impairment (patrons:<5 times/year)	100	4	110
Public address, indoors and outdoors	Hearing impairment	85	1	110
Music through headphones/earphone	Hearing impairment (free-field value)	85#4	1	110
Impulse sounds from toys, fireworks and firearms.	Hearing impairment (adults) Hearing impairment (children)	-	-	140#2 120#2
Outdoors in parkland and conservation areas	Disruption of tranquillity	#3		

#1: as low as possible;

#2: peak sound pressure (not Lamax, fast), measured 100mm from the ear;

#3: existing quiet outdoor areas should be preserved and the ratio of intruding noise to natural background should be kept low; and

#4: under headphones, adapted to free-field values.

4.4.4 Result and Analysis of Noise Level

The minimum and maximum noise levels recorded at the points measured are 30.1dBA and 68.6dBA respectively (Table 4.7), while the mean is 45.8dBA. These values are below 70dBA set limit by World Health Organization (WHO) for industrial area and FMEnv limit of 90dBA for 8 hours working period. The noise experienced in the proposed AIH project location are aeolian which is attributed to movement of wind; psithurism which is generated from the impact of wind on leaves; and chirping sounds produced during bird calls. Sounds generated during vehicular movements are not significant at the time of study. This is attributed to low vehicles plying the existing Jibia road and the distance of measurement points from the road.

The sleep disturbance limit was not breached from results obtained from all the measurement points for minimum. However, it was breached for maximum. Adverse impact of the recorded noise values will impact of natural communities which harbours wildlife species. Human communities of Kusa, Liman Musa and Mudassir are not affected by this noise levels as a result to their distances from the proposed AIH site boundary. In general, the measured noise levels are representative of natural areas.

Table 4.7: Results of Air Quality and Noise levels at the Proposed AIH Project site

Sample Point	Latitude	Longitude	Time	Noise (dB[A])		
				Min.	Ave.	Max.
Aq.KT-01	13° 2'40.88"N	7°32'37.85"E	11:00am	31.5	42.6	62.5
Aq.KT-02	13° 2'38.80"N	7°32'41.63"E	11:20am	31.3	41.2	61.3
Aq.KT-03	13° 2'35.94"N	7°32'46.89"E	11:40am	30.4	45.5	68.5
Aq.KT-04	13° 2'38.03"N	7°32'35.66"E	12:00pm	32.3	47.2	63.5
Aq.KT-05	13° 2'35.69"N	7°32'40.67"E	12:20pm	30.8	47.2	63.1
Aq.KT-06	13° 2'34.05"N	7°32'45.18"E	12:40pm	30.1	45.3	64.7
Aq.KT-07	13° 2'35.16"N	7°32'33.53"E	1:00pm	31.2	43.7	68.6
Aq.KT-08	13° 2'33.09"N	7°32'38.94"E	1:20pm	31.1	44.9	68.6
Aq.KT-09	13° 2'29.80"N	7°32'43.27"E	1:40pm	30.3	47.3	64.6
Aq.KT-10	13° 2'25.31"N	7°32'40.65"E	2:00pm	33.4	45.3	65.1
Aq.KT-11	13° 2'27.90"N	7°32'36.48"E	2:20pm	33.6	43.9	67.3
Aq.KT-12	13° 2'30.61"N	7°32'31.03"E	2:40pm	33.6	49.7	62.6
Aq.KT-13	13° 2'25.90"N	7°32'28.35"E	3:00pm	31.9	47.5	62.1
Aq.KT-14	13° 2'22.83"N	7°32'33.34"E	3:20pm	32.8	46.8	65.7
Aq.KT-Cntrl	13° 2'20.78"N	7°32'40.76"E	3:40pm	31.6	49.7	60.4
Mean				31.7	45.8	64.6
Minimum				30.1	41.2	60.4
Maximum				33.6	49.7	68.6
Equipment Detection Limit						
FMEnv Limit						

Source: Fahamu Fieldwork, 2024

4.5 REGIONAL GEOLOGY AND HYDROGEOLOGY

4.5.1 Geology of the Area

With its location in the northwestern region of Nigeria, the state is predominantly features sedimentary rock formations. These formations are mainly from the Cretaceous and Paleocene periods. The state's geology is shaped by various geological processes, including sedimentation, tectonism, and erosion. Some of the key geological features and formations of the state includes the sokoto basin which comprised of sedimentary rocks including sandstone, shale and limestone; gwandu formation which is known to consist interbedded sandstone, shale and siltstone deposits; basaltic intrusions form from volcanic activities that occurred in the southern part of the state; alluvial deposits which are formed through erosion and deposition of alluvial soils and sediments; and laterite which are formed through the weathering of underlying rocks in hot and humid climates, and rich in iron and aluminium oxides.

The AIH project site is situated in a region with Migmatite formation (Figure 4.8), a composite rock found in medium and high-grade metamorphic environments, typically in Precambrian cratonic blocks. Migmatites consist of two or more layers, one older metamorphic rock reconstituted by partial melting, and the alternate layer with a pegmatitic, aplitic, granitic, or plutonic appearance.

Migmatites form in extreme temperature and pressure condition during prograde metamorphism when partial melting occurs in metamorphic paleosomes. These components, called neosomes, may be heterogeneous at microscopic to macroscopic scales. Migmatites often appear as tightly folded veins, forming segregations of light-colored granitic components within dark-colored amphibole- and biotite-rich melanosomes. If present, a mesosome forms an unmodified remnant of the metamorphic parent rock paleosome.

In summary, the metamorphic rocks at the proposed AIH project site indicate the change in the geological cycle from metamorphic to igneous rocks. These geological characteristics are very important. For instance, talc is used in cosmetics, paints, and lubricants; garnets are used as gemstones and abrasives; and asbestos is utilized for fireproofing and insulation. The processing of metamorphic rocks brings about the realization of these products.

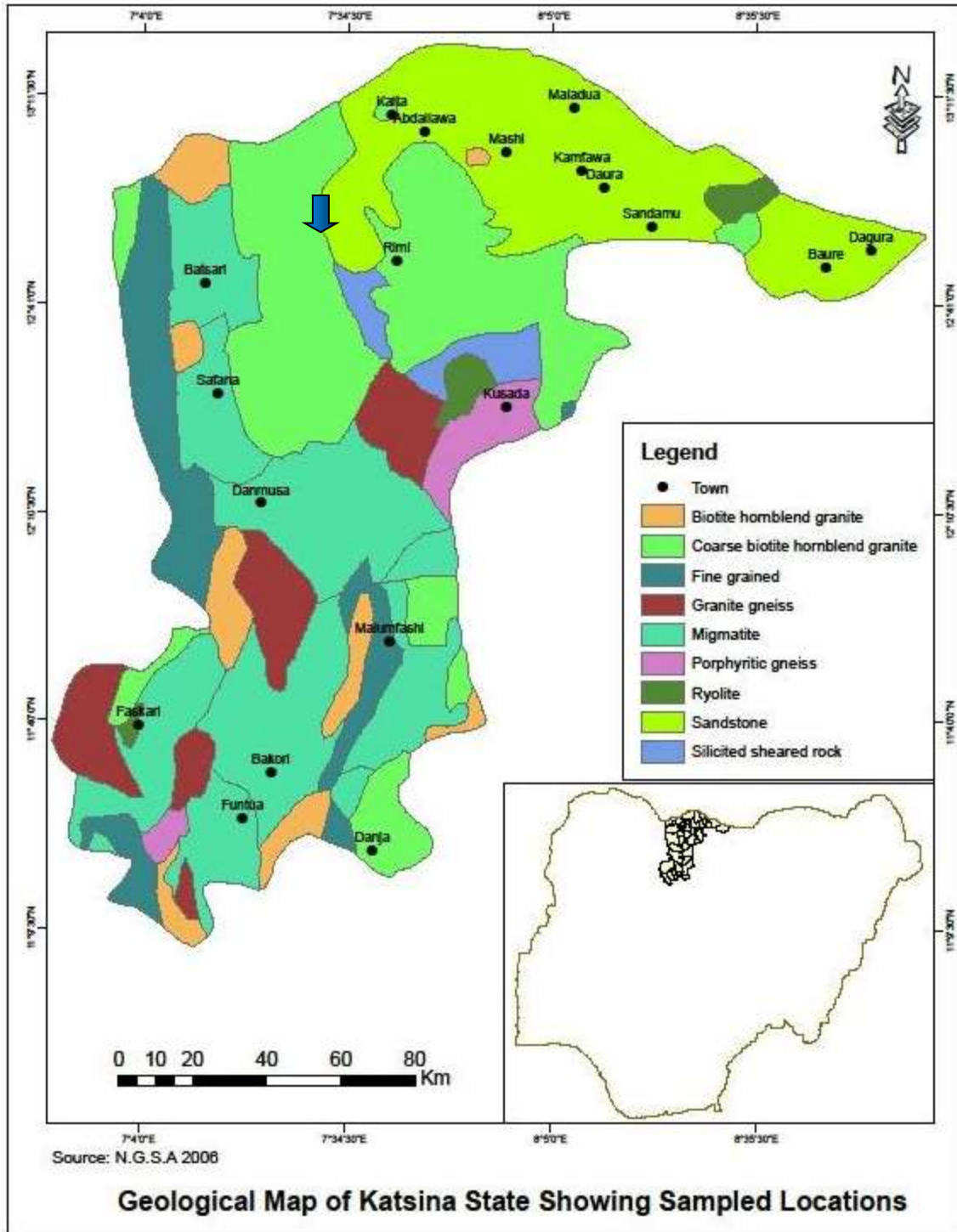


Figure 4.8: Geological Map of Katsina State identifying the Study Area

The continent of Africa is made up of a vast stable crystalline basement of very old rocks, mainly of Precambrian age. Superimposed on this basement are later, largely flat-lying cover successions. Along the East, North, and West coasts there are sediments of Mesozoic and Tertiary age, deposited in marginal marine basins. The Precambrian Basement of Africa can be divided into three large masses or cratons: the Kalahari, Congo, and West African cratons. They are separated from each other by a number of mobile belts active in Late Precambrian and early Palaeozoic times (Akintola et al., 2012). The general geology of Nigeria has been studied by various workers which include Rahaman (1988), Oyawoye (1965, 1972), Cooray (1972), Dada and Rahaman., (1995) and Ajibade (1976).

Nigerian rocks can be grouped into crystalline and sedimentary rocks. Half of crystalline rocks in Nigeria are buried beneath the Cretaceous and Younger sediments while the other half outcrop largely in the North Central, Southwestern and in three regions from the North to the South along the Cameroon line, that is Mandara highland, Adamawa Plateau and Oban massif. According to Dada et al, 1993, the crystalline rocks can further be divided into three main groups: Basement Complex, Younger Granite, and Tertiary-Recent Volcanics.

The evolution of the Basement Complex is associated with the general evolution of the African continent. The complex comprises of gneisses and migmatite with supra-crustal relicts which have yielded Archean between (C. 2700 Ma) and Proterozoic (C. 2000 Ma) according to Dada et al., 1998. According to Oyawoye (1964) the Basement Complex was differentiated into four (4) different groups: the ancient meta-sediments, the gneisses-migmatite and older granites, the newer meta-sediments, and the pegmatite as well as dolerite dikes which are considered as a special minor group.

Isotopic age distribution has demonstrated the polycyclic nature of the migmatite-gneiss complex. The age of the schist belt and their possible role in the evolution of the Nigeria Basement Complex during the Pan African event has become controversial. McCurry (1971), Ogezi (1977) and Ajibade (1980) noted that apart from the Older Granite, no other rock group can confidently be assigned to the Pan African. They were of the opinion that the nature of the Pan African events in Nigeria has therefore become

obscured. They also suggested that to understand the evolution of the Nigeria basement, it must be considered in the context of Pan African belt as a whole.

4.5.2 Hydrogeology of the Area

The hydrogeology of the study area is influenced by its geological formations, climatic condition, and surface water bodies. Large area of the state is underlain by sedimentary formations, such as sandstone and limestone, which often serve as aquifers, storing and transmitting groundwater. These aquifers vary in their hydraulic properties and yield depending on factors such as porosity, permeability, and degree of consolidation.

The proposed AIH project area however, is underlined by migmatite form which composed of metamorphic rocks. Metamorphic rocks are characterized by negligible porosity and permeability in terms of groundwater exploitability. However, their fracture permeability can be significantly increased by alteration processes occurring in the initial 10–100 m of depth. In the altered zone, this can result in the formation of secondary porosity aquifers with a modest level of productivity. These types of aquifers are crucial for agriculture and the supply of drinking water. Besides permeability, alteration processes also affect rock total porosity, i.e., water content, which results in a wide range of electrical resistivities within the alteration zone.

Hydrological features within the study area is the Kusa Dam, located approximately 4.6km Northwest of propoer AIH project site. Geographical located with latitude 13.075964, and longitude 7.516483, and on elevation of 474.6m above sea level, it is charged from Liman Musa stream located on latitude 13.046764, and longitude 7.563819 on elevation of 499.8m above sea level.

4.6 GEOGRAPHY AND TOPOGRAPHY OF THE STUDY AREA

The proposed Agro-Industrial Hub shall be developed on a plot of land measuring an estimated 200 hectares. This portion of land is acquired from the 800 hectares of land allocated for the proposed development of the Green Special Economic Industrial Zone off Jibia Road by the Katsina State Government. This site is approximately 3.6km and 4.6km Northeast of Natsinta Army Barracks and Katsina City, 4.2km respectively.

The site features a concrete fence wall, security outpost, graded access road and drainage, concrete electricity distribution poles and administrative building which are man-made inclusion. Naturally, the site is geographical characterized by relatively flat land, has some of its section undulating and some topsoil washed away by erosion. Shrubs, climbers and dry grasses characterised its vegetation.

4.7 SOIL QUALITY

The soil within the proposed AIH project site and its surrounding areas varies, but is generally fertile, supporting agriculture, which is a significant economic activity being practices by the locals of Kusa Luman Musa and Mudassir communities. As observed during on-site field study, the soil types include sandy, and loamy; and are however dried on the top due to extreme heat received in the area.

Soil provides water, nutrients and anchorage for plants and trees in natural forests and grasslands, annual and perennial crops and planted grassland. It also provides the habitat for decomposer organisms which have an essential role in the cycling of carbon and mineral nutrients. However, within the proposed project site a gully erosion was observed. This is as a result of soil quality degradation which is as result of human activities which include agriculture, cattle grazing, deforestation and mining. The implementation of the proposed AIH project shall further degrade the soil through improper management of the land resulting from poor management of solid waste, application of construction materials and chemicals, as well as industrial processing activities to be carried out in the facility upon completion. Mitigation measures will be provided for these impacts in chapter six.

4.7.1 Soil Sampling

A total of thirty (30 Nos) soil samples were collected within the proposed project site including one (1No) control soil sample. At each sampled point, soil samples were collected at two depths (0-15cm for top soil and 16-30cm for sub soil). This operation was carried out with the aid of stainless steel Dutch auger (Plate 4.4).



Plate 4.4: Soil sample collection using soil auger

Each sample was collected in aluminium foil, labeled appropriately, and stored in a cooler. The samples were then transported to Abuja Environmental Protection Board Laboratory (accredited by FMEnv.) in Asokoro District of Abuja.

The physico-chemical characteristics of soil samples obtained from thirty (30) points and one (1) control point within the study area after in-situ/laboratory measurement and analyses is summarized in Table 4.8 below.

Table 4.8: Proposed Special Agro-Industrial Processing Zone Katsina Physical/Chemical Parameters of Soils Samples

S/N	PARAMETERS (Units in mg/kg) accepted stated	Kat SS 1 0-15cm	Kat- SS 1 16-30cm	Kat- SS 2 0-15cm	Kat- SS 2 16-30cm	Kat- SS 3 0-15cm	Kat-SS3 16-30cm
		13° 2' 40 .88"N 7° 32' 37.85"E					
	PHYSICAL TEST						
1	TEMPERATURE (°C)	37.4	36.7	37.0	36.7	36.4	36.1
2	PARTICLE SIZES/TEXTURE	SAND/SILT/CLAY 46.74/36.06/16.2	SAND/SILT/CLAY 47.42/39.58/13	SAND/SILT/CLAY 41.78/39.21/19.1	SAND/SILT/CLAY 71.05/20.74/8.21	SAND/SILT/CLAY 58.64/26.02/15.34	SAND/SILT/CLAY 44.62/28.51/26.87
3	pH	7.32	7.19	7.17	6.87	7.31	6.76
4	MOISTURE CONTENT (%)	1.010	1.000	0.920	0.880	0.850	0.780
5	SOIL POROSITY (%)	23.33	25.00	23.33	30.00	33.33	30.00
6	BULK DENSITY (g/cm ³)	0.880	0.920	0.860	0.840	0.850	1.250
7	WET DENSITY (g/cm ³)	0.960	0.820	1.160	1.020	0.940	1.020
8	DRY DENSITY (g/cm ³)	0.680	0.710	0.740	0.590	0.610	0.640
	ORGANICS						
9	TOTAL ORGANIC CARBON	1.00	1.20	1.40	1.90	2.10	1.60
	EXCHANGEABLE IONS						
10	PHOSPHATE (mg/kg)	16.00	10.60	24.80	13.85	14.65	15.10
11	SULPHATE (mg/kg)	53.0	39.60	41.44	38.30	50.73	45.33
12	NITRATE (mg/kg)	18.23	16.24	21.30	17.61	23.27	20.00
13	CALCIUM (mg/kg)	32.80	31.70	36.60	29.80	32.30	28.80
14	MAGNESSIUM (mg/kg)	16.50	16.10	18.30	15.10	16.50	15.10
15	CHLORIDE (mg/kg)	3.60	3.00	2.70	2.15	2.30	1.93
	HEAVY METALS						
16	MANGANESE (mg/kg)	0.210	0.182	0.194	0.205	0.310	0.249
17	COPPER (mg/kg)	0.415	0.373	0.627	0.5510	0.335	0.300
18	IRON (mg/kg)	7.650	8.140	11.040	10.100	9.410	11.101
19	ZINC (mg/kg)	3.310	2.914	3.120	2.855	2.980	3.640
20	CADMIUM (mg/kg)	0.017	0.013	0.014	0.017	0.015	0.018
22	LEAD (mg/kg)	0.012	0.010	0.012	0.009	0.012	0.013
22	NICKEL (mg/kg)	0.007	0.005	0.005	0.004	0.007	0.006
	BACTERIAL ISOLATE						
23	Total Heterotrophic Bacteria (cfu/100 ml)	4.6 X 10 ²	3.8 X 10 ²	5.1 X 10 ²	4.1 X 10 ²	5.0 X 10 ²	4.8 X 10 ²
24	Total Heterotrophic fungi (THF) (cfu/100 ml)	3.3 X 10 ²	3.0 X 10 ²	4.1 X 10 ²	4.2 X 10 ²	3.9 X 10 ²	4.1 X 10 ²
25	Total fungi count (TFC) (cfu/100 ml)	2.9 X 10 ²	3.2 X 10 ²	3.2 X 10 ²	3.6 X 10 ²	3.4 X 10 ²	3.7 X 10 ²
26	Feacal Coliform Count (FCC) (cfu/ 100 ml)	2.9 X 10 ²	2.7 X 10 ²	3.4 X 10 ²	2.9 X 10 ²	2.8 X 10 ²	3.1 X 10 ²

Table 4.8 contd: Proposed Special Agro-Industrial Processing Zone Katsina Physical/Chemical Parameters of Soils Samples

S/N	PARAMETERS (Units in mg/kg) accepted stated	Kat- SS 4 0-15cm	Kat- SS 4 16-30cm	Kat- SS 5 0-15cm	Kat- SS 5 16-30cm	Kat- SS 6 0-15cm	Kat-SS6 16-30cm	Bau- Control 0-15cm	Bau- control 16-30cm
	PHYSICAL TEST								
1	TEMPERATURE (°C)	37.5	36.7	37.0	36.8	37.3	36.4	37.3	36.8
2	PARTICLE SIZES/TEXTURE	SAND/SILT/CLAY 45.19/25.6/29.21	SAND/SILT/CLAY 42.26/36.84/20.9	SAND/SILT/CLAY 37.91/37.59/24.5	SAND/SILT/CLAY 27.90/35.11/36.99	SAND/SILT/CLAY 45.65/40.91/13.44	SAND/SILT/CLAY 27.95/43.55/28.50	SAND/SILT/CLAY 25.55/23.46/17.16	SAND/SILT/CLAY 53.30/38.98/7.72
3	pH	7.48	7.20	7.32	7.09	7.74	7.18	7.03	6.93
4	MOISTURE CONTENT (%)	0.880	0.970	1.008	1.130	1.170	0.980	0.980	1.008
5	SOIL POROSITY (%)	28.33	26.66	33.33	30.00	23.33	26.66	24.22	26.70
6	BULK DENSITY (g/cm ³)	1.040	0.970	0.830	0.930	0.990	0.870	0.930	0.900
7	WET DENSITY (g/cm ³)	1.180	1.110	0.940	0.860	1.010	0.780	0.906	0.806
8	DRY DENSITY (g/cm ³)	0.670	0.740	0.720	0.650	0.589	0.600	0.605	0.654
	ORGANICS								
9	TOTAL ORGANIC CARBON	3.60	4.00	2.70	2.05	3.10	1.70	2.10	1.92
	EXCHANGEABLE IONS								
10	PHOSPHATE (mg/kg)	28.40	18.75	31.40	25.30	33.00	26.50	24.0	17.0
11	SULPHATE (mg/kg)	56.80	49.70	59.20	50.20	61.80	52.70	41.6	32.0
12	NITRATE (mg/kg)	14.45	12.10	20.10	17.54	18.84	1.40	19.94	14.65
13	CALCIUM (mg/kg)	34.10	31.40	32.20	27.70	32.10	30.80	33.10	30.40
14	MAGNESSIUM (mg/kg)	17.40	16.00	16.70	14.80	16.60	16.00	17.00	15.70
15	CHLORIDE (mg/kg)	2.138	2.121	1.89	2.05	3.08	1.90	3.62	3.10
	HEAVY METALS								
16	MANGANESE (mg/kg)	0.180	0.200	0.260	0.130	0.300	0.210	0.195	0.210
17	COPPER (mg/kg)	0.551	0.440	0.613	0.585	0.495	0.480	0.540	0.470
18	IRON (mg/kg)	8.815	6.520	9.010	7.023	7.780	5.200	8.200	6.740
19	ZINC (mg/kg)	4.794	6.030	7.084	6.403	9.500	5.910	3.900	2.773
20	CADMIUM (mg/kg)	0.036	0.028	0.027	0.023	0.030	0.028	0.021	0.028
22	LEAD (mg/kg)	0.019	0.016	0.010	0.011	0.013	0.016	0.015	0.016
22	NICKEL (mg/kg)	0.004	0.002	0.007	0.005	0.004	0.003	0.012	0.008
	BACTERIAL ISOLATE								
23	Total Heterotrophic Bacteria (cfu/100 ml)	4.3 X 10 ²	3.8 X 10 ²	4.8 X 10 ²	4.3 X 10 ²	4.5 X 10 ²	4.1 X 10 ²	4.8 X 10 ²	4.4 X 10 ²
24	Total Heterotrophic fungi (THF) (cfu/100 ml)	3.7 X 10 ²	3.3 X 10 ²	3.6 X 10 ²	3.7 X 10 ²	3.4 X 10 ²	3.6 X 10 ²	4.0 X 10 ²	3.5 X 10 ²
25	Total fungi count (TFC) (cfu/100 ml)	2.9 X 10 ²	3.0 X 10 ²	3.3 X 10 ²	2.9 X 10 ²	3.1 X 10 ²	3.1 X 10 ²		
26	Feecal Coliform Count (FCC) (cfu/ 100 ml)	2.4 X 10 ²	2.7 X 10 ²	2.8 X 10 ²	2.5 X 10 ²	2.7 X 10 ²	2.6 X 10 ²		

Source: Fahamu Fieldwork, 2024

Analysis of Soil Samples

Physico-chemical analysis was carried out on the soil samples collected from the proposed AIH project site in Katsina State (Table 4.8), with the result clearly shows that soil types are based on the proportion of sand, silt, clay and fragment of clay and silt which varied largely between sandy and silt.

Temperature: Soil temperature refers to the measurement of the ground's inherent warmth. It controls the chemistry and biology of the ground and the atmospheric-ground gas exchange. The importance of soil temperature in agriculture is due to its impact on the effectiveness of many farming procedures. Soil temperature is not a universal value and depends on several constituents, including its colour, slope, vegetation cover, compaction, moisture, and, naturally, the amount of sunlight available. Average temperature recorded for samples between 0 - 15cm was 37.1°C while those of 16 - 30cm was 36.6°C, and comparing with 37.3°C and 36.8°C recorded for the control point. Results obtained are within the limit of <40°C as recommended by FMEnv for plant survival.

pH: Soil pH is a measure of the acidity or alkalinity of the soil. Natural soil pH depends on the rock from which the soil was formed (parent material) and the weathering processes that acted on it—for example climate, vegetation, topography and time. Generally, for a pH decrease of 1, the acidity increases by a factor of 10. Soil pH decreases with an increase in soil depth. At a higher pH, soil builds up toxic level of certain nutrients. For example, molybdenum, typically a plant nutrient, becomes poisonous to plants in large amounts. The average value recorded was 7.39 for level 0 - 15cm, and 7.05 for level 16 - 30cm against control values of 7.03 and 6.93 respectively. Generally, values recorded are within the neutrality region of pH scale, and also fall within FMEnv range of 6 to 9 recommended for plant survival.

Moisture Content: soil's moisture content is the total amount of water in the ground's pores or on its surface. The weather, the type of land, and the plants all have an impact on the moisture content of the soil. The amount of poisonous compounds, the salinity of the soil, the structure and thickness of the ground, as well as its temperature and heat-retaining capacity, are all impacted by soil moisture. It displays the state of the field as well as how much water is there in a particular zone. The size and aeration of a plant's

roots, which initially absorb water, have a direct impact on the health of the plant. The effect of soil moisture on plants and the final yield is very important. The average value reported for moisture content of the soil are 0.973% for soils on level 0 - 15cm and 0.957% for soils of level 16 - 30cm, against control values of 0.980% and 1.008% respectively.

Soil Porosity: Soil porosity refers to the amount of air or water that exists in the spaces between mineral particles (and solid organic matter) in soil. The pore space both contains and regulates the majority of the soil's functions. The size distribution of the pores and the continuity between them, rather than just the total amount of pore space, govern the behaviour and function of soil. The average value reported for the sample was 27.5% for soil within level 0 - 15cm and 28.05% for soil within 16 - 30cm. Values recorded for control samples however are 24.22% and 26.70% respectively.

Exchangeable Anions:

The exchangeable anions decreases with increasing soil sampling depth. Average values recorded for the exchangeable anions were; nitrate 16.8mg/kg, sulphate - 49.9mg/kg, chloride - 2.4mg/kg respectively. These values were below FMEnv limits of 20mg/kg, 52.4mg/kg and 35mg/kg recommended for plant survival.

Nitrate (NO₃⁻): Nitrates are highly soluble compounds and as such move readily and available to plant roots at the top soil. Nitrates are also subject to leaching if they move out of the root zone and can eventually cause contamination of ground water if present in excess.

Phosphate (PO₄³⁻): Just like any other soil nutrient, its concentration decreases with increase in soil sampling depth. The average value recorded for was 21.53mg/kg, which is above FMEnv limit of 5mg/kg recommended for plant survival. Phosphorus containing compounds are essential for photosynthesis by plant for energy transformations and for the activity of some hormones in both plants and animals.

Chlorides (Cl⁻): Just like any other soil nutrient, its concentration decreases with increase in soil sampling depth. The average value recorded for was 2.4mg/kg. High chloride level can seriously harm the majority of plant parts, which will therefore have an impact on production and fruit quality. Chloride can harm things in a variety of ways, including low level of chlorophyll cause the leaves to yellow. low fruit sugar content.

Sulphate (SO₄²⁺): sulphur is a component of several secondary metabolites (SMs) that are essential for the growth, development, and physiological processes of plants. The types of species and developmental stages have an impact on the sulphur requirements of plants. For instance, more sulphur is needed during vegetative growth and seed formation. Numerous biological functions, such as photosynthesis, energy production, photo protection, and metabolic processes, call for self-sustaining substances, such as proteins containing Fe-S clusters. For plants, inorganic sulphate (SO₄²⁺) is the main and most important source of sulphur. Just like any other soil nutrient, its concentration decreases with increase in soil sampling depth. The average value recorded for was 49.9mg/kg and below FME_{env} limit of 250mg/kg recommended for plant survival.

Total Organic Carbon (TOC): Total organic carbon (TOC) is the carbon (C) stored in soil organic matter (SOM). Organic carbon (OC) enters the soil through the decomposition of plant and animal residues, root exudates, living and dead microorganisms, and soil biota. It supports the growth of beneficial soil microorganisms, enhancing nutrient cycling and overall soil ecosystem functioning. Average TOC concentration detected in the soil samples was 2.2mg/kg.

Heavy Metals: The heavy metals tested for in this study include Fe, Cu, Zn, Mn, Pb, Cd and Ni. The average concentrations of these heavy metals were 8.48mg/kg, 0.48mg/kg, 4.88mg/kg, 0.22mg/kg, 0.013mg/kg, 0.022mg/kg and 0.005mg/kg respectively. Heavy metals with severe adverse health effect in human metabolism are lead and mercury, which presents obvious concern due to their persistence in the environment as well as documented potentials for serious health implications.

Soil Microbiology

The soil samples were also examined for the presence of heterotrophic bacteria and fungi as well as hydrocarbon utilizing micro-organisms whose population may be affected by activities of the facility. The soils of the area generally showed the type of species of micro-organisms. The surface soils showed species of micro-organisms that include: *Bacillus spp*; *Pseudomonas spp*; *Rhizopus stolonifer*; *Corynebacterium spp*; and *Aeromonae spp*. The sub-soils indicated *Aeromonae spp*; *Mucor spp*; *Trichoderma spp*; *Micrococcus spp*; *Aspergillus flavus*; *Bacillus spp*. These microbial groups have been associated with organic transformation and re-cycling in soils.

4.8 GROUND WATER QUALITY

Both natural and man-made factors controls the chemistry of groundwater. Chemical composition of geologic formations affects the hydrochemical characteristics of groundwater during their circulation in the subsurface (Elango et al. 2003). This underground passage through the pore spaces and weathered zones may alter the natural composition of the groundwater by the action of various hydrochemical processes (Rajmohan and Elango 2004). In other words, the many processes occurring in groundwater can be revealed by the composition of the water. Numerous human activities have the potential to alter the chemistry of groundwater. These include industrial pollutants and point sources such waste disposal facilities.

4.8.1 Groundwater Vulnerability

The reason for the vulnerability categorization is the ease with which pollutants can pass through the fracture and weathered formation as a result of rainfall and runoff carrying over from the surface to groundwater. This assessment is based on the generic consideration of soil and rock types and does not indicate that the risks to individual sources are high.

4.8.2 Sampling Methodology

Ground water sample were typically collected from a hand-dug well in Dan Naigaba community and a discharge line of a borehole in Gahoni community which are closest to the proposed AIH project site. These samples were collected using 750ml plastic bottles, labeled appropriately, preserved in ice pack and transported to AEPB Laboratory in Abuja for laboratory analysis.



Plate 4.5: Ground water sample collection and *in situ* measurement

Table 4.9: Proposed Special Agro-Industrial Processing Zone Katsina Physical/Chemical Parameters of Ground Water Sample

S/N	PARAMETERS	KAT GW1	KAT. GW2	FME _{Env} LIMIT
		13 ⁰ 2'37.87"N; 7 ⁰ 31'17.35"E	13 ⁰ 2'36.17"N; 7 ⁰ 31'43.11"E	
A	PHYSICAL TEST			
1	Odour	Odorless	Odorless	Odorless
2	TEMPERATURE (°C)	32.7	31.9	<40
3	pH	7.3	7.5	6-9
4	ELECTRICAL CONDUCTIVITY (µS/cm)	242.0	328.0	1000
5	DISSOLVED OXYGEN (mg/l)	3.2	3.0	7.5
6	TOTAL DISSOLVED SOLIDS (mg/l)	158.0	171.0	500
7	SALINITY (%)	0.01	0.02	0.0
8	ALKALINITY (m/l)	19.0	22.0	100
9	TOTAL SUSPENDED SOLID mg/l)	0.0180	0.0140	<10
B	CHEMICAL TEST			
10	TOTAL HARDNESS (mg/l)	136.96	308.16	200
11	MAGNESIUM HARDNESS (mg/l)	34.24	85.6	50
12	CALCIUM HARDNESS (mg/l)	102.72	222.56	150
13	PHOSPHATE (mg/l)	0.395	0.621	5
14	NITRATE as NITROGEN (mg/l)	4.40	8.10	10
15	TOTAL CHLORIDE (mg/l)	40.0	60.0	250
16	BOD (mg/l)	-	-	7.5
17	COD (mg/l)	-	-	30
18	SULPHATE (mg/l)	25.2	63.3	250
C	HEAVY METAL			
19	MANGANESE (mg/l)	0.110	0.284	0.2
20	IRON TOTAL (mg/l)	0.221	0.541	1.5
21	COPPER (mg/l)	0.003	0.005	0.1
22	CADMIUM (mg/l)	0.007	0.008	0.05
23	ZINC (mg/l)	0.110	0.213	0.1
24	LEAD (mg/l)	0.009	0.0011	0.05
25	NICKEL (mg/l)	0.002	0.004	0.05
D	BATERIOLOGICAL			
26	Total Coliform count (CFU/100ml)	2.1	2.7	1.8
27	Escherichia Coli (cfu/ml)	1.2 X 10 ¹	1.2 X 10 ²	Absent
28	Salmonella (cfu/ml)	0.0	0.8 X 10 ²	Absent
29	Shigella (cfu/ml)	0.0	0.0	Absent
30	staphylococcus (cfu/100ml)	0.0	0.0	Absent

Source: Fahamu Fieldwork, 2024



Analytical Discussion of Groundwater Results

The water groundwater samples collected from the hand-dug well and community borehole at both Dan Nagaba and Gahoni communities respectively were analysed for physical, chemical heavy metal and bacteriological concentrations at the Abuja Environmental Protection Board Laboratory at Asokoro, Abuja; and result presented (Table 4.9 above) and analyses below as follows:

Temperature: Temperature is the degree of coldness or hotness of a body. It is an important factor that contributes to a chemical reaction. Groundwater temperature varies from place to place and so is with weather conditions. The average temperature during field work was 43.8⁰C. Temperature values recorded for both water samples of the hand-dug well and borehole were 32.7⁰C and 31.9⁰C respectively. Both are below the <40⁰C FMEnv permissible limit for potable water.

pH: pH of a solution is described as the negative logarithm to base 10 of hydrogen ion concentration. pH defines acidity, neutrality and alkalinity of the groundwater sample analyzed. A slightly alkaline pH value obtained for both water samples are 7.3 and 7.5 for the hand-dug well in Dan Nagaba community and community borehole in Gahoni community respectively. RPI, (1985) and Ideriah *et al.*, (2010) opines that water with pH values in this range is safe for consumption; and the pH value falls within the recommended pH range of 6-9 by FMEnv.

Alkalinity: Alkalinity is a measure of water's ability to resist pH changes that lead to acidity, or to neutralize acids, and maintain a fairly stable pH. This ability is usually referred to as water's 'buffering capacity'. Alkaline water has a pH of 8 or higher. The pH scale is used to measure the alkalinity of water. Water with a pH of 8 to 10 is considered mildly alkaline, while water with a pH of 10+ is considered very alkaline. A pH of 7 is neutral, while anything lower than 7 is considered acidic. Alkalinity values recorded were 19.0mg/l and 22.0mg/l for the hand-dug well Dan Nagaba community and borehole in Gahoni community respectively. Both values are below FMEnv recommended limit of 100mg/l for water portable.

Conductivity: Conductivity is described as ionic mobility in solution. In other words, conductivity is a key electrical property of that solution. With the temperature of the



samples being 32.7⁰C and 31.9⁰C, conductivity values of the water were 242.0 μ S/cm and 328.0 μ S/cm respectively. The value shows that the conductivity of the water sample was low, indicating lower ionic richness when compared with the permissible limits of 1000 μ S/cm established by FMEnv.

Total Hardness: Hardness refers to the amount of dissolved calcium or magnesium in water which makes the water difficult to form lather with soap. Calcium and magnesium are divalent metal ions that come from minerals dissolved in the water. The total hardness value recorded for both water samples were 136.96mg/l and 308.16mg/l respectively. Both values are above 200mg/l permissible limit set by the FMEnv.

Salinity: Salinity is the amount of dissolved salt in a body of water. It makes a significant contribution to conductivity and influences many aspects of the chemistry of natural waters as well as the biological activities that take place there. Temperature, pressure, and salinity all influence the physical properties of water, including its density and heat capacity. Salinity values for both samples were 0.01mg/l and 0.02mg/l respectively. Salinity level that are too high can be harmful to freshwater plants and animals and dangerous for drinking, irrigating, and watering livestock.

Dissolved Oxygen (DO): Dissolved oxygen is the amount of oxygen present in water, as measure of how much oxygen from the atmosphere that is dissolved in water. DO is the amount of oxygen available to living aquatic organisms, and tells a lot about water quality, because life in aquatic environment is supported by the presence of DO. Values recorded were 3.2mg/l and 3.0mg/l as against the 7.5mg/l limit of FMEnv.

Total Dissolved Solids (TDS): Total dissolved solids indicate concentration of inorganic salts: calcium, magnesium, potassium, sodium, bicarbonates, chlorides, sulphates and some amounts of organic matter that are dissolved in water. TDS values recorded were 158mg/l and 171mg/l, and they falls within FMEnv limit of 500mg/l for potable water. High value of TDS in groundwater affects the taste of water; it can make water taste bitter, salty, and brackish. Higher solids in water increase turbidity and colour of water. Water containing high solid may cause laxative or constipation effects (Sasikaran *et al*, 2012)



Total Suspended Solids (TSS): TSS are the solids in water that can be trapped by a filter. Value recorded were 0.0180mg/l and 0.0140mg/l for both hand-dug well and borehole respectively. Both concentrations were below FMEnv recommended limit of <10mg/l for potable water.

Biochemical Oxygen Demand (BOD): BOD is the amount of dissolved oxygen (DO) needed by aerobic biological organisms to break down organic material present in water sample at a certain temperature over a specific period. BOD was not detected in both water samples, thus, both water are safe for drinking BOD concentrations for observed for both samples falls within FMEnv limit of 7.50mg/l for potable water.

Chemical Oxygen Demand (COD): COD is the measure of water and waste water quality. COD increases as the concentration of organic material increases. Water with high COD typically contains decaying plant matter, human waste, or industrial effluents. COD is the amount of dissolved oxygen needed in water to decompose organic materials. COD was not detected in both water samples, thus, both water are safe for drinking COD concentrations for observed for both samples falls within FMEnv limit of 30mg/l for potable water.

Cations: Cations are positively charged ions. They are formed when a metal loss its electron(s), to possess net positive charge(s). The Groundwater sample is enriched with cations and anions. Cations occur in increasing order: $\text{Ca}^{2+} > \text{Mg}^{2+} > \text{K}^+ > \text{Na}^+$, meaning the bedrock is rich in Ca, Mg, K and Na nutrients. Their values obtained in the groundwater samples were $\text{Ca}=102.72\text{mg/l}$ and $\text{Mg}=34.24\text{mg/l}$ for the hand-dug well, and $\text{Ca}=222.56\text{mg/l}$ and $\text{Mg}=85.60$ for the borehole respectively. These values were above the FMEnv limits of 150mg/l and 50mg/l and for cations recommended for potable water.

Anions: Anions are negatively charged ions. They are formed when a non-metal gains electron(s). Anions in the groundwater sample occur in decreasing order: $\text{Cl}^- > \text{SO}_4^{2-} > \text{NO}_3^- > \text{PO}_4^{3-}$. Their values for the groundwater sample obtained were $\text{SO}_4^{2-} = 25.2\text{mg/l}$, $\text{NO}_3^- = 4.40\text{mg/l}$ and $\text{PO}_4^{3-} = 0.3951\text{mg/l}$ for the hand-dug well, and $\text{SO}_4^{2-} = 63.3\text{mg/l}$, $\text{NO}_3^- = 8.10\text{mg/l}$ and $\text{PO}_4^{3-} = 0.621\text{mg/l}$ for the borehole respectively. They were all within the FMEnv limit of 250, 10 and 5mg/l recommended for potable water.



Heavy Metals: Heavy metal is metals with relatively high density, atomic mass or atomic numbers (James C. Nwafor, 2006). Several acute and chronic toxic effects of heavy metals affect different body organs: kidney, nervous system disorders, vascular damage, cancer, birth defects, etc. are examples of complications as a result of heavy metals' toxic effects. From laboratory investigation, values of Mn, Fe, Zn and Cu obtained from groundwater samples were 0.110mg/l, 0.221mg/l, 0.110mg/l and 0.003mg/l for the hand-dug well, and 0.284mg/l, 0.541mg/l, 0.213mg/l and 0.005mg/l for the borehole respectively. Apart from the borehole for which concentration of Manganese was 0.284mg/l which is above FMEnv limit for potable water, all other concentrations recorded were below limits of 0.2mg/l, 1.5mg/l, 0.1mg/l, and 0.1mg/l recommended by FMEnv for potable water. Other heavy metals such as Pb, Ni, and Cd were below equipment detection limits of (0.0001mg/l).

Coliform: Coliform bacteria are organisms that are present in the environment and in the faeces of all warm-blooded animals and humans. Coliform bacteria will not likely cause illness, however, their presence in drinking water indicates that disease-causing organisms (pathogens) could be in the water system. Values recorded of coliform in both water samples were 2.1CFU/ml and 2.7CFU/ml against 1.8CFU/100ml which is the limit set by FMEnv. This indicates members of both Dan Nagaba and Gahoni communities are exposed health effect associated with consumption of the water, which includes gastrointestinal upset and general flu-like symptoms such as fever, abdominal cramps, and diarrhea.

Escherichia Coli: *E. coli* was present in the water samples with concentrations ranging up to 1.2×10^1 and 1.2×10^2 . Escherichia Coli (*E. Coli*) is a sub-group of the fecal coliform group. Most *E. coli* bacteria are harmless and are found in great quantities in the intestines of people and warm-blooded animals. Some strains, however, can cause illness. The presence of *E. coli* in a drinking water sample almost always indicates recent fecal contamination, meaning there is a greater risk that pathogens are present.

Salmonella: Salmonella was present in the water samples with concentrations ranging from 0.0 up to 0.8×10^2 . Salmonella infection (salmonellosis) is a common bacterial disease that affects the intestinal tract. Salmonella bacteria typically live in animal and human intestines and are shed through stool (faeces). Humans become infected most frequently through contaminated water or food.



Shigella: Shiegella was absent in the groundwater sample. Shigella are bacteria that cause an infection called shiegellosis. Shiegella causes diarrhea, fever and stomach cramps.



4.9 BIODIVERSITY STUDIES

Biological diversity or biodiversity simply means the resources upon which individuals, families, communities, nations and future generations depend. It is the link between all organisms on earth, binding each into an interdependent ecosystem in which all species have their role. It is the web of life.

4.9.1 Terrestrial Biodiversity

Performance Standard 6 recognizes that protecting and conserving biodiversity, maintaining ecosystem services, and sustainably managing living natural resources are fundamental to sustainable development. The requirements set out in this Performance Standard have been guided by the Convention on Biological Diversity, which defines biodiversity as “the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are a part; this includes diversity within species, between species, and of ecosystems.” Ecosystem services are the benefits that ecosystems provide to humans and the environment, and biodiversity is the source of these benefits. These services includes:

- (i) provisioning services, which are the products people obtain from ecosystems;
- (ii) regulating services, which are the benefits people obtain from the regulation of ecosystem processes;
- (iii) cultural services, which are the non-material benefits people obtain from ecosystems; and
- (iv) support services, which are the natural processes that maintain the other services.

Biodiversity frequently serves as the foundation for ecosystem services that people value. Therefore, effects on biodiversity can frequently have a negative impact on the provision of ecological services. The management and mitigation of the proposed AIH project's impacts on biodiversity and ecosystem services by clients over the course of the project are covered by this Performance Standard.

The objectives of this biodiversity study are to:

- Identify biodiversity resources in the study area,



- Identify the benefits from biodiversity,
- Determine the ecosystem services of the biodiversity and ensure sustainable management of the resources through appropriate conservation measures.

Most of the detailed biodiversity inventories in Nigeria are held as propriety rights of multinational oil companies who often conduct such exercises as a pre-requisite for their operations. However, private recording is a new and a fascinating trend. This is owed largely to greater awareness, economy liberalization, threat of changing climatic regimes and enforcement of the ESIA act and its various instruments. The availability of biodiversity data in most regions is poor. The few that exist are mainly ESIA reports of telecommunication firms and quarrying operation. And these include *Bridelia ferruginea*, *Cadaba grandulosa*, *Cola cordyla*, *Cordia stuhlmannii*, *Detarium microcarpum*, *Diospyros mespilliformis* and *Erythrophleum africanum* plant species, and *Osteolaemus tetraspis*, *Agama agama*, *Alligator sinensis*, *Civettictis civetta*, *Rattus rattus*, *Helioscius rufobrachium* and *Potamochoerus porcus* fauna species were constantly mentioned in the reports of the reviewed ESIA's.

4.9.2 Flora Studies

Katsina state is primarily characterised by savannah and semi-desert landscapes, and cover three vegetation zones; the Sahel, Sudan and Northern Guinea Savanna. Acacia trees, baobabs, shea trees, thorny shrubs and various grass species dominate the region. Plant species are adapted to the state's arid to semi-arid climate, with some areas experiencing seasonal rainfall patterns. Human activities such agriculture and grazing also influence the distribution of vegetation.

The Sahel typically, is mostly covered in grassland and savanna, with areas of woodland and shrubland. Grass cover is fairly continuous across the region, dominated by annual grass species such as *Cenchrus biflorus*, *Schoenefeldia gracilis* and *Aristida stipoides*. Species of acacia are the dominant trees, with *Acacia tortilis* the most common, along with *Acacia senegal* and *Acacia laeta*. Other tree species include *Commiphora africana*, *Balanites aegyptiaca*, *Faidherbia albida*, and *Boscia senegalensis*. Areas of desert shrub, including *Panicum turgidum* and *Aristida sieberana*, alternate with areas of grassland and

savanna. During the long dry season, many trees lose their leaves and the predominantly annual grasses die.

4.9.3 Sampling Parameters and Methods

Floristic data were collected randomly using a 50cm quadrant. 10 sampling points considered for the purposed of this study. Observations and photographic methods were also employed. Trees, grasses and shrubs were identified, photographs taken and checks carried out in plant album.

Result revealed that shrubs dominate the proposed AIH project site. Most of the species for this report were identified in the field. Unknown species were collected, pressed and preserved for identification at The National Park Service, off Umaru Musa Yar'Adua Expressway in Abuja. Furthermore, botanical exploration was carried out for collection and listing of plant species not encountered within the sampled plots. Literature and herbaria were consulted for species already listed for the area. Table 4.10 and Plate 4.6 presents photographs and list of plant species observed in the course of this study.





Plate 4.6: Photographs showing plant species observed in the study area

Table 4.10: List of Plant Species observed in the project area

S/N	Scientific Name	Common Name	Family
1	<i>Corbichonia Scop</i>	Prostrate purslane	Lophiocarpaceae
2	<i>Euphorbia plagiantha</i>	Euphorbia	Euphorbiaceae
3.	<i>Salvia mellifera</i>	Black sage	Lamiaceae
4.	<i>Hieracium murorum</i>	Wall hawkweed	Asteraceae
5.	<i>Cleistanths collinus</i>	Cleistanths collinus	phyllanthaceae
6.	<i>Atriplex nummularia</i>	Oldman slatbush	Amaranthaceae
7.	<i>Solanum arundo</i>	Solanum arundo	Solanaceae

Source: Field study, 2024

IUCN Status of the Flora

IUCN Red List is set as precise criteria to evaluate and classify species in terms of high risk of global extinction. The general aim is to provide an explicit and objective framework for conservation of the species to the public and policy makers, as well as help the international community reduce activities leading to species extinction. This is because the Red lists are among the most widely used conservation tools globally.

The IUCN status of the plant resources for the studied area was evaluated using IUCN version 2017 criterion. The results showed that most of the plant species encountered do not fall to the categorization of IUCN Red lists.

4.9.4 Ecosystem Services (Flora)

Ecosystem services are benefits humankind receives from ecosystems. They are generally categorized into four major types: provisioning services (food, fiber, freshwater); regulating services (pest regulation, pollination, water purification); supporting services (nutrient cycling, soil formation, photosynthesis); and cultural services (recreation, tourism, aesthetic values) (MEA, 2005). Ecosystem services are described as nature’s contributions to people by the United Nations Inter-governmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), as they are the channel between nature and a good quality of life (Díaz et al., 2015; Pascual et al., 2017). Biodiversity underpins ecosystem functioning and the provision of ecosystem services is essential for human well-being (CBD, 2010).

Services

Services that describe the material or energy outputs from ecosystems are termed provisional services. Provisional services offered by the floristic resources of the study area are organized into three groups namely; food/fibre/energy, medicinal attributes and raw materials. All the plant species censored in the study offers provisioning services but at varying degrees. They are applied to addressing carbon sequestration and storage, regulation of water flow, local climate regulation, erosion prevention and maintenance of soil fertility, and biological control. A total of seven (7) plants censored in the study offers provisioning services (Table 4.11). Nearly all the identified plants have medicinal values.

Table 4.11: Services offered by Plant Species observed in the project area

S/N	Scientific Name	Common Name	Service Offers
1	<i>Corbichonia Scop</i>	Prostrate purslane	Herbal treatment for purgative, cardiac tonic, emollient, muscle relaxant, and anti-inflammatory and diuretic treatment
2	<i>Euphorbia plagiantha</i>	Euphorbia	Herbal treatment
3.	<i>Salvia mellifera</i>	Black sage	It is made into a sun tea and used as a foot soak to treat pain, food flavouring.
4.	<i>Hieracium murorum</i>	Wall hawkweed	Used for treating diseases of the digestive tract and liver, to reduce swelling and relieve painful menstruation. Hawkweed tea is used to improve the functioning of the digestive organ and as an eye wash
5.	<i>Cleistanths collinus</i>	Cleistanths collinus	



6.	<i>Atriplex nummularia</i>	Oldman slatbush	Animal feeds, erosion control, reduces parasites, recycles nutrients and improve soil quality
7.	<i>Solanum arundo</i>	Solanum arundo	Used for treating fever, wounds, tooth decay, reproductive problems, and arterial hypertension.

Source: Field study, 2024

4.9.5 Human Activities and Threat to Vegetation

The various anthropogenic activities in the study area include construction, and grazing. At the time of study, substantial portion of the vegetation have been killed due to extreme weather condition. The primary threats of the human activities to the vegetation in the study area are deforestation, habitat degradation, loss of plant and animal diversity and change in plant community structure.

4.10 FAUNA STUDIES

The Sahel was formerly home to large populations of grazing mammals, including the scimitar-horned oryx (*Oryx dammah*), dama gazelle (*Gazella dama*), Dorcas gazelle (*Gazella dorcas*), red-fronted gazelle (*Gazella rufifrons*), the giant prehistoric buffalo (*Pelorovis*), and Bubal hartebeest (*Alcelaphus buselaphus buselaphus*), along with large predators, such as the African wild dog (*Lycaon pictus*), the Northwest African cheetah (*Acinonyx jubatus hecki*), the Northeast African cheetah (*Acinonyx jubatus soemmeringii*), and the lion (*Panthera leo*). The larger species have been greatly reduced in number by over-hunting and competition with livestock, and several species are vulnerable (Dorcas gazelle, cheetah, lion and red-fronted gazelle), endangered (Dama gazelle and African wild dog), or extinct (the Scimitar-horned oryx is probably extinct in the wild, and both Pelorovis and the Bubal hartebeest are now extinct).

The seasonal wetlands of the Sahel are important for migratory birds. Hundreds of bird species occur in the area, including shoebill and crowned crane. Communities also depend on the land for their livelihoods through nomadic and sedentary pastoralism, fishing and hunting.

Current challenges in the region are linked to the interplay between biodiversity conservation and resource-fueled conflict, impacting many livelihoods. Climate change only exacerbates these challenges as water scarcity and growing desertification further

resource competition and conflicts over land-use between farmers and transhumant pastoralists who traditionally make their way in search of fertile pastures for grazing of livestock production. Additional challenges include insecurity, poaching, illegal fishing, grazing and burning, farmer encroachment, deforestation, low implementation of regulations and a lack of proper management, and extractive industries. These challenges lead to the degradation of natural ecosystems, traditional and social livelihoods of immediate communities.

Fauna study was conducted to ascertain species presence. The results of the fauna study are presented for each parameter in Table 4.12.

Sampling method

Inventory of the site was conducted in plotless sampling points where fauna inventory was carried out. Both direct sighting and observation indices of presence were employed. In addition, information was obtained through interviews with hunters, and local. Presence of habitats, faeces and droppings of animal species were also employed. Table 4.10 present list of wildlife species known to have inhabit the proposed AIH project area.



Plate 4.7: Ant holes and hills observed in the project site

Table 4.12: Wildlife species That have inhabit the proposed AIH project area

S/N	Scientific Name	Common Name
	Mammals	
1.	<i>Ovis aries</i>	Domestic Sheep
2.	<i>Felis catus</i>	Domestic cat
3.	<i>Capra aegagrus-hircus</i>	Domestic goat
4.	<i>Xerus erythropus</i>	Ground squirrel
5.	<i>Thryonomys swinderianus</i>	Grass cutter
6.	<i>Rattus rattus</i>	House rat
7.	<i>Lepus victoria</i>	African Hare
8.	<i>Erinaceus europaeus</i>	Hedgehog
	Avian	
1.	<i>Columba guinea</i>	Speckled pigeon
2.	<i>Streptopelis senegalensis</i>	Laughing dove
3.	<i>Streptopelia decipiens</i>	African Mourning Dove
4.	<i>Haliaeetus vocifer</i>	West African eagle
5.	<i>Corvus albus</i>	Pied Crow
6.	<i>Passer griseus</i>	Sparrow
7.	<i>Centropus senegalensis</i>	Senegal coucal
	Reptiles	
1.	<i>Kinixys erosa</i>	Tortoise
2.	<i>Hemidactylus mabouia</i>	Wall Gecko
3.	<i>Echis Ocellatus</i>	Carpet viper
4.	<i>Agama agama</i>	Agama Lizard
5.	<i>Veranus niloticus</i>	Nile Monitor
6.	<i>Chamaeleo gracilis</i>	Cameleon
	Invertebrate	
1.	<i>Achaeranea tepidariorum</i>	Spider
2.	<i>Buthus occitanus</i>	Scorpion
3.	<i>Anopheles sp.</i>	Mosquitoes
4.	<i>Marcotermes bellicosus</i>	Termites
5.	<i>Lepisiota sp.</i>	Black ant
6.	<i>Musca domestica</i>	House Flies
7.	<i>Lumbricus terrestris</i>	Earthworm
8.	<i>Lithobius spp.</i>	Centipede



4.11 SOCIO-ECONOMIC STUDY

This socio-economic study was undertaken based on recommended guidelines by the appropriate regulatory agencies such as the Federal Ministry of Environment (FMEnv) as contained in the EIA Act CAP E12 LFN 2004. The methods adopted in the collection and analysis of information are discussed below.

Research Design

A descriptive research design has been selected to provide in-depth explanation and analysis using quantitative and qualitative approaches. The overall study design entailed determining the target populations i.e. the population of the host/impact community of the project. It also involved making decisions to:

- Whether to obtain information at one point several points in time
- The methods of data collection; and
- Whether questionnaires, if used should be self - administered face-to-face, using trained interviewers.

It was decided that:

- Questionnaires were used and administered face to face to house hold respondents at one point in time by trained assistants;
- Discussions were held with focus groups;
- Key informants (Knowledgeable persons within the community) were interviewed;
- Observation and measurements of key community features were undertaken by trained assistants; and that photography was liberally employed to clarify the community and project features
- In terms of research design, the study belongs to the class described as ‘passive Observation’ (Cook and Campbell, 1979), in the sense that subjects were studied in-situ, without any form of experimental manipulation.

Instrumentation and Data collection

This Study employed both primary and secondary data sources. The latter comprised government records and internet, while the former included pre-coded questionnaires, interviews (of Key Informants), Focus Group Discussion (FGDs), direct observation, direct measurement, standardize formats for recording observations, photography, and participatory research.

Primary Data Collection

The various data collection tools are described below:

(a) Questionnaires

A detailed and structured questionnaire was used alongside other methods to acquire relevant information. Questionnaires had questions on basic demography, livelihood of inhabitants, availability of social infrastructure etc. This was distributed and completed for the project area. A total of 215 questionnaires were administered among the residents of the project areas and the same number of copies were retrieved for analysis of the socio-economic baseline for the project area.

Table 4.13 presents the distribution of administered questionnaires per community. The questionnaires were administered based on the size of the community. Considering the homogeneity of the population, this sample size is considered adequate. In administering the questionnaire, a purposive sampling procedure was utilized to select individuals / groups that were sampled for the survey.

Table 4.13: Questionnaire administered and retrieved per community

S/N	Community	No of questionnaire administered	No of questionnaire retrieved
1.	Natsinta	60	60
2.	Kusa	35	35
3.	Dambarewa	25	25
4.	Gahoni	30	30
5.	Dawana	30	30
6.	Dan Naigaba	35	35
	TOTAL	215	215

Source: Field study, 2024



(b) The Stakeholder Engagement Process (SEP)

Stakeholder engagement is an all-inclusive, interactive, systematic and continuous process, spanning the entire life cycle of a project, in which stakeholders are engaged as active partners in establishing the priorities and focus of a project or programme, and not treated merely as the passive recipients of the project when completed. Stakeholders’ engagement is all about redressing the problem of nonparticipation of stakeholders by providing strategies, processes and infrastructure to enable the proponent to:

- i. Discover what really matters to key stakeholders involve them in providing feedback on corporate strategies and performance and in identifying what and how things can be changed.
- ii. Monitor and manage stakeholder’s contributions and satisfaction levels.

Information disclosure and consultation will be carried out throughout the preparation period, construction period and operation period of the project, by laying primary focus on the requirements (inclusiveness) of directly affected and vulnerable groups, such as the elderly, women, physical challenged, etc.

Table 4.14 is a list of categories of stakeholders consulted.

Table 4.14: List of categories of stakeholders consulted

S/N	Categories of Stakeholders	Institutions consulted
1.	Government Ministries, Departments	1. Federal Ministry of Environment 2. Katsina State Ministry of Environment 3. Federal Controller, Katsina State Ministry of Environment. 4. Katsina State Ministry of Agriculture and Livestock Development 5. Jibia LGA 6. Rimi LGA 7. Bakori LGA 8. Daura LGA 9. Makera LGA
2.	Traditional Institution	Mai Angwa, Sariki, Imam, Hakimi
3.	Youths, Women Leaders and Community Based Organisations	Youths, Women Leader, Community Based Organisations, Mai Angwa in the communities

Source: Fahamu Fieldwork, 2024

The first visit was to the Commissioner, Ministry of Agriculture in order to collect official information and establish link to respective leader of the communities ahead of the community engagement, communications was sent to all community leaders, Elders, Youth leaders and women leaders. Various meetings were held with these groups on the proposed project and need for the socio-economic studies. They were then mobilized to co-operate and participate in the survey. The consultations continued with workshop for members of the communities, that involved question and answer, interviews and discussions.



Plat. 4.8: Consultation meeting with the Commissioner of Agriculture, Katsina State

(c) Focus Group Discussions (FGD)

These were held separately with male elders, youths, and few women, because women are not allowed to interact much especially married ones, based on culture and religion belief. All socio-economic and health issues were discussed which includes, their concerns, and possible ways of mitigating against the identified possible negative impacts due to the negative environmental effects that may arise, and perceived constraints also were discussed.



Questionnaire distribution/Focus Group Discussion



Consultation meeting with the community
Plat. 4.9: Community Consultation and FGD



4.11.1 Secondary Data Collection

The Secondary sources of data collection were utilized particularly in areas where the primary data sources suffer limitations or constraints. Thus, information was sourced in alignment with the objective of this survey from relevant stakeholders such as the National Population Commission, the National Bureau of Statistics and the National Institute of Social and Economic Research. Other secondary data sources include:

a) Maps and Literature Search

The exercise commenced with the identification of leadership in the affected communities and government organs within the project area. Existing administrative, topographic and street maps were adopted. Extensive literature searches relevant to the area and the proposed ZAPS project were conducted with a view to acquiring initial information on the characterization of the area. The activity culminated in the generation of a checklist of environmental attributes that may be affected.

Data Analysis

Data collected were analysed using appropriate statistical software packages. Most quantitative data were subjected to inferential statistics such as percentages, ratios, mean etc.

4.11.2 Socio-economic Baseline Information

Baseline information on socio-economic was obtained through the following activities:

- Reconnaissance survey, selection and training of survey assistant:
- Pre-stating of questionnaires;
- Household listing;
- Field Identification and Interview of Key Informants;
- Questionnaire administration and interview of Key assistance.
- Focus Group Discussion (FGD) and
- Photography and geo-location of key features.

The socio-economic baseline information obtained for this study include:

- Demographic Profile of the study area;



- Administrative and socio-cultural institutions;
- Livelihood Assets and Activities;
- Infrastructure and Services;
- Housing Structures/settlement patterns;
- Land Acquisition;
- Project Affected Persons (PAPs);
- Waste management;
- Health Profile;
- Gender Assessment; and
- Community Concerns and Perceptions.

4.11.3 Affected Communities and People

The project site is located at Kusa, Katsina Industrial Estate, Special Economic Zone (SEZ), which spread across an area of 800ha, while 200ha is allocated for the SAPZ project, in Jibia LGA of Katsina state. The land is elevated and slop from north to south, rectangular in shape, and grazing ground. A small gully was observed on the northern part of the site. The main cause of this gully is flash flood coming from the eastern part of the site to the west, that converge around the uncompleted road construction within the site. The depth of the gully is estimated between 4 to 8 meters wide, and 5 to 10 meters deep located at within the project site Latitude 13°02'35"N, Longitude 7°32'30"E coordinate. The site coordinates are longitude 7°32'18"E, Latitude 13°02'13"E. The site elevation is 1,683ft above the sea level with a savanna.

A combination of information from community heads and high resolution imagery of the project area show that three communities are around the project site. The information and location of the communities is presented on the map below. Field campaign and information gathering were conducted in each of the three communities. Kusa, Natsinta and other smaller communities such as Gahon, Dnnaigaba, Dawana and Dmbariwa.



Table 4.15: Communities around the AIH Project Site

State	Community	LGA	Distance
Katsina	Kusa	Jibia	500m
	Natsinta	Jibia	1km
	GahonI	Jibia	700m
	Dan Naigaba	Jibia	1km
	Dawana	Jibia	800m
	Dambarewa	Jibia	600m

Host Local Government Area

The Local Government Area for the proposed project is Jibia LGA in Katsina state, created in 1985. Jibia local government was created 1985 the federal Government of Nigeria. Jibia town is it’s headquarter. The local Government Area lies between the latitude of 13057’08”, 13071’27” and longitude of 7015’48” and 7018’15” respectively. It share land borders with Niger Republic from the north, Katsina and Kaita local government from the east, Batagarawa and Batsari from the south and Zamfara State from the west. The local government area is largely crossed by rivers The topography of the area can be characterized as relatively undulated with high elevation in Southern and Eastern Parts. The Climate of Jibia is of tropical continental type with wet and dry seasons naught for seasons, roughly following the movement of tropical discontinuity. The rainfly seasons last for about four month starting from May to late September. The projected population of people in the study areas is about 245,000. The dominant s are Hausa and Fulani Other tribes includes Zabarmawa,Berbers, and Kanuri. The mean annual rainfall 690mm and maximum rainfall has in many instances been experienced in August. The dry season on the other hand last from April to many and the maximum temperature ranges between 750C to 850C. While dried wind harmattan season start from September to April and the effect of its felt most when a dust laden dry air across the Sahara blows over the area. The construction of Jibia dam and Makiyawa water treatment plant and lying of irrigation canal across 3.5 km² farm land also contribute to the constant water supply in Jibiya town and nearby Villages.



4.11.4 Administrative Structure

Running along with the state administrative structure are the traditional authorities. Although there is no traditional head of state, each state has a traditional leader and in the case of Katsina state there is an Emir. The Emir of Katsina has authority over the whole State and is supported by an Emirate Council. The Emirate Council acts as an advisory board to the Emir; council members are not elected, but selected based on their knowledge, skills and influence.

At LGA level there is no traditional authority equivalent, however, at the district level the Hakimi is the traditional leader. Each Hakimi is supported by a number of Seriki's, who are the traditional leaders at the settlement level. Seriki's are often supported by a Yerima, who is a trusted individual and often a family member, who shares responsibilities for managing the settlement. The final level in the traditional authority structure is a Mai Angwa, who is the leader of a sub-settlement and answers directly to the Seriki.

All traditional leaders are selected by the Emirate Council and the positions are hereditary with candidates chosen from members of a royal family. Once selected, the Hakimi, Seriki and Mai Angwa all need to be approved by the Emir before taking up the leadership position. The traditional authority continues to be an important administrative structure in the day to day lives of the local population. Cultural ties continue to be strong and although traditional leaders must subscribe to national laws, they have executive and judicial powers, and are key to conflict resolution.

Finally, within northern Nigeria, Imams also play a significant role in the lives of local people. Not all settlements have a mosque, but local people travel every Friday to their nearest mosque to pray. Imams continue to influence the behaviour and opinions of local people.

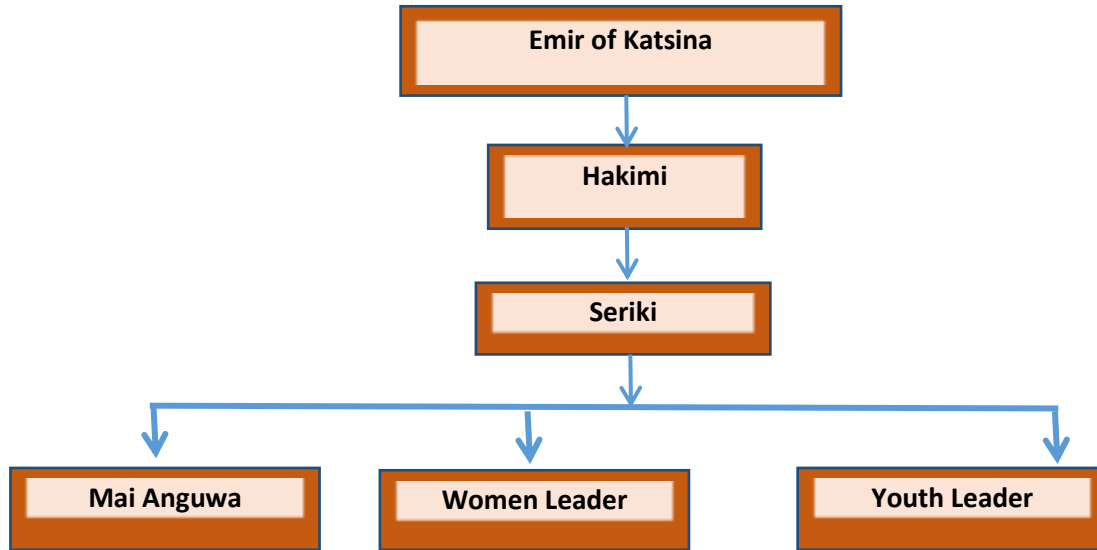


Figure 4.9: Showing Traditional Administrative Structure of Host Community

4.11.5 Demographic Profile of the Study Area

(a) Population Size

Jibia Local Government Area is situated in Katsina State, northwest Nigeria. The LGA shares borders with the Batsari, Kaita, and Batagarawa LGAs and with parts of Zamfara State and the Niger Republic about 44 kilometers. Towns and villages that make up Jibia LGA include Daddara, Jibiya, Tudun wada, Magama, Faru, and Matso-matso. The population of Jibia LGA has increased steadily over the years, and according to Nigeria population commission 2006 population census record was 167,435, while 2022 projection is at 299,200. Therefore, the annual population change between 2006-2022 is stands at 131,765. The inhabitants of the area are mainly populated by members of the Fulani ethnic group. The ffulde language is commonly spoken in the area while Islam is the widely practiced religion in the LGA. The populated Notable landmarks in Jibia LGA include the Jibiya Dam and the General Hospital Jibia. Jibia LGA sits on a total area of 1037 square kilometers and has an average temperature of 34 degrees centigrade. The area witnesses two distinct seasons which are dry and the rainy seasons with the dry seasons in the LGA often characterized by extremely hot weather. The average wind speed in Jibia LGA is 11km/h.

Farming is an important economic activity in Jibia LGA with crops such as wheat and rice grown in the area. A number of markets are also found in Jibia LGA and these markets offer the inhabitants of the area veritable platforms for the exchange of a variety of goods and services. Other important economic activities in Jibia LGA include hunting, pottery and the rearing of a variety of animals.

(b) Respondent and Household Distribution in Project Area

The following Sections show how the residents of the project area responded to the socioeconomic survey administered to them. A total of 250 questionnaires were administered to residents within the project communities with a 100% return, because of the in-house questionnaire pattern deployed. Based on the survey, the 250 respondents with 1933 household members were documented for Kusa ward, that comprises: Gahon, Natsinta, Dnnaigaba, Dawana and Dmbariwa hamlets.

(c) Gender

The survey data indicated male/female distribution of 45.6/54.5% for households Kusa ward. The household data is reflected in Figure 4-10. Men and women in the project area are generally mainly involved in farming. Both men and women are significantly involved in the general pursuits of livelihoods.

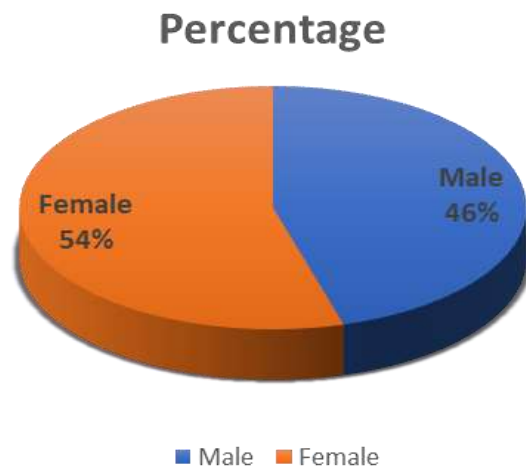


Figure 4.10: Male and female age distribution

(d) Age

The age distribution data (Figure 4.11) indicated that the percentage of household member below 21 years at Kusa ward, the project area is 57.1%. The survey also showed that 33.1% are within the youthful ages of between 22 – 45 years, and 46 – 60 years member of the household is 7.1%. It further showed that household member above 60 year is 2.7%. The survey now pointed out that that there is more percentage of children below t21 year of age in the household of the area.(Figure 4.2)

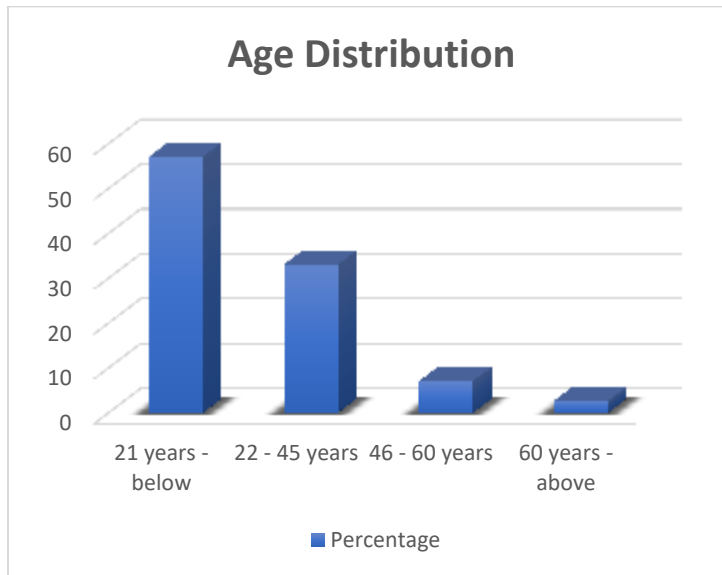


Figure 4.11: Kusa ward age distribution

(e) Household size distribution

The household size distribution from the survey ranged from a minimum of one person to a maximum of 19 persons in Kusa ward. The average size of households is 6 persons for the project area community. On the extreme household size ends, the project area has 6.5% of the households with one to two members and 36.8% of the households with more than 8 persons (Figure 4-12). About 19.9% of the households have sizes of 7 or 8 persons while 21.3% showed sizes of 5 or 6 persons. The data showed 15.5% households have sizes of between 3 and 4 persons.

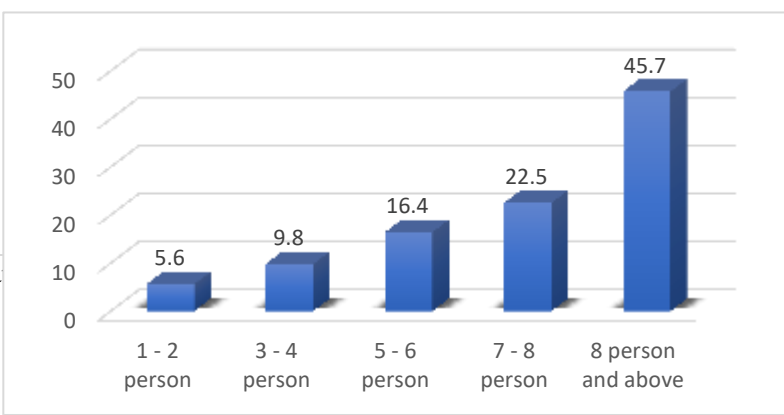


Figure 4.12: Household size distribution in Kusa ward

(f) Marital Status of Respondents

The survey data showed that 30.2% of respondents in the project area are married, 45.7% are children of non-marriageable age, 23.2% are single, 0.5% are divorced and 0.4% widowed. (Figure 4.13)

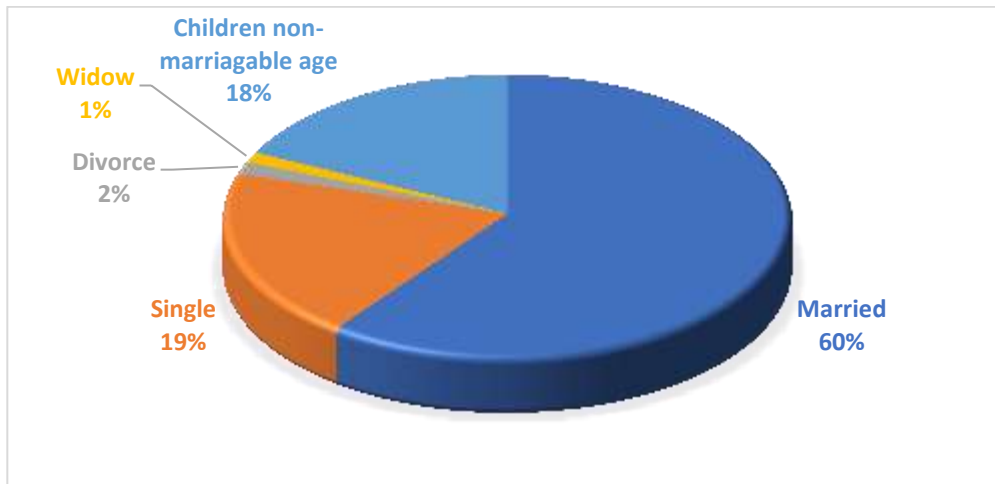


Figure 4.13: Marriage status with Kusa ward

4.11.6 Cultural Heritage and Religion

The majority of the local population are Muslim with only a small number identified as Christian. Few Christian households were found in Natsinta village. There are no archaeological and sacred sites, such as traditional burial grounds and shrines in the communities. There are no sacred places/shrines within the communities. Furthermore, there are no taboos, although it is forbidden to entice married women into illicit relationship and stealing of any form is forbidden and attracts punishment. In conclusion, there are no taboos that will negatively impact contractor activity on the project. However, the major festival celebrated within the study area are Muslim festivals such as "Salah" celebrations of ldeI fitri and ldeI Kabir.

4.11.7 Access to Education

The survey responses indicated that within the project site communities, the population of schooling age who never attended western education is 41.3%; 33.8% had basic primary school education (FSLC); 19.7% attended Secondary school (SSCE); 3.1% are Undergraduates; 1.8% are Graduates and 0.3% had a Post-Graduate degree. (Figure 4.14). The very low literacy level within the project affected area is reflected in the significantly low number of existing educational infrastructure support within the area, there are just 3 primary school in the whole ward, and no secondary school. However, Islamic schools about 4 in number was observed within the project communities.

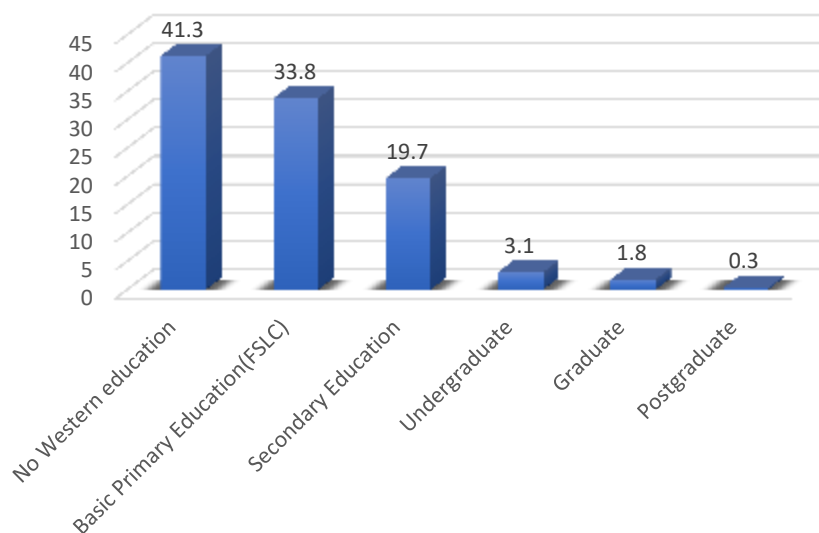


Figure 4.14: Access to education within Project site communities

4.11.8 Economic Activities within the Project Area

Occupational and Income Distribution of Respondents

The occupational distribution data from the questionnaires indicated that of surveyed households within the project communities, 46% are farmers; 20% are working blue collar jobs; 2% are civil servants; 14% are students and 18% are unemployed (Figure 4-15). The main source of income for the households surveyed came from farming and trading/business across the community.

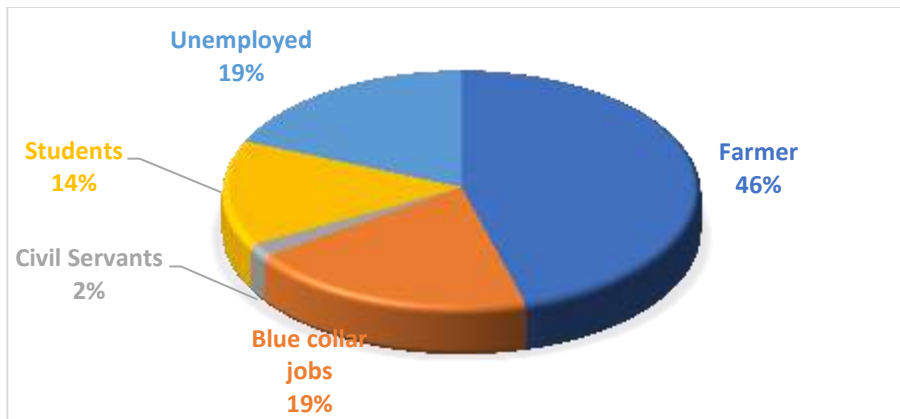


Figure 4.15: Occupation within the project communities

Based on the income data provided within the project communities, 48% earned less than N21,000 monthly, 16% earned between N21,000-30,000 monthly, 11% earned N31,000-45,000 monthly, 13% earned N46,000-60,000 monthly, 11% earned above N60,000 monthly (Figure 4-16). The margin of error in the information provided on incomes may be significant considering that some of the respondents may have grossly inflated data provided with the intent that it will bring some sort of welfare packages in the future in accordance with incomes indicated in the survey. Therefore, the data provided could not be independently verified.

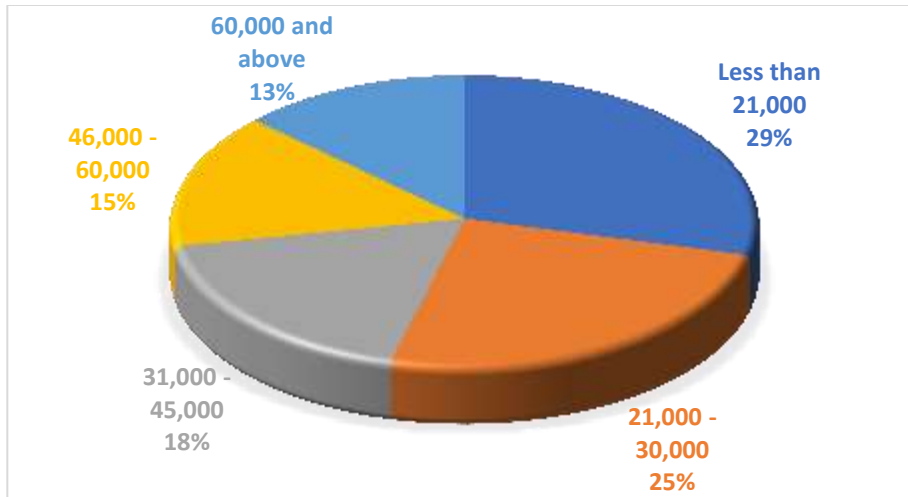


Figure 4.16: Monthly Income distribution within the project communities

Housing and Living Conditions

The house design within the project communities are mostly mud block and thatcher roofs, however block houses with zinc roof was observed more at Natsinta and Dambariwa hamlets. Traditional houses provide good ventilation for the residents, but it also exposes them to mosquito bite, which will make them susceptible to malaria disease. Malaria as well known is an endemic tropical disease which is currently being prevented with insecticide treated net. The building arrangement as witnessed within the project communities are constructed in clusters pattern, a popular pattern within the Northern Nigeria.

Desirability of the Project

All the respondents in the survey (100%) indicated immense desirability for the project to proceed. Many of them expressed a clear wish for the project to proceed before the next round of harvest season.



4.11.9 Public Infrastructure and Social Facilities

Access to Health Infrastructure

The common diseases in Kusa ward include diarrhea, malaria, typhoid, pneumonia, cough, skin diseases, deficiency diseases, eye diseases, ear diseases, and waterborne diseases resulting mainly from malnutrition and lack of hygiene. The high poverty rate, contributed to the poor quality of the health care services in the areas, reason most residents patronizing quacks and medicine shops for their medical treatment, while some depend on herbs. There is no health facility within the project site, except General hospital located in Katsina metropolis which is over 18km from the project site, and it should be anticipated that there will be increased pressure in the demand for health facilities in the communities resulting from influx of persons during the implementation of this project.

Access to Socioeconomic Infrastructure

The socioeconomic infrastructures such as: access to water; electric power; roads system; and Telecommunication, within the project communities are generally in poor state. Public access to potable water is accessed through borehole, hand pump and open water well. Some hamlets like Dannaigaba can only access water through open water well, while other hamlets such as Gahon, Natsinta, Dawana and Dambariwa accesses water through borehole and water well.

The power is generally not steady, which the implementation of this project will result in an influx of persons seeking gainful employment with the project contractors or to gain any social preivilages within the project communities. Therefore, it should be anticipated that there will be increased pressure in the demand for social infrastructures and amenities in the communities resulting from influx of persons during the implementation of the project. The influx of persons will inevitably put pressures on existing social service resources like water, electricity, transportation and others in the communities. The use of existing facilities will be on the rise.

Road infrastructures within the project communities are not tarred, and with no drainage facility, many are foot parts as most of the communities means of transportation is motorcycle known as Okada.



There is network for the three main telecommunication within and around the project site, such as MTN, GLO, 9Mobile and Aitel network.

4.11.10 Security and Social Issues

Potential Security Risk Challenges

As severally indicated, implementation of the SAPZ project will result in an influx of persons seeking gainful employment with the project contractors or providing social services of various types or to gain any social previlages within the project communities. Different types of persons, including criminals of sorts, may be expected to find their ways into the project communities within this time. Such movement of persons will inevitably increase the potential for criminal activities within the Jibia project communities. It should therefore be anticipated that there will be increased pressure in the demand for police services and other security issues in the project area, even though there presence of military, police and immigration check-points, before and after the project. Additionally, the cumulative unemployment levels in Jibia town resulting from the influx of employment seeking persons to the area will pose its own security risks for both the communities and the security institutions.

As expected, the communities rely largely on local community policing (vigilante groups) or solely rely on tradition medium in tackling crime. The practice of good neighbourliness as held in rural areas is generally relied upon for security of lives and properties (everyone watching over the others things).

Conflict Resolution

All respondents in the survey (100%) prefer and find it most convenient to have conflicts resolved through informal traditional modes of conflict resolution which currently exist within the communities. The court system is seen as an alternative means to resolve issues but no respondent favored it as a means of resolving conflict. None of the respondents was indifferent to the preferred approach.



4.11.11 Waste Management

Household Waste Disposal

Most of the respondents in the communities indicate that their household wastes are disposed of at convenient locations including crevices and drainage channels. In many areas, the wastes are also indiscriminately dumped inside the water canals or at illegal dumpsites created only as a matter of convenience. Solid waste management in the project areas is a considerable hazard to the health of the population and the effective functioning of the storm water drainage systems. The unmanaged refuse causes regular obstruction of the storm water drainage systems.

Most residents in the project communities dispose their domestic refuse randomly outside their residential compounds and the flood-prone areas are also treated as de facto waste disposal sites. The situation in the communities are indeed a reflection of the poor waste management and waste disposal mechanisms in most part of the state. As with other parts of the country, majority of households typically dispose of their domestic refuse inappropriately outside their residences. During the wet season, solid waste is transported by flowing storm water through unplanned drainage paths leaving a trail of refuse.

4.11.12 Health Assessment

Health care facility

The Inhabitants of the study areas do not enjoy access to standard health care service delivery when compared with their contemporaries living in Katsina Township. Dearth of standard medical facility had been the bane of inhabitants of the study areas as they must travel several kilometers to access standard health care services in Katsina Specialist hospital.

Medical Referrals are usually made to Kirfi General Hospital, Navy specialist Hospital and Katsina Teaching Hospital/Specialist, which are more equipped to handle medical emergencies of all sorts. The medical services obtainable from healthcare facilities include: routine immunization, Pregnancy test, Antenatal, RDT for malaria and typhoid treatment. Due to lack of equipped hospital, some respondents reported relying on traditional medicine to cure minor ailments.

Health Indicators in the Project Affected Area



The Katsina State faces many challenges in improving the health status of residents and data shows that the state has very low health indicators, especially for child mortality, maternal health, HIV/AIDS, malaria and other diseases that were targeted for reduction under the Millennium Development Goals (MDG). According to a World Health Organisation (WHO) data published in 2013, life expectancy in Nigeria is: Male 54, Female 55 and total life expectancy is 55. For Katsina state, there is no precise data on life expectancy but the estimated data is very similar to the national data (male 53, female 56) (Nigeria Bureau of Statistics NBS, 2014). The population structure of Katsina state also indicates low life expectancy, high birth rate, and high death rate. Despite the challenges facing local people in accessing primary health care services, over half of survey respondents stated that a midwife attended their child's birth and in three settlements over 80% of all births were attended by a midwife.

Survey respondents reported that the most common illnesses found in the Project area are malaria, cough, yellow fever, dysentery/diarrhoea, and skin diseases/rashes. Malaria is the most serious illness in the Project area, and Katsina state in general, affecting children the most. According to the Katsina State Strategic Health Development Plan (BASSHDP) 2010 - 2015, the target was to reduce the incidence of malaria in Katsina state from 11,534/100,000 to 7500/100,000 by 2020. No precise data is available on the incidence of malaria in each community, but the general consensus amongst stakeholders, is that malaria is the most serious illness in the Project area. The main reasons for the high incidence of malaria and other diseases are lack of awareness on health matters, inadequate health facilities and inadequate social infrastructure, such as electricity and sanitation facilities.

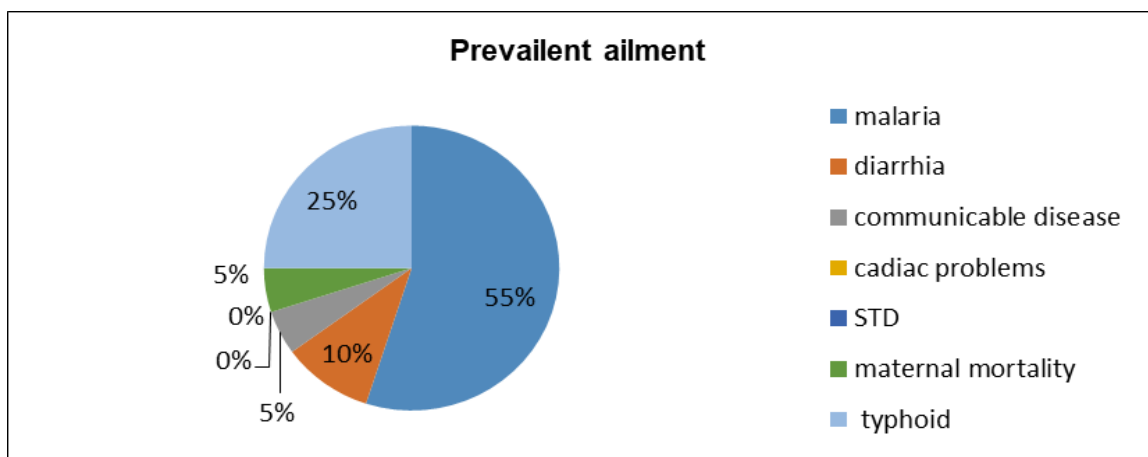




Figure 4.17: Prevalent ailments in the Communities

Source: Field survey 2024

4.12 Defining Stakeholder Engagement

Stakeholder engagement is an ongoing process of sharing project information, understanding stakeholder concerns, and building relationships based on collaboration. Stakeholder consultation is a key element of engagement and essential for effective project delivery. Disclosure of information is equally as vital. If there are risks or adverse impacts from a project, consultation must be inclusive and culturally appropriate and provide stakeholders with opportunities to express their views. In line with current guidance from the International Finance Corporation (IFC), consultation should ensure “*free, prior and informed consultation of the affected communities.*” In other words, effective consultation requires the prior disclosure of relevant and adequate project information to enable stakeholders to understand the risks, impacts, and opportunities. The Project’s consultation program was intended to ensure that stakeholder concerns are considered, addressed and incorporated in the development process, especially during the ESIA.

4.12.1 Objectives

The stakeholder engagement process was designed to conform to the Nigerian EIA Act and International standards. For this project, the key objectives for stakeholder engagement are:

- i. inform and educate stakeholders about the proposed Project;
- ii. gather local knowledge to improve the understanding of the environmental and social context;
- iii. better understand the locally-important issues;
- iv. provide a means for stakeholders to have input into the project planning process;
- v. take into account the views of stakeholders in the development of effective mitigation measures and management plans; and
- vi. lay the foundation for future stakeholder engagement

4.12.2 Stakeholder Engagement Activities

This section describes the stakeholder engagement activities that have been carried out so far. The activities that are planned for later stages are also described. The consultations served to provide stakeholders with information about the Project and to gather information important to the ESIA. The objective was to identify any key concerns or high-level issues that the stakeholders had at this early stage. Additional consultation shall be undertaken as the study progresses. Plates 4.10 to 4.15 show the sample photographs of the stakeholder Scoping Workshop conducted on the 27th of April 2024 while attendance lists and other stakeholder engagement tools are provided in Appendix 1.



Plate 4.10: from left to the right: The Hon. Minister’s Rep. Mr. A. B. Maina and Mr. Nura Abubakar, Katsina State Ministry of Environment addressing participants at the Scoping Workshop.



Plate 4.11: from left to the right: Yusuf Umar, FMEnv Katsina State Controller and Muntari Sani, Ministry of Agric and Livestock Development addressing participants at the Scoping Workshop.



Plate 4.12: Cross-section of stakeholders during the scoping workshop (back view)



Plate 4.13: Cross-section of stakeholders during the scoping workshop (front view)



Plate 4.14: Mr. Abel Agada, ESIA Consultant addressing participants during the Scoping Workshop



Plate 4.15: Group picture photograph at the Scoping Workshop



Issues Raised During Public Consultations

The principal issues raised during the various stages of community consultation and the perceptions about the project are summarised as follows:

S/N	Issues Raised	How they were addressed
1.	The community people express their concerns that they might be abandon at a later stage of the project	It was proposed that the project proponent should organize a series of similar meeting to strengthen community and involved in the proposed SAPZ project.
2.	Community Involvement: The communities were of the view that they should be consulted at various stages of the project, from preparation to project implementation	Community Consultation and involvement is a continuous lifelong exercise as long as the project last
3.	Employment: Employment opportunity it is for the educated only? How about the locals?	Employment opportunity will be given to the skilled and unskilled labourers including the locals.
4.	Remarks/Recommendations	The Community members appreciates the project proponent. Also, thank God for given them the opportunity to witness what the site is main for since the people were asking on what the Government is going to do with this vast demarcated land.
5.	Response of stakeholders about the project	The Stakeholders were delighted about the project and optimistic that the project would help the farmers to improving their storage and processing capacity as well as increasing the community's status. However, representatives of the neighbouring communities pleaded that the project should be designed to accommodate them in the area of employment opportunity for their people. Meanwhile they promise to they promise to work harmoniously with the PIU and the contractors when work commences.



CHAPTER FIVE

5.0 POTENTIAL AND ASSOCIATED IMPACT ASSESSMENT

5.1 Introduction

The objectives of Environmental and Social Impact Assessment (ESIA) are to identify and describe the potential environmental and social impacts associated with the proposed project activities, predict the likelihood and magnitudes of such impacts, evaluate the significance of changes likely to result from them, and thereafter proffer measures that will be taken to mitigate the predicted impacts. This chapter therefore, presents the associated and potential Health, Safety and Environmental (HSE) impacts of the proposed implementation of the Special Agro-Industrial Processing Zone (SAPZ), Katsina, Nigeria.

5.2 Impact Assessment Methodology

The use of appropriate impact identification and prediction methods is crucial for good ESIA. A number of methods have been developed over the years for impacts assessment, while new approaches continue to emerge. Every method has merits and demerits; however, all good methods have certain elements in common, which are widely accepted as essential for good ESIA. The Scientific Committee on the Problems of the Environment (SCOPE, 1979) suggested that the following qualities should be considered while choosing Impact assessment methods:

Comprehensiveness: This implies that the method should be able to detect the full range of important elements and combinations of elements, directing attention to novel or unsuspected effects or impacts, as well as to the expected ones.

Selectivity: This has to do with the ability of the method to focus attention on major factors. It is often desirable to eliminate as early as possible (i.e., during identification) impacts that would dissipate effort if included in the final analysis.

Mutually exclusive: This quality ensures that double counting of impacts or effects are avoided. However, experience has shown that this is difficult because of the many interrelationships existing in the environment.

Yield to Confidence limits: Subjective approaches to uncertainty are common in many existing methods and can sometimes lead to quite useful predictions. However, explicit



procedures are generally more acceptable, as their internal assumptions are open to critical examination, analysis, and, if desirable, alteration.

Objectivity: The objectivity of impact assessments has been well emphasized by many regulators including the FMEnv. Objectivity minimizes the possibility that the predictions automatically support the preconceived notions of the promoter and/or assessor. Such pre-judgments are usually caused by a lack of knowledge of local conditions or insensitivity to public opinion. A second merit of objectivity is to ensure comparability of EIA predictions amongst similar types of actions. An ideal prediction method contains no bias.

Prediction of Interactions: Environmental, social, and economic processes often contain feedback mechanisms. A change in the magnitude of an environmental effect or impact indicator could produce unsuspected amplifications or dampening in other parts of the system.

Generally, impact assessment methods fall under seven types of approaches:

1. The Leopold matrix approach
2. The Battelle environmental evaluation system
3. Checklists
4. Matrices
5. Flowcharts and Networks
6. Mathematical/Statistical and computer models
7. Overlays using maps and GIS

In selecting an overall impact assessment methodology for this project, a number of widely used methods were reviewed and qualities considered appropriate, were incorporated in the assessment. The major steps in the impact assessment methodology for this project are as presented in Figure 5.1.

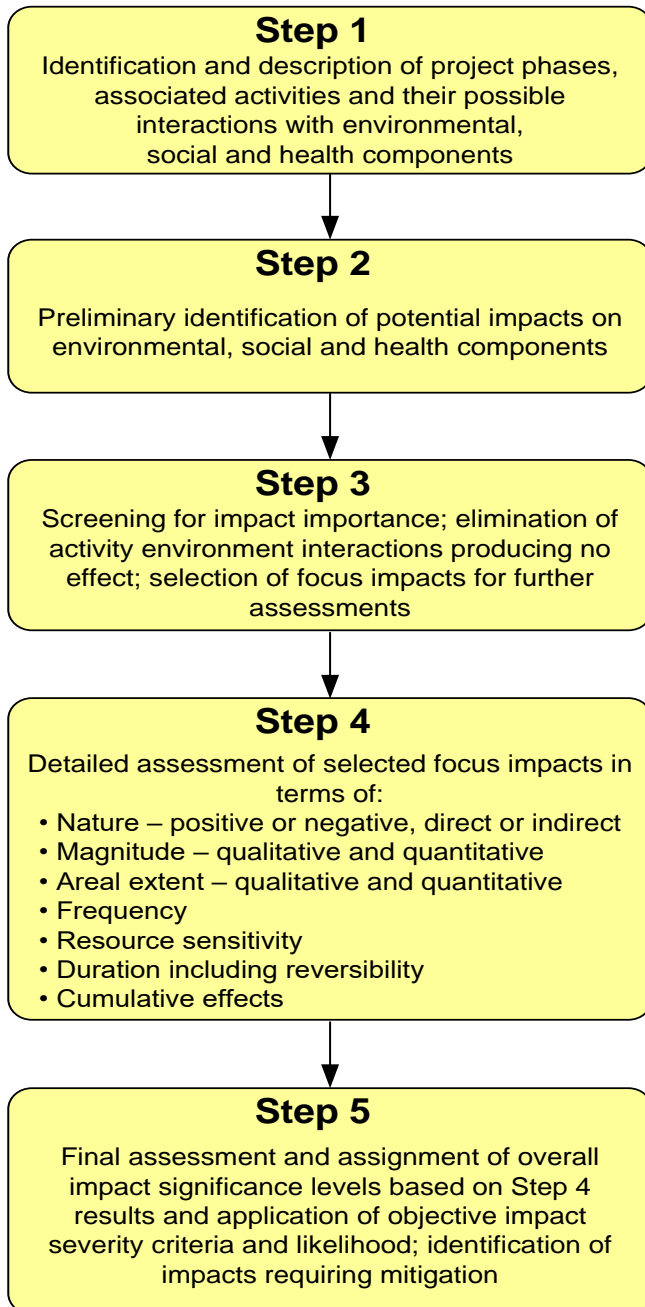


Figure 5.1: Schematic of the Impact Assessment Methodology

5.3 Identification and Description of Project Phases and their Possible Interaction with the Environment

The analysis of impacts covers the following project phases and associated activities interaction with the environment.

1. **Pre-construction:** This will include mobilization of materials and personnel, recruitment of workers and community engagement, permit to work, site preparation activities, creation of access road and camping etc.
2. **Construction/Installation:** Soil excavation, foundations and building constructions, and other associated earthen works, metal works, waste management etc.
3. **Operation and maintenance:** Operations such as processing of agricultural products for exportation, transportation of raw materials from ATCs to the HUB and subsequent maintenance activities
4. **Decommissioning:** Disusing/abandoning of project.

Table 5.1 shows the environmental components as they interact with the various project phases

Table 5.1: Environmental Components and their Impact Indicators

Aspect	Environmental Component	Project Phase	Impact Indicators
Biophysical	Climate	All project phases	Humidity, Temperature, Rainfall, Wind Speed and Direction
	Air quality	All project phases	Gaseous emissions (like: NO _x , SO _x PM, CO, VOC) that contaminates ambient air.
	Noise levels	All project phases	Day and night disturbance, hearing loss communication impairment.
	Water Quality (Surface water and Ground water)	Construction, Operation and Maintenance phases	Changes in the baseline physico-chemical and biological properties of surface water; Changes in the Physico-chemical properties of sediment; Changes in community composition and abundance of aquatic biota including; microbes, plankton, macrobenthos, fishes, mammals, reptiles, amphibians, bird species, etc.
	Geology	Pre-construction phase	Changes in geology structure
	Soil	Pre-construction, operation and maintenance phases	Changes in physico-chemical and biological properties of soil



	Topography	Pre-construction phase	Changes in land terrain and topography
	Vegetation	Pre-construction phase	Changes to vegetation population, health, species abundance and diversity and impact on endangered and economic species
	Wildlife	Pre-construction phase	Changes in wildlife distribution and abundance
Human, Socioeconomic and Cultural	Land-use pattern	Pre-Construction and Construction phases	Changes in land-use patterns such as agriculture, fishing, logging, hunting, etc,
	Local Population level	All project phases	Immigration and in-migration of workers and other people
	Socio-economic system	All project phases	Changes in employment opportunities, income differentials, inflation, difference in per capita income, inequality of benefits to local population, etc.
	Socio-cultural system	Operation and Maintenance	Changes in social structure, organisation and cultural heritage, practices and beliefs, natural resources, rights of access, changes in value system influenced by foreigners, etc.
	Basic Amenities and Infrastructure	All project phases	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 System	All project phases	Changes in transport systems and associated effects such as noise, accidents risk, changes in existing facilities, etc.
	Aesthetics	Construction phase	Presence of unsightly structures.

5.4 Preliminary Identification of Potential Impacts on the Environment

The existing baseline description of the environment and the various project phases/ activities were used to develop a checklist of potential and associated impact of the proposed Special Agro-industrial Processing Zones (SAPZ) on the biophysical and socio-economic environment. The World Bank Environmental Assessment Source book on Industrial set-up and FMEnv EIA Sectoral Guidelines for Infrastructures were used as reference in developing the checklist (Table 5.2).

Table 5.2: Checklist of Associated and Potential Impacts

Project Phase/Activity	Associated and Potential Impacts
Pre-Construction <ul style="list-style-type: none"> • Permitting • Land Acquisition • Mobilisation of materials and personnel • Recruitment • Site Preparation 	Economic loss arising from clearing of farm lands
	Uncertainty and misunderstanding due to a lack of information and communication.
	Acquisition/Displacement of people
	Employment opportunities arising from recruitment of skilled and unskilled workers
	Business opportunities for local contractors through sub-contracting activities
	Local support services from road side supply markets and shops etc.
	Skill acquisition and enhancements to local indigenes and workforce.
	Influx of people (migrant workers, sub-contractors and suppliers) and increased pressure on existing social infrastructure
	Increase of communicable diseases due to influx of people
	Increase in social vices (like theft, prostitution etc.) resulting from increased number of people
	Community agitation over unidentified stakeholder, leadership tussles etc.
	Increased traffic during mobilization on road with risk of accidents leading to injury/death and loss of asset
	Conflicts/community agitations over employment issues (quota and methods)
	Nuisance (noise and vibrations) due to movement from heavy duty equipment and vehicles affecting site workers and wildlife
	Increase of dust particles and vehicular emissions
	Disturbance of the vegetative cover due to site clearing and preparation
Construction Phase Civil work, Mechanical and Electrical work which include: <ul style="list-style-type: none"> • Drainage • Foundation (trenching, Piling etc). • Building erection • Cabling and Conductor wire stringing • Painting and coating • Transportation and logistics etc. 	Waste Disposal <ul style="list-style-type: none"> • Paper, domestic waste • Waste from laydown area and camp site (material and wood) • Scrap metal, wood, sand, concrete, iron rods, paper • Used oil and replace/obsolete equipment parts that may contaminate soil/ground water
	Contamination of surface water as a result of siltation caused by increased erosion during site preparation
	Visual intrusion and aesthetic quality resulting from the construction of the road
	Work place accidents/ incidents (falling from height, injury from falling objects, etc.)
	Littering of site with packaging materials and unused construction material.
	Respiratory disorder from inhalation of cement dust.
	Respiratory / health hazards to onsite personnel due to the release of fumes from construction equipment (bulldozers, excavators)
Injuries to on-site workers from fall or dislodgement of earth, rock or other materials.	



<ul style="list-style-type: none"> Commissioning /Testing Waste management 	<p>Localised increase (above baseline values) in ambient concentrations of air pollutants (NO_x, SO_x, CO_x, C_xH_y, H₂S, & SPM) from fuel combustion engines (e.g. cement mixing machine) used for construction and cement dust</p> <p>Influx of predominantly male population) job seekers) into host community and neighbouring communities leading to increased extramarital sexual activity, and introduction of commercial sex workers</p> <p>Increase in the ambient noise level of the area above baseline values due to noise generated from construction activities</p> <p>Increased pressure on social amenities (housing, water supply, roads) due to influx of workers and job seekers into the community</p> <p>Decrease in groundwater aquifer as a result of groundwater abstraction for construction activities e.g. concrete mixing, equipment washing, etc.</p> <p>Increased erosion potential as a result of construction activities such as excavation and reduction in structural stability and percolative ability of soil resulting from compaction during civil works and installation activities.</p> <p>Damage to ecological resources and environmental degradation by minor spillages during fuelling of construction trucks and equipment</p> <p>Risk of electrocution and burns (to onsite workers) during electrical installation processes</p> <p>Job creation/ Business opportunity/Economic enhancement</p> <p>Accidents due to collapse of structure under construction</p> <p>Kidnapping of personnel</p>
<p>Demobilisation</p> <ul style="list-style-type: none"> Demobilization after construction phase 	<p>Workplace accidents from burns, cuts, bruises, trips and falls, object at height leading to injury of fatalities.</p> <p>Soil/groundwater contamination resulting from accidental leakages and spill of hazardous substances (diesel, lubricants, hydraulic oil etc.)</p> <p>Traffic congestion during transportation of demobilized equipment and personnel</p> <p>Generation of dust and automobile/heavy duty equipment emissions</p> <p>Waste disposal (scrap metal, wood, sand, concrete, paper)</p> <p>Reclamation and restriction of access roads to prevent unauthorized uses</p> <p>Loss of employment and business opportunities due to completion of construction phase</p> <p>Illegal access to building site leading to accident, sabotage, asset damage and loss</p> <p>Surface runoff and erosion resulting in sedimentation problems</p>
<p>Operations and maintenance</p> <ul style="list-style-type: none"> Building inspection and checks Power generation/ servicing Transportation of raw materials and finished product 	<p>Risk of injury from fall from height/trip or being hit by object</p> <p>Air pollution by gaseous emission (CO, SO₂, NO₂) and particulates from power generator and other processing plants</p> <p>Soil contamination resulting from accidental leakages and spill of hazardous substances from generator and plant servicing (diesel, spent oil etc.)</p> <p>Generation of dust and gaseous pollutants from automobile emissions</p> <p>Increase in noise level nuisance from vehicles plying the access roads</p>



<ul style="list-style-type: none"> • Agro-products processing for export • Plant maintenance • industrial waste discharges • Emergence of small-scale enterprises • Green buffer development around each industrial plot. • Recruitment of workers 	Traffic congestion along as a result of transportation of raw materials and processed agro-products
	Metallic materials generation from plant parts, retrofitting/upgrade of parts during plant servicing
	Potential for land contamination from industrial waste disposal
	Pollution of surface water bodies by wastewater generated from industrial waste discharges
	Change in Land Use of nearby areas
	Recreational facility
	Acquisition of skills by individuals to be employed
	Increase in income for workers.
Decommissioning/ Abandonment <ul style="list-style-type: none"> • Removal of electrical cables and wires • Demolition of buildings for facilities retrieval • Waste generation • Transportation of Plant components for sale/ another site 	Risk of accident and injury to workers during demolition of structures
	Increased dust and vehicular emissions during haulage of plant components from site by heavy-duty vehicles
	Increased sedimentation process close to river banks and floodplains along the building sites
	Risk of soil and adjoining surface water contamination from accidental oil and hazardous substance leakages
	Traffic obstruction from transportation of decommissioned structures and equipment
	Availability of land for alternative uses such as community hall
Improved Ecology, Air Quality and Aesthetics	

5.5 Screening of Impact Importance

This involves the elimination of project activity-environmental interaction producing no effect and selection of focus impact for further assessment. The basis for the screening was derived from the following:

- Knowledge of the Project activities as summarized in Table 5.1.
- Detailed information on the environmental and socio-economic setting of the Project's area of influence as documented in Chapter 4. The potential environmental and social receptors/resources that could be affected by the proposed Project are summarized in Table 5.1.
- Consultation with relevant stakeholders including potentially affected community
- Review of other ESIA reports on similar projects/environments.
- Series of experts group discussions, meetings and experience on similar projects.

A modified Leopold matrix (Leopold, 1971) was used for the 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 socio-economic 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. It is considered sufficient for the purpose of the impact assessment to indicate that the Project is expected to result in a positive impact, thus no magnitude designation is assigned.

Ranking of negative impacts are discussed below:

Negligible Impact: this impact may occur but based on experience, available scientific information and expert knowledge will have very insignificant, immeasurable, undetectable effect on the environment or within the range of normal natural variation.

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.

Moderate Impact: This affects a portion of an area, system, aspect (physical), population or species (biological) and at sufficient magnitude to cause a measurable numerical increase in measured concentrations when compared with national or



international limits and standards specific to the receptors) and may bring about a change in species abundance, but does not threaten the integrity of that population or any population dependent on it.

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 presents in Table 5.4.



Table 5.4: Activity-Receptor Interaction for Impact Screening

Summary of ProjectActivities at various Phases	Receptors														
	Physical					Biological		Socio-economic					Others (Health and Safety)		
	Air Quality	Ambient Noise	Soil	Groundwater and Aquifers	Landscape/ Topography	Terrestrial Flora	Terrestrial Fauna	Land Use	Population	Utilities	Infrastructure	Employment/ Income	Construction workers	Workplace health and safety	General Public
Pre-construction Phase															
Site selection	0	0	0	0	0	0	0	2	1	1	0	1	0	0	1
Site clearing and preparation	2	1	1	0	0	3	3	3	1	1	1	+	2	2	1
Mobilization of construction equipment and materials to site	2	2	1	0	0	1	1	2	2	2	1	+	2	2	1
Construction of access road, drainages and erosion control	2	2	3	2	2	2	2	2	1	1	1	+	2	3	2
Construction Phase															
Civil work activities including excavation, trenching, cable laying, foundation, construction of buildings	3	2	2	2	3	1	1	3	2	2	2	+	3	3	2
Installation of agro-processing plant and other facilities	1	2	0	1	0	0	0	0	1	1	1	+	2	3	1
Waste generation and disposal	2	0	3	0	2	0	0	2	0	0	0	+	0	2	2
Commissioning															
Testing of agro-processing plant and associated infrastructure.	2	2	0	0	0	0	0	0	0	0	0	0	2	2	0
Commissioning of the Agro-Industrial Hub (AIH).	0	2	0	0	0	0	0	0	2	2	1	0	0	0	2
Operation and Maintenance															
Power generation	3	3	0	0	0	0	0	0	0	0	2	+	2	3	2
Plant operation and maintenance	3	3	2	2	0	1	1	0	2	2	2	+	3	3	2
Movement of Agro-products from ATCs to AIH for storage and exportation	2	1	1	0	0	1	1	0	0	0	2	+	2	3	2
Routine maintenance; waste generation and disposal	2	1	2	0	2	1	1	2	0	0	0	0	2	2	2
Decommissioning	2	2	2	0	2	+	+	+	2	1	1	2	2	2	2



5.6 Detailed Assessment of Selected Focus Impact

The preliminary identification and screening of environmental and social impacts resulted in a group of focus impacts (impacts ranked 1, 2 and 3), which were further assessed in terms of severity and significance. Impact severity and significance criteria used at this next stage (as shown in table 5.5 and table 5.6) relied on a number of resources and tools including the following:

- ISO 14001 guidelines
- 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.
- Discussion with design contractors and project engineers.
- Published and unpublished documents (such as The World Bank Environmental Assessment Sourcebook, relevant IFC Performance Standards, and other authoritative texts on performing environmental and social impact assessments) providing guidance on performing impact analysis for industrial development activities.
- UNEP EIA Training Resources Manual (1996) and
- European Commission Guidance on EIA/EIS Review (European Commission, 2001).

Table 5.5: Impact Characterization

Impact Characterization	Definition
Beneficial Impacts	Impacts that would produce an overall positive effect on the well-being of the people as well as the environment.
Adverse Impacts	Impacts that may result in: <ul style="list-style-type: none"> • irreversible and undesirable change(s) in the biophysical environment; • decrease in the quality of the biophysical environment; • limitation, restriction or denial of access to or use of any component of the environment to others, including future generations; and • sacrifice of long term environmental viability or integrity for short term economic goals
Direct Impacts	Impacts resulting directly (direct cause-effect consequence) from a project activity
Indirect Impacts	Impacts that are at least one step removed from a project activity. They do not follow directly from a project activity.
Normal Impacts	Impacts that will normally be expected to follow a particular project activity
Abnormal Impacts	An impact is considered to be abnormal when it follows a project activity as against sound predictions based on experience
Short-term Impacts	Impacts that will last only within the period of a specific project activity.
Long-term Impacts	Impacts whose effects remain even after a specific project activity.
Reversible Impacts	Impacts whose effects can be addressed on application of adequate mitigation measures
Irreversible Impacts	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 Impacts	Impacts resulting from interaction between ongoing project activities with other activities, taking place simultaneously
Incremental Impacts	Impacts that progress with time or as the project activity proceeds.
Residual Impacts	Impacts that would still remain after mitigation measures have been applied

Table 5.6: Characterization of potential and associated impacts of the proposed project

Project Phase/Activity	Associated and Potential Impacts	Impact Characterization								
		Direct	Indirect	Adverse	Beneficial	Reversible	Irreversible	Cumulative	Long term	Short term
Pre-Construction -Permitting -Mobilization -Recruitment -Site Preparation	Economic loss arising from loss of farm lands.	√		√		√			√	
	Employment opportunities arising from recruitment of skilled and unskilled personnel.	√			√	√				√
	Business opportunities for local contractors through subcontracting activities.	√			√	√				√
	Local support services from road side supply markets and shops etc		√		√					√
	Skill acquisition and enhancements to local indigenes and workforce.	√			√		√		√	
	Influx of people (migrant workers, sub-contractors and suppliers) and increased pressure on existing social infrastructure		√	√		√				√
	Increase of communicable diseases due to influx of people		√	√		√				√
	Increase in social vices (like theft, prostitution etc.) resulting from increased number of people		√	√		√				√
	Community agitation over unidentified stakeholder, leadership tussles etc.		√	√		√				√
	Conflicts/community agitations over employment issues (quota and methods)	√		√		√				√
	Noise and vibrations due to movement from heavy duty equipment and vehicles affecting site workers, residents and wildlife	√		√		√				√
	Deterioration of air quality due to the release of obnoxious gas such as Sox, Nox, CO etc and dust resulting from the movement of construction vehicles on unpaved surfaces during site clearance	√		√		√				√
	Increased traffic during mobilization on road with risk of road obstruction and traffic accidents leading to injury/death and loss of asset.		√	√			√			√
	Removal of the vegetative cover due to site clearing and preparation	√		√			√		√	
	Indiscriminate waste disposal due to waste from wood, sandpaper; domestic waste from laydown area and camp site (material and wood)	√		√		√			√	



Project Phase/Activity	Associated and Potential Impacts	Impact Characterization								
		Direct	Indirect	Adverse	Beneficial	Reversible	Irreversible	Cumulative	Long term	Short term
	Contamination of surface water around Kabomo ATC site about 200m, Zobe dam at Makera ATC site about 850m and Kwana Are ATC site about 100m as a result of siltation caused by increased erosion during site preparation.	√		√		√				√
Construction / Installation Civil work, Mechanical and Electrical work which include; <ul style="list-style-type: none"> • Drainage • Foundation (trenching, Piling etc). • Building erection • Cabling and Conductor wire stringing • Painting and coating • Transportation and logistics etc. • Commissioning /Testing • Waste management 	Workplace accidents from burns, bruises, trips and falls, object at height leading to injury/ fatalities.	√		√			√			√
	Employment of local labour and skills acquisition for workers taking advantage on new opportunities	√			√		√			√
	Increased business and economic activities as well as diversification of income sources due to supply contracting and sub-contracting	√			√		√			√
	Increase in revenue opportunities for local population due to presence of non-resident workers and travelers		√		√		√		√	
	Generation of dust and automobile / heavy duty equipment emissions from construction earthworks.	√		√		√		√		√
	Flora/habitat loss and disturbance through vegetation clearing and earthworks along access roads and building sites.	√		√			√	√	√	
	Fauna disturbance and displacement as a result of migration away from construction area (e.g. birds, rodents and reptiles)	√		√			√		√	
	Soil/groundwater contamination resulting from accidental leakages and spill of hazardous substances (diesel, lubricants, hydraulic oil etc.)		√	√		√		√		√
	Risks injury/death and loss of assets resulting from accidents associated with road transportation to and from construction sites		√	√			√	√		√
	Risk of electrocution and burns (to onsite workers) during electrical installation processes	√		√			√			√
	Traffic congestion during haulage of plant components to site for installation		√	√		√				√
Risk of injury from fall from height and building collapse due to unstable geotechnical conditions	√		√			√			√	



Project Phase/Activity	Associated and Potential Impacts	Impact Characterization								
		Direct	Indirect	Adverse	Beneficial	Reversible	Irreversible	Cumulative	Long term	Short term
	Reduction in wildlife population as a result of poaching due to easier access created by access roads		√	√			√	√	√	
	Inhalation by onsite workers of cement dust and toxic fumes during foundation works and welding for building components	√		√			√			√
	Noise nuisance from construction activities e.g. Piling resulting to irritation in humans and temporal migration of sensitive mammals	√		√		√				√
	Visual intrusion as a result of alterations from accidental ignition of onsite diesel storage tanks	√		√		√				√
	Waste Disposal <ul style="list-style-type: none"> Scrap metal, wood, sand, concrete, paper Spent-oil and replaced /obsolete equipment parts that may contaminate soil/ground water Waste from laydown area and building sites causing unsightliness 	√		√		√		√		√
Demobilization -Demobilization after construction phase	Workplace accidents from burns, cuts, bruises, trips and falls, object at height leading to injury of fatalities.	√		√			√			√
	Soil/groundwater contamination resulting from improper waste disposal and accidental leakages and spill of hazardous substances (diesel, lubricants, hydraulic oil etc.)		√	√			√			√
	Traffic congestion during transportation of demobilized equipment and personnel		√	√		√				√
	Generation of dust and automobile/heavy duty equipment emissions		√	√		√		√		√
	Waste disposal (scrap metal, wood, sand, concrete, paper)	√		√		√				√
	Reclamation and restriction of access roads to prevent unauthorized uses		√		√			√	√	
	Loss of employment and business opportunities due to completion of construction phase	√		√		√			√	
	Illegal access to building site leading to accident, asset damage and loss		√	√		√				√
Operation and Maintenance	Risk of injury from fall from height/trip or being hit by an object	√		√			√			√



Project Phase/Activity	Associated and Potential Impacts	Impact Characterization								
		Direct	Indirect	Adverse	Beneficial	Reversible	Irreversible	Cumulative	Long term	Short term
<ul style="list-style-type: none"> Building inspection and checks Power generation /servicing Transportation of raw materials and finished product Agro-products processing for export. Plant maintenance Industrial waste discharges Emergence of small-scale enterprises Green Buffer development around each industrial plot. Recruitment of workers 	Security threat such as kidnapping and banditry attack		√	√			√		√	
	Air pollution by gaseous emission (CO, SO ₂ , NO ₂) and particulates from power generator		√	√			√	√	√	
	Soil contamination resulting from accidental leakages and spill of hazardous substances from generator servicing (diesel, spent oil etc.)		√	√			√			√
	Generation of dust and gaseous pollutants from heavy duty equipment, agro processing machineries, automobile emissions	√		√			√		√	
	Increase in noise level nuisance from operation machines and from vehicles plying the access roads		√	√			√	√	√	
	Traffic congestion along agro-products transportation route		√	√		√		√	√	
	Reduction of water tables and source of water for production processes	√		√		√			√	
	Metallic materials generation from plant parts, retrofitting/upgrade of parts during plant servicing	√		√			√			√
	Potential for land contamination from industrial waste disposal	√		√		√			√	
	Pollution of surface water bodies by wastewater generated from industrial waste discharges	√		√			√		√	
	Change in Land Use of nearby areas	√		√		√		√	√	
	Recreational facility from lawns/parks/green areas		√		√		√	√	√	
	Acquisition of skills by individuals to be employed as operators	√			√		√	√	√	
Decommissioning/ abandonment <ul style="list-style-type: none"> Removal of electrical cables and wires, water and sewage treatment plant pipelines. 	Risk of accident and injury to workers during demolition of structures	√		√			√		√	
	Increased dust and vehicular emissions during haulage of plant components from site by heavy-duty vehicles	√		√			√		√	
	Risk of soil and adjoining surface water contamination from accidental oil and hazardous substance leakages		√	√		√		√	√	

Project Phase/Activity	Associated and Potential Impacts	Impact Characterization								
		Direct	Indirect	Adverse	Beneficial	Reversible	Irreversible	Cumulative	Long term	Short term
<ul style="list-style-type: none"> Demolition of buildings for facilities retrieval Waste generation Transportation of Plant components for sale/another site Re-vegetation of site 	Traffic obstruction from transportation of decommissioned structures and equipment		√	√		√		√		√
	Abandoned structures possibly taken-over by miscreants/criminals		√	√		√				√
	Availability of land for alternative uses such as community hall, farmland, etc	√			√		√		√	
	Improved Ecology, Air Quality and Aesthetics	√			√	√			√	

5.7 Final Assessment and Assignment of Overall Impact Significance Levels

At this stage, the potential and associated impacts identified and characterized in the previous stages of the assessment process were evaluated. The evaluation which was based on clearly defined criteria was used to determine the significance or otherwise of the impacts. The criteria and weighing scale adopted for the evaluation are described below.

Legal/Regulatory Requirements (L)

Here, the proposed project activities that resulted in impacts were weighed against existing legal / regulatory provisions to determine the requirement or otherwise for permits prior to the execution of such activities. Such legal/regulatory requirements were identified from the laws/guidelines, which have been reviewed in chapter one of this report. The weighting scale used was as follows:

Table 5.7: Legal/Regulatory Requirements Criterion

Condition	Rating
No legal / regulatory requirement for carrying out project activity	Low =1
Legal / regulatory requirement exist for carrying out activity	Medium =3
A permit is required prior to carrying out project activity which may result in impact on the environment	High =5

Risk Posed by Impact (R)

The health, safety and environmental risks associated with each impact were assessed and ranked as “low”, “medium” or “high”, using the Risk Assessment Matrix (RAM). Reference was also made to the source references listed in the previous sections. Three criteria (consequence, probability of occurrence and severity) were used as basis for ranking the risks of the impacts. These were determined using the RAM as shown in Table 5.8.

Table 5.8: Risk Assessment Matrix (RAM)

		<u>Probability</u>				
		A	B	C	D	E
Consequences	I					
	II					
	III					
	IV					

Probability Category	Definition
A	Possibility of Repeated Incidents
B	Possibility of Isolated Incidents
C	Possibility of Occurring Sometime
D	Not Likely to Occur
E	Practically Impossible

Consequence Category	Considerations			
	Safety / Health	Public Disruption	Environmental Aspects	Financial Aspects
I	Fatalities / Serious Impact on Public	Large Community	Major/Extended Duration/Full Scale Response	High =5
II	Serious Injury to Personnel / Limited Impact on Public	Small Community	Serious / Significant Resource Commitment	Medium =3
III	Medical Treatment for Personnel / No Impact on Public	Minor	Moderate / Limited Response of Short Duration	Low =1
IV	Minor Impact on Personnel	Minimal to None	Minor / Little or No Response Needed	None

The risks (measure of the likelihood and magnitude of an adverse effect) associated with such project operations were evaluated in terms of:

- Risk to human health;
- Risk to asset (commercial and economic risk);
- Risk to the biophysical environment; and
- Risk to the SAPZ’s reputation.

Based on the matrix above, the weighting used was as follows:

Table 5.9: Risk Criterion

Risk	Attribute – Environmental, Human Health, Safety and Reputation
1= Low ■	<ul style="list-style-type: none"> This means that no further mitigation may be required
3= Medium ■	<ul style="list-style-type: none"> This means that the impact can be mitigated with additional controls and modifications
5=High ■	<ul style="list-style-type: none"> This means that the impact require avoidance or major control/mitigation

Frequency of Impacts Occurrence (F)

Evaluation of the frequency of occurrence of each impact was also carried out. Frequency of occurrence was rated as “high”, “medium” or “low” based on the historical records of accidents/incidents, consultation with experts and professional judgment. The frequency criterion is summarized below.

Table 5.10: Frequency Criterion

Frequency	Attribute – Environmental, Human Health and Safety
High = 5	<ul style="list-style-type: none"> Major degradation in quality in terms of scale (>1% of study area or habitat within the study area), appearance, duration (beyond duration of project) Irreversible or only slowly recoverable (change lasting more than 1 year) degradation of environmental ecosystem level (population, abundance, diversity, productivity) High frequency of impact (occur continuously and almost throughout the project execution period (< 4months) Geographic extent of impact (e.g. encompassing areas beyond study area)
Medium =3	<ul style="list-style-type: none"> Degradation in quality in terms of scale (>0.1% of study area, habitat), appearance, duration (a few months) Effect beyond naturally occurring impacts variability Slow reversibility (change lasting a few months before recovery), lasting residual impact Potential for cumulative impact Intermittent frequency of impact (occur in only a few occasions during the project execution period) Limited geographic extent of impact (large area within study Area)
Low = 1	<ul style="list-style-type: none"> Minor degradation in quality in terms of scale (<0.1% of study area, habitat, very localized), appearance, duration (a few days to a month) Effect within range of naturally occurring impacts, changes, dynamics Rapid reversibility (change lasting only a few weeks before recovery), no lasting residual impact of significance No potential for significant cumulative impact Low frequency of impact (occur in just about one occasion during the project execution period) Only very localized geographic extent of impact (e.g. not more than a



	few meters from impact source point)
--	--------------------------------------

Importance of Impact (I)

The importance of target environmental component in respect of identified potential impact was also determined and rated as “high”, “medium” or “low”. The ratings were based on consensus of opinions among consulted experts including project engineers and other stakeholders in the proposed project. The importance criterion is summarized below.

Table 5.11: Importance Criterion

Importance	Attribute – Environmental, Human Health and Safety
High = 5	<ul style="list-style-type: none"> • Highly undesirable outcome (e.g., impairment of endangered, protected habitat, species) • Detrimental, extended flora and fauna behavioral change (breeding, spawning, molting) • Major reduction or disruption in value, function or service of impacted resource • Impact during environmentally sensitive period • Continuous non-compliance with international best practices
Medium = 3	<ul style="list-style-type: none"> • Negative outcome • Measurable reduction or disruption in value, function or service of impacted resource • Potential for non-compliance with international best practices
Low =1	<ul style="list-style-type: none"> • Imperceptible outcome • Insignificant alteration in value, function or service of impacted resource • Within compliance, no controls required

Public Interest/Perception (P)

Here, the interest/perception of the public on the proposed project and the identified potential/ associated impacts were determined through consultation with proposed project stakeholders. The ratings of high, medium or low were assigned based on consensus of opinions among consulted stakeholders. The public perception/interest criterion is summarized below:

Table 5.12: Public perception /interest criterion

Public Perception	Attribute – Environmental and Human Health
High (5)	<ul style="list-style-type: none"> • Elevated incremental risk to human health, acute and/or chronic • Possibility of life endangerment for community inhabitants and site personnel • Major reduction in social, cultural, economic value • Continuous non-compliance with international best practices • Any major public concern among population in the project region
Medium (3)	<ul style="list-style-type: none"> • Limited incremental risk to human health, acute and/or chronic • Unlikely life endangerment for community inhabitants and site personnel • Some reduction in social, cultural, economic value • Possibility of adverse perception among population • Potential for non-compliance
Low (1)	<ul style="list-style-type: none"> • No known risk to human health, acute and/or chronic • No known risk of life endangered for community inhabitants and site personnel • Minor reduction in social, cultural, economic value • Unlikely adverse perception among population

Result of Impact Assessment

For each of the three main project phases (pre-construction/construction, operation, maintenance, demobilization and decommissioning), the levels of significance for potential impacts of the proposed project were assigned (table 5.13) as those impacts to which the following conditions apply.

High = (L+R+F+I+P) ≥ 15 or (F+I) ≥ 6 or P = 5

Medium = (L+R+F+I+P) ≥ 9 but < 15

Low = (L+R+F+I+P) <9

Table 5.13: Potential and Associated Impact Assessment of the Proposed Project

Project Phase/Activity	Associated and Potential Impacts	Assessment Criteria							Significance rating
		L	R	F	I	P	Sum	F+I	
Pre-Construction -Permitting -Mobilization -Recruitment -Site Preparation	Economic loss arising from loss of farm lands.	3	5	1	5	5	21	6	High
	Employment opportunities arising from recruitment of skilled and unskilled personnel	-	-	-	-	-	-	-	Beneficial
	Business opportunities for local contractors through subcontracting activities	-	-	-	-	-	-	-	Beneficial
	Local support services from road side supply markets and shops etc	-	-	-	-	-	-	-	Beneficial
	Skill acquisition and enhancements to local indigenes and workforce.	-	-	-	-	-	-	-	Beneficial
	Influx of people (migrant workers, sub-contractors and suppliers) and increased pressure on existing social infrastructure	1	3	3	3	3	13	4	Medium
	Increase of communicable diseases due to influx of people	1	5	1	3	3	13	4	Medium
	Increase in social vices (like theft, prostitution etc.) resulting from increased number of people.	1	5	1	3	3	13	4	Medium
	Community agitation over unidentified stakeholder, leadership tussles etc.	1	5	1	5	5	17	6	High
	Conflicts/community agitations over employment issues (quota and methods)	1	5	1	3	5	15	4	High
	Noise and vibrations due to movement from heavy duty equipment and vehicles affecting site workers, residents and wildlife	3	3	1	3	1	11	4	Medium
	Increase of dust particles and vehicular emissions such as SO _x , NO _x , CO _x , etc	3	3	1	3	1	11	4	Medium
	Increased traffic during mobilization on road with risk of accidents leading to injury/death and loss of asset	1	3	1	5	3	13	6	High
	Disturbance of the vegetative cover due to site clearing and preparation	3	3	1	3	3	13	4	Medium
	Littering of the environment due to waste from wood, sand, paper; domestic waste from laydown area and camp site (material and wood)	3	3	3	3	1	13	6	High
Contamination of surface water as a result of siltation caused by increased erosion during site preparation	3	3	1	3	1	11	4	Medium	



Project Phase/Activity	Associated and Potential Impacts	Assessment Criteria							Significance rating	
		L	R	F	I	P	Sum	F+I		
Construction / Installation Civil work, Mechanical and Electrical work which include; <ul style="list-style-type: none"> • Drainage • Foundation (trenching, Piling etc). • Building erection • Cabling and Conductor wire stringing • Painting and coating • Transportation and logistics etc. • Commissioning / Testing • Waste management 	Workplace accidents from burns, bruises, trips and falls, object at height leading to injury/ fatalities.	3	3	1	3	3	13	4	Medium	
	Employment of local labour and skills acquisition for workers taking advantage on new opportunities	-	-	-	-	-	-	-	-	Beneficial
	Increased business and economic activities as well as diversification of income sources due to supply contracting and sub-contracting	-	-	-	-	-	-	-	-	Beneficial
	Increase in revenue opportunities for local population due to presence of non-resident workers and travelers	-	-	-	-	-	-	-	-	Beneficial
	Generation of dust and automobile / heavy duty equipment emissions from construction earthworks.	3	3	3	3	1	13	6	High	
	Flora/habitat loss and disturbance through vegetation clearing and earthworks along access roads and building sites.	3	3	1	3	1	11	4	Medium	
	Fauna disturbance and displacement as a result of migration away from construction area (e.g. birds, rodents and reptiles)	3	3	1	3	1	11	4	Medium	
	Soil/groundwater contamination resulting from improper waste disposal and accidental leakages and spill of hazardous substances (diesel, lubricants, hydraulic oil etc.)	3	3	1	3	1	11	4	Medium	
	Risks injury/death and loss of assets resulting from accidents associated with road transportation to and from construction sites	3	3	1	5	3	15	6	High	
	Traffic congestion during haulage of plant components to site for installation	3	3	1	3	3	13	4	Medium	
	Risk of injury from fall from height and building collapse due to unstable geotechnical conditions	1	3	1	3	3	11	4	Medium	
	Risk of electrocution and burns (to onsite workers) during electrical installation processes	1	3	1	3	3	11	4	Medium	
	Reduction in wildlife population as a result of poaching due to easier access created by access roads	5	1	3	3	1	13	6	High	



Project Phase/Activity	Associated and Potential Impacts	Assessment Criteria							Significance rating	
		L	R	F	I	P	Sum	F+I		
	Inhalation by onsite workers of cement dust and toxic fumes during foundation works and welding for building components	1	3	3	3	1	11	6	High	
	Noise nuisance from construction activities e.g. Piling resulting to irritation in humans and temporal migration of sensitive mammals	3	3	3	3	1	13	6	High	
	Visual intrusion as a result of alterations from accidental ignition of onsite diesel storage tanks	1	3	1	3	3	11	4	Medium	
	Waste Disposal <ul style="list-style-type: none"> Scrap metal, wood, sand, concrete, paper Spent-oil and replaced /obsolete equipment parts that may contaminate soil/ground water Waste from laydown area and building sites causing unsightliness 	3	3	3	3	3	15	6	High	
Demobilization -Demobilization after construction phase	Workplace accidents from burns, cuts, bruises, trips and falls, object at height leading to injury of fatalities.	1	3	1	3	1	9	4	Medium	
	Soil/groundwater contamination resulting from accidental leakages and spill of hazardous substances (diesel, lubricants, hydraulic oil etc.)	3	3	1	3	3	13	4	Medium	
	Traffic congestion during transportation of demobilized equipment and personnel	3	3	3	5	3	17	8	High	
	Generation of dust and automobile/heavy duty equipment emissions	3	3	1	3	1	11	4	Medium	
	Waste disposal (scrap metal, wood, sand, concrete, paper)	3	3	1	3	3	13	4	Medium	
	Reclamation and restriction of access roads to prevent unauthorized uses	-	-	-	-	-	-	-	-	Beneficial
	Loss of employment and business opportunities due to completion of construction phase	3	3	1	3	3	13	4	Medium	
Operation and Maintenance • Building inspection and checks • Power generation /servicing	Risk of injury from fall from height/trip or being hit by an object	3	3	1	3	1	11	4	Medium	
	Security threat such as kidnapping and banditry attack	3	5	1	5	3	17	6	High	



Project Phase/Activity	Associated and Potential Impacts	Assessment Criteria							Significance rating	
		L	R	F	I	P	Sum	F+I		
<ul style="list-style-type: none"> • Transportation of raw materials and finished product • Agro-products processing for export. • Plant maintenance • Industrial waste discharges • Emergence of small-scale enterprises • Green Buffer development around each industrial plot • Recruitment of workers 	Air pollution by gaseous emission (CO, SO ₂ , NO ₂) and particulates from power generator	3	3	3	3	1	13	6	High	
	Soil contamination resulting from accidental leakages and spill of hazardous substances from generator servicing (diesel, spent oil etc.)	3	3	1	3	1	11	4	Medium	
	Generation of dust and gaseous pollutants from automobile emissions	3	3	3	3	1	13	6	High	
	Odour disturbances from the processing of Rice, Tomato, Edible oil etc	1	3	5	1	3	11	6	High	
	Increase in noise level nuisance from operation machines and from vehicles plying the access roads	3	1	3	3	1	11	6	High	
	Traffic congestion along agro-products transportation route	3	3	1	3	3	13	4	Medium	
	Threat to community culture, safety and security due to presence of workers and business opportunists	1	3	1	3	3	11	4	Medium	
	Reduction of water tables and source of water for production processes	3	1	3	3	3	13	6	High	
	Metallic materials generation from plant parts, retrofitting/upgrade of parts during plant servicing	1	3	1	3	1	9	4	Medium	
	Potential for land contamination from industrial waste disposal	3	3	1	3	3	13	4	Medium	
	Pollution of surface water bodies by wastewater generated from industrial waste discharges	3	3	3	3	3	15	6	High	
	Change in Land Use of nearby areas	1	3	1	3	3	11	4	Medium	
	Recreational facility from lawns/parks/green areas	-	-	-	-	-	-	-	-	Beneficial
	Acquisition of skills by individuals to be employed as operators	-	-	-	-	-	-	-	-	Beneficial
Decommissioning /Abandonment <ul style="list-style-type: none"> • Removal of electrical cables and wires, water and sewage treatment plant pipelines. • Demolition of buildings for 	Risk of accident and injury to workers during demolition of structures	3	3	1	3	1	11	4	Medium	
	Increased dust and vehicular emissions during haulage of plant components from site by heavy-duty vehicles	3	3	1	3	3	13	4	Medium	
	Risk of soil and adjoining surface water contamination from accidental oil and hazardous substance leakages	3	3	1	3	1	11	4	Medium	

Project Phase/Activity	Associated and Potential Impacts	Assessment Criteria							Significance rating
		L	R	F	I	P	Sum	F+I	
facilities retrieval • Waste generation • Transportation of Plant components for sale/another site • Re-vegetation of site	Traffic obstruction from transportation of decommissioned structures and equipment	3	3	1	3	3	13	4	Medium
	Abandoned structures possibly taken-over by miscreants/criminals	1	3	3	3	3	13	6	High
	Availability of land for alternative uses such as community hall, farmland etc	-	-	-	-	-	-	-	Beneficial
	Improved Ecology, Air Quality and Aesthetics	-	-	-	-	-	-	-	Beneficial

5.8 Analysis of Impacts for the Proposed ATC Projects

An in-depth analysis of the identified impacts indicate that some impacts may generate from the local social and economic setting, which may in many ways have significant costs on the social, economic and environmental settings related to the proposed ATC projects. Other impacts are phase specific, but each has different levels of significance indicating that those most sever demand attention for the sustainability of the project. The significance of these impacts is summarized in Table 5.14.

Table 5.14: Impact assessment

Impact	Description	Impact assessment
Potential employment opportunities	- It is envisaged that employment opportunities will increase for local communities during both construction and operational phases. This will be mostly in manual, skilled and unskilled work (excavation, security guards, cleaners). - Technical works (plant/machine operators) will require training, capacity building.	Significant impact, particularly on individual and local economies
Enhanced farming and livestock keeping skills	- The proposed strategy for extending extension services to local producers will enhance their skills and eventually their competitiveness in terms of supplying quality products in the long run.	Significant
Enhanced women’s empowerment	- Women’s trades such as in food vending and food processing will have a larger market/clientele during both project construction and operational phases. This opportunity will increase their incomes and ability to enhance their livelihood status.	Significant
Advanced trade linkages	- There is the potential of increased involvement of local traders in the value chain associated with ATCs	Significant
Enhanced District economy and incomes	- Once project management structures are clearly shared, District/Municipal authorities will receive revenues from the ATC operations	Significant
Limitations in access	- Possibility of favouritism or discrimination in recruitment	Significant impact, could affect



to employment	which may affect local people's opportunity for employment within the ATCs' catchment. This may be because of recruitment policies, or, targeting of individuals with special skills.	social acceptability of project, threaten security
Conflict/competition in basic resources	- Project development may threaten availability or water access/supply for project and surrounding communities	Significant, during both construction and operational phases
Decline in business by some traders	- Possibility of more attractive terms of trade offered by the ATC facility can minimize the ability of locally established private entrepreneurs to get adequate supply of products for their business	Not significant, will depend on the conduciveness of business run by the ATC
Loss of competitive edge by local producers	- The degree of quality demanded by the ATC may shelve out certain products and hence the incomes of local producers who cannot maintain certain standards.	Medium impact, can be mitigated by concerted extension services to producers
Dust pollution during construction phase	- Frequent movement of construction vehicles and piling of construction materials, sand, gravel will definitely cause dust emission beyond normal levels.	Significant, but short term
Bio-diversity loss (degradation of vegetation and disturbance of insects)	- Vegetation clearance during construction phase is inevitable given the proposed designs of the facilities. This will definitely disturb the natural environment and fauna dependent on it.	Significant, low scale depending on area to be covered by the facility.
Increased road traffic	- Increased volume of vehicles going in and out of the facility to bring products or transport products to the ATC is expected particularly on the access road to the project area. Depending on volume of traffic this may impact on the safety of traders and residents.	Low significance
Increase in waste generation (solid, liquid)	- A large volume of solid and liquid waste is likely to be generated during the operational phase, and is likely to increase as the volume of products also increases over time. This includes waste water for processing.	Significant
Potential of aflatoxins in crops	- Poor quality of storage facilities at initial collection points (household and ATCs) may expose harvested produce to aflatoxin contamination	Significant, small-scale
Contamination of water sources	- Accidental spillage of liquid waste, solid matter or facility debris into water sources	Likely to occur during both construction and operational phases
Spread of infectious diseases – HIV, STIs	- Population increase, increase in money transactions due to increase in trade and other opportunities may encourage multiplication of transactional relationships and sex. - Possibility of lowly-resourced females to succumb to unsafe sex is likely.	May occur during both construction and operational phases
Gender-based violence (GBV)	- The abuse of women and young girls is likely to happen in the manner of sexual abuse or sexual exploitation.	Medium intensity because it may be mitigated by sensitization and punitive action
Child abuse	- There is a high likelihood of individuals taking advantage of children seeking employment in an environment of lucrative business interaction such as that expected of the ATCs. This is because they are easier to exploit.	Medium intensity because it may be mitigated by sensitization and punitive action
Occupational and Workers health	- Project (facility) workers may be exposed to a number of health and safety hazards during both the construction and operation phase due to work-related hazards, including pollution, or accidents. - There is also the possibility that other individuals may be affected by pollution owing to the increase in number of products transacted within the facility's catchment.	Significant, depending on the quality of safety measures put in place.



5.8 Discussion of Impacts

5.8.1 Positive Environmental and Social Impacts of the Proposed Project

Employment Opportunities

Several employment opportunities (skilled and unskilled) shall be created throughout the project phases.

Provision of Market for Supply of Construction Materials

The proposed project shall require supply of large quantity of materials, most of which will be sourced locally and in surrounding areas. This provides market for material suppliers such as quarry companies, sand, wood, cement, paints and roofing material dealer as well as other dealers of building materials and local food vendors. The impact is rated significant and positive.

Improved Drainage

The project area is seriously affected by gully erosion due to lack of a well-planned drainage pattern; therefore, upon completion of the project, the drainage system of the area will be enhanced to meet the designed standard of the project. This will be a positive impact.

Gains in the Local and National Economy

There will be gains in the local and national economy as a result of the construction of this project, through consumption of locally available materials including: timber, metals and cement. The consumption of these materials in addition to fuel oil for the machines to be used at the site and others will attract taxes including Value Added Tax (VAT) and Income Tax which will be payable to the government. The cost of the materials will be payable directly to the suppliers.

Informal Sectors Benefits

During construction phase of this project, the informal sectors are temporarily likely to benefit more from this phase. This will involve kiosk operators who will be selling food to the workers on site thereby promoting entrepreneurs in the host communities for the period that the construction will be taking place.

Skills Transfer and Training

Through labour recruitment locally, the workers will have an opportunity to learn an array of skills that relate to building construction and ancillary works. Improved transport



will improve interaction with other communities that will also provide an opportunity for further learning and cultural exchange.

Gender and youth Aspects

The SAPZ Project will systematically ensure that the project contributes to active gender equality and will not lead to unintended negative gender impacts, such as exclusion. Gender perspectives have been integrated into project formulation in line with the National Gender Strategy and policies while taking due cognizance of the Bank's Gender Policy. The PIU will also ensure development of a Gender Action Plan (GAP) that will drive the real engagement of either of the gender and also the youth to fully engage during the implementation of the project. In terms of project implementation, Component 1, 2 and 3

will aim to ensure that at least 35% of all beneficiaries are female, and/or female headed households to ensure the project addresses the challenges of the most vulnerable households. In terms of Component 4, which focuses on training, a target of 50% has been

set to ensure balance in the institutional capacity building efforts.

Climate Change and Green Growth

This project was screened using the Climate Safeguards System (CSS) of the African Development Bank and found to be a Category 2 Project. In terms of climate change and green growth, the project will contribute to climate change resilience through improved agricultural production, better land use programme and good water and land management practices through catchment management. The project will also enhance climate change resilience through improved storage and warehousing facilities and improved marketing systems. However, efforts should and will be made to seek additional resources that may be used to enhance the effectiveness of this project by implementing climate change adaptation measures such as catchment management programmes and rainwater harvesting initiatives. Such activities will include: (i) sustainable land use practices; (ii) terracing to minimise topsoil losses through erosion; (iii) agroforestry initiatives that will improve soil fertility while providing animal feeds; (iv) development of water harvesting micro-dams; (v) provision of drought tolerant crop seeds; and, (vi) capacity building.



Climate mitigation and adaptation

The project is unlikely to directly cause material greenhouse gas (GHG) emissions. Emissions will arise from transport and construction of infrastructure and facilities such as micro-dams, irrigation systems, agro-processing facilities, dam access roads, agricultural produce storage facilities, or similar activities. In such regard, there will be limited scope for project-based mitigation. However, by improving land, water management and agricultural production systems, the project will directly increase the overall GHG emission efficiency of the agricultural sector and hence reduce the net GHG emission intensity of food production in the country. The project will, therefore, directly assist Borno State to adapt to changing climates by improving the efficiency agricultural production while minimizing wastages through improved storage and marketing systems and market facilitation.

5.8.2 Anticipated Negative Impacts of the Proposed Project

Dust Emissions Impact

During construction work, substantial quantity of dust shall be generated through excavation, construction, leveling works, and to a small extent, transport vehicles delivering materials. Emission of large quantities of dust may lead to significant impacts on construction workers and the local residents. This impact is rated high. However it is expected that after mitigation measures are applied, the residual impact will be low.

Noise and Vibration Impact

The construction works, delivery of materials by heavy trucks and the use of machinery/equipment including bulldozers, generators, graders and compactors shall contribute high levels of noise and vibration within the construction site and the surrounding area. Elevated noise levels within the site shall affect project workers, the residents, passers-by, domestic animals, wildlife and other persons within the vicinity of the project area.



Increased Soil Erosion Impact

The project area will be exposed to erosion and structures need to be developed to reduce soil erosion during construction activities. Soil erosion leads to sediments loading and silting water sources, reduction in stream flows upon abstraction or siltation, expose aquatic life to risks, depleted oxygen levels and destruction of river basin.

Impact on Vegetation clearance

Vegetation clearance/removal of tree shall be required which will lead to disruption/displacement of animal's ecosystems and death of animals, among others.

Extraction and Use of Materials Impacts

Construction materials such as hard core, rough stone, sharp sand gravel, laterite and water shall be required for the construction activities and will be obtained from quarries, bore holes and land. Sharp sand shall be extracted from rivers. Since substantial quantities of these materials will be required for construction of the proposed development project, the availability and sustainability of such resources at the extraction sites will be negatively affected, as they are not renewable in the short term. In addition, the sites from which the materials will be extracted shall be significantly affected in several ways including landscape changes, displacement of wildlife, intrusion into animal's breeding ground, and destruction of vegetation, poor visual quality and opening of depressions on the surface leading to pond creation thereby serving as a breeding ground for vector organisms, as well as other human and animal health impacts.

Exhaust Emissions Impact

Trucks and other vehicles that will be used to transport various materials from their sources to the project area will contribute to the increase in emissions of oxides of carbon, oxides of nitrogen, oxides of sulphur amongst other harmful gases and fine particulates along the way as a result of fossil fuel combustion. Such emissions can lead to several environmental and health impacts including global warming. The impacts of such emissions shall be greater in areas where the materials are sourced and at the construction site as a result of frequent combustion by vehicle engines, frequent vehicle turning and slow vehicle movement in the loading and offloading areas.



Risks of Accidents and Injuries to Workers

As a result of intensive engineering and construction activities, including grinding and cutting, masonry work, traffic, among others, construction workers will be exposed to risks of accidents and injuries. Such injuries will result from accidental falls from high elevations, injuries from hand tools and construction equipment, cuts from sharp edges of metal sheets, failure and collapse of machines. Injuries and/or fatal death can also occur due to attacks by wildlife. Open ditches, unfinished works and improper storage of materials can lead to accidents to both the public and workers.

Impacts on Soil

The impacts on the soil of the study area will be: disturbance of the natural soil structure, mixing of layers and compaction thus reducing the ecological function of soil in the respective areas. Generally, the valuable top soil containing organic material, nutrients as well as seeds and the soil fauna will be excavated separately for landscaping.

Waste Generation Impact

Large quantities of solid waste will be generated at the site during construction of the proposed development project. Such waste will consist of excavated materials, vegetation, metal drums, rejected materials, surplus materials, surplus spoils, paper bags, empty cartons, waste oil, and waste bitumen, amongst others. Such solid waste materials can be injurious to the environment through blockage of drainage systems, choking of water bodies and negative impacts on human and animal health. This may be emphasized by the fact that some of the waste materials contain hazardous substances such as waste oil, solvents, while some of the waste materials including metal cuttings and plastic containers are not biodegradable and can have long-term and cumulative effects on the environment.

Energy Consumption Impact

During the construction of the proposed project, fossil fuels will be used to run transport vehicles, generators and construction machinery. This fuel is non-renewable and its excessive use may have serious environmental implications on its availability, price and sustainability.



Contamination of Environment

Contamination of soil, water and air will take place during the construction process. Soil contamination will occur through aerial deposition and spills of related pollutants; asphalt residual, erosion by storm water. Air quality will be reduced due to generation of dust, hydrocarbon emissions, oxides of nitrogen, oxides of sulphur, oxides of carbon amongst other gases and particulate matter from machineries. Noise generation from machinery, equipment and increased traffic will also lead to disturbance of residential members, scare domestic and wild animals. Water shall be contaminated due to siltation of water pans, stream; deposit of construction residual materials (asphalt, cement, oil, hydrocarbons, spoils etc). The hydrological patterns will also be affected with increased flows from collection drains and surface run off from the site. The water quality shall change in terms of turbidity, hydrocarbon levels, silt, suspended solids, organic matter etc. Hydrocarbons levels at water sources will increase due to spillage and deposit of oil residue, transfer of hazardous material into aquatic and human systems leading to health risk.

Impact on Sanitary Facilities

Construction workers will require sanitary facilities while working in the field and other areas leading to pollution of the environment.

Water supply impact

The proposed project will create or require large quantities of water. Excessive water use may negatively impact on the water source and its sustainability.

Impact on Storm Water Flow and Demand for Sanitation

The roof and pavements will increase volume and velocity of storm water or run-off flowing across the project area.

Impact on Interference of Traffic Flow

If access road and its maintenance activities are not well planned or organized, it will interfere with traffic flow leading to delay, accidents and other negative impacts related to traffic flow.

Social Infrastructural Impact

From the existing baseline data collected, the project area has a very good and organized social infrastructures such as housing, portable water, schools, health centers, market etc.



This means that there will be increased pressure on these infrastructures as population will increase with the development of this project.

Impact on Health / Aesthetics

The impact of the proposed project on the health of the community may arise as a result of sharp increase in the population, induced by employment. This will increase the health demand on the existing health facilities in the community. This may lead to secondary effects like pollution, increase in solid waste generation in the environment of the project. On the positive side, the presence of clinics will go a long way in stabilizing the health situation in the area.

CHAPTER SIX

6.0 MITIGATION MEASURES

6.1 Introduction

This chapter presents the mitigation (preventive, reduction and control) measures considered to ensure that the associated and potential impacts of the project on the ecological and socio-economic environment are eliminated or reduced to as low as reasonably practicable (ALARP), thus preserving the ecological integrity of the existing environment. Also, stated here are details of the control technology and compliance with health and safety hazards requirements including a table showing potential impacts of proposed project with their proffered mitigation measures (Table 6.1).

6.2 Impact Mitigation Methodology

The framework for determining the form of mitigation measures to be applied for the significant impacts identified for the project is shown in Figure 6.1 below. The frequency, severity, sensitivity, scale, magnitude and nature of the impacts were taken into consideration in the assessment.

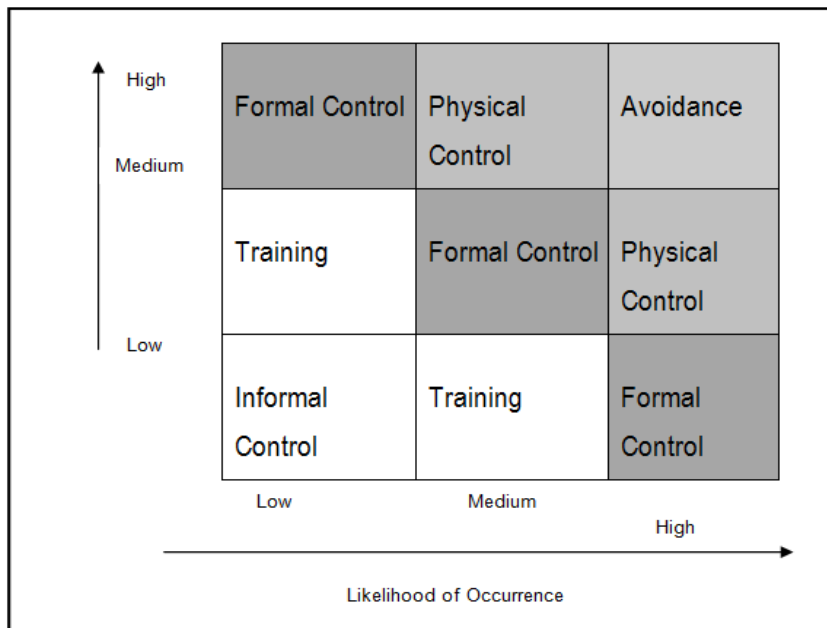


Figure 6.1: Matrix for Determination of Mitigation measures



The approaches to the mitigation measures include enhancement (for the positive impacts), prevention, reduction, avoidance and compensation (for the significant negative impacts). The mitigation measures for each (significant and adverse) impact of the proposed project activities were generally identified based on the associated effect to the environment and human health/safety.

The definitions of the various approaches to impact mitigation considered are presented below.

Enhancement: These are measures proffered to ensure that significant beneficial impacts of the existing facilities and proposed project are encouraged.

Prevention: These are measures proffered to ensure that significant and adverse potential impacts and risks do not occur.

Reduction: These are measures proffered to ensure that the effects or consequences of those significant associated and potential impacts that cannot be prevented are reduced to a level as low as reasonably practicable.

Formal control: This involves the application of documented policy, process or procedure in mitigating the impacts of the project activities.

Informal Control: This involves the application of sound judgment and best practice in mitigating the impacts of project activities.

Physical control: This involves the application of physical processes or instruments (pegs, flags, sign post etc), not necessarily requiring any special technology, in order to mitigate the impacts of a project or impacts.

Avoidance: This involves the modification of plans, designs or schedules in order to prevent the occurrence of an impact or impacts.

Training: This involves personnel awareness in specific / specialized areas.

6.3 Management Procedure for Mitigation Measures

The management procedures employed for the establishment of mitigation measures for the identified impacts is presented in figure 6.2. Mitigation measures were subsequently proffered for adverse significant potential impacts. These measures (prevention, reduction, control strategies) were developed for the adverse impacts through review of industry experience (past project experience), consultations and expert discussions with multi-disciplinary team of engineers and scientists.

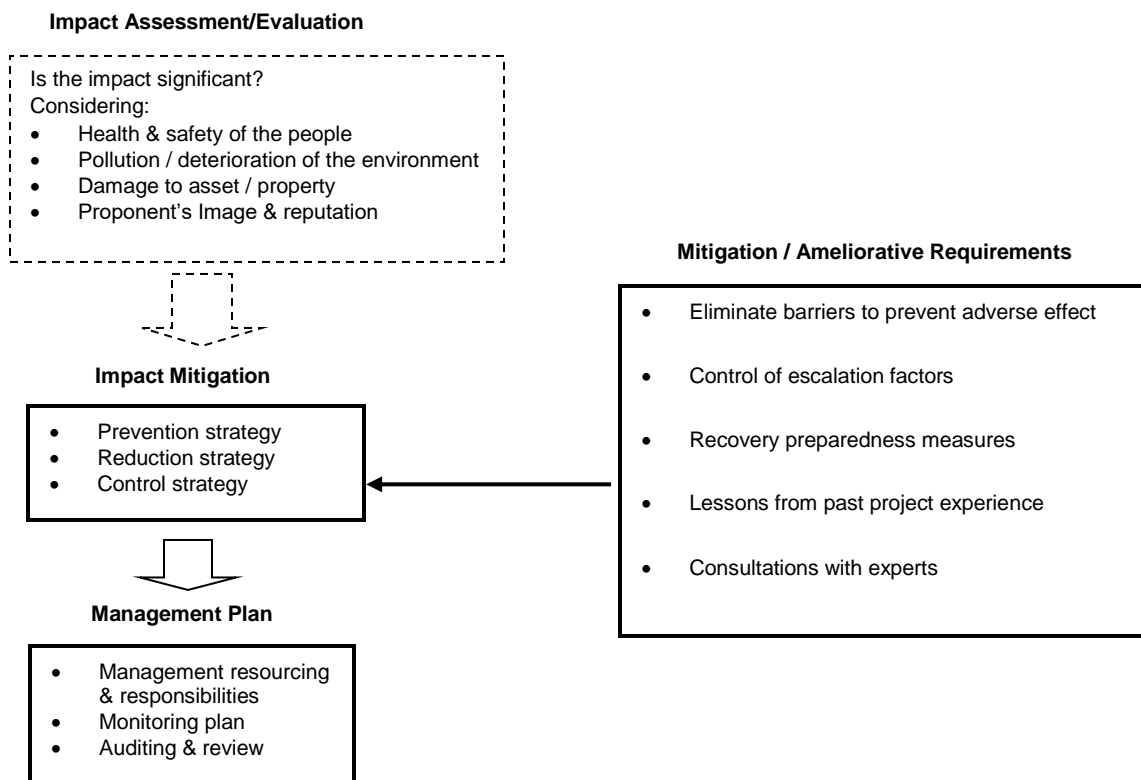


Figure 6.2: Management Procedure for Mitigation Measures



6.4 Proffered Mitigation Measures

Accordingly, this section presents the mitigation measures proffered for the significant (medium and high) adverse impacts of the project. These cost effective measures have been proffered with reference to best industry practice and HSE considerations.

Based on the impact assessment matrix in the previous section, the overall ratings of impact significance **High** or **Medium** or **Low** was established for each identified impact. The proffered mitigation measures and the expected final residual impact rating for the identified potential significant impacts are presented in the **Table 6.1**. A residual impact is the impact that is predicted to remain after mitigation measures have been designed into the intended activity. Impact prediction takes into account any mitigation, control and operational management measures that are part of the project design and project plan. The residual impacts are described in terms of their significance in accordance with the categories identified in chapter 5.



Table 6.1: Impacts and Mitigation Measures of the Proposed Project

Project Phase/Activity	Associated and Potential Impacts	Significance rating	Mitigation Measures	Residual Impact Rating
Pre-Construction -Permitting -Mobilization -Recruitment -Site Preparation	Economic loss arising from loss of farm lands	High	<p>KSMA&LD shall ensure:</p> <ul style="list-style-type: none"> • That due diligence is carried out prior to land acquisition. • To carry out census of affected farmers for compensation. • That all relevant stakeholders and issues are identified, discussed, and resolved properly prior to mobilization. • To implement regular consultations with the local community and other stakeholders (government, community, NGOs, CBOs, etc.) for effective communication and social license; support traditional conflict resolution structures in the project communities. • The activation of Grievance Redress Mechanism. • To compensate and resettle displaced farmers prior to mobilization. 	Medium
	Employment opportunities arising from recruitment of skilled and unskilled personnel	Beneficial	<p>KSMA&LD shall ensure:</p> <ul style="list-style-type: none"> • Local contractors are engaged, and prompt payment for engaged labour is made regularly. • Only specialised professional workers will be recruited from outside the communities • To encouraging contractors to maintain a list of short-term employees for future call-ups when required • Adopt procurement practices that favour local merchants and service providers where practicable consultation with the locals shall be carried out in terms of provision of jobs. • Prepare a Local Content Plan and strictly adhered to it in order to facilitate involvement of local labour. 	Positive
	Business opportunities for local contractors through subcontracting activities	Beneficial		
	Local support services from road side supply markets and shops etc	Beneficial		
	Skill acquisition and enhancements to local indigenes and workforce.	Beneficial		
Influx of people (migrant workers, sub-contractors and suppliers) and increased pressure on existing social infrastructure	Medium	<p>KSMA&LD shall ensure:</p> <ul style="list-style-type: none"> • To embark on community development programmes in line with the desires and needs of the people. • The provision of accommodation for workers. • Employment of indigenes. 	Low	



Project Phase/Activity	Associated and Potential Impacts	Significance rating	Mitigation Measures	Residual Impact Rating
	Increase of communicable diseases due to influx of people	Medium	<ul style="list-style-type: none"> To coordinate with medical posts and emergency services to prepare for water supply, waste management and incidents. To install proper and independent facilities at construction site for water supply, sanitation, solid and liquid waste, so that pressure on community infrastructure is limited. Areal fumigation and use of Insecticide Treated Net should be promoted in the Workers camp Sex education in protected sex, risk of casual sex and counselling services should be provided. Provision should be made for workers to live off-site with their families. 	
	Increase in social vices (like theft, prostitution etc.) resulting from increased number of people a	Medium	<p>KSMA&LD shall:</p> <ul style="list-style-type: none"> Make security plan and emergency response and contacts with security forces. Engage professional security outfit in protecting lives and properties within the project area and the community. This must be registered with the Nigerian Police/NSCDC etc. Prepare a Local Content Plan to facilitate involvement of locals in the security network. Develop a code of behaviours for workers. All workers to receive training on community relations and code of behaviour. Ensure that the workers are properly cautioned to respect the culture and place of worship of the people. 	Low
	Community agitation over unidentified stakeholder, leadership tussles etc.	High	<p>KSMA&LD shall:</p> <ul style="list-style-type: none"> Inform communities about details of construction activities (e.g., employment opportunities, schedule, timing of noise activities, traffic including movements of oversized loads) by billboards, posters and community meeting Set-up and effectively monitor project grievance redress mechanism Engage communities in the monitoring activities to enhance transparency and involvement. Enhance ongoing consultations with local communities (with good representation) to create continuous dialogue, trust and planning of community development activities. Proper consultation with the host communities and youth 	Low
	Conflicts/community agitations over employment issues (quota and methods)	High		



Project Phase/Activity	Associated and Potential Impacts	Significance rating	Mitigation Measures	Residual Impact Rating
			<p>organizations on the recruitment of labour and work at height.</p> <ul style="list-style-type: none"> • To liaise with local community head and relevant local organizations to work out formula for recruitment from the host communities • To be transparent in working out the formula for recruitment 	
	Noise and vibrations due to movement from heavy duty equipment and vehicles affecting site workers, residents and wildlife	Medium	<p>KSMA&LD shall ensure:</p> <ul style="list-style-type: none"> • Vehicles are fitted with effective silencers; • regular maintenance of heavy duty vehicles are performed; • Vehicles are switched off when not in use; • Maintain and operate all vehicles and equipment engines in accordance with manufacturers recommendations • Use experienced drivers and fuel-efficient equipment, vehicles and machineries throughout the project phases. • Develop a detailed plan that relates to noise control for relevant work practices and discuss this with workers during health & safety briefings • Select-low noise' equipment or methods of work • Use temporary noise barriers for equipment (e.g. sound proofing walls around stationary power generating sources). • Avoid dropping materials from height, where practicable • Avoid mobile plant clustering near residences and other sensitive land uses. • Ensure periods of respite are provided in the case of unavoidable maximum noise level events • Inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration. 	Low
	Increase of dust particles and vehicular emissions such as SO _x , NO _x , CO _x , etc	Medium	<p>KSMA&LD shall ensure:</p> <ul style="list-style-type: none"> • Engine to comply with international standards for exhaust gases; • Maintenance of engines and exhaust gas check; • Adoption of engine off policy at the site • Use of the cleanest fuel economically available shall be adopted • Maintain and operate all vehicles and equipment engines in accordance with manufacturers recommendations • Use experienced drivers and fuel-efficient equipment, vehicles and machineries throughout the project phases. 	Low



Project Phase/Activity	Associated and Potential Impacts	Significance rating	Mitigation Measures	Residual Impact Rating
	Increased traffic during mobilization on road with risk of accidents leading to injury/death and loss of asset	High	<p>KSMA&LD shall ensure:</p> <ul style="list-style-type: none"> The creation of awareness amongst commercial communities by signages on the potential of increase in traffic, and the need for extra precautions through public enlightenment. Compliance with journey management policy To minimize movement at the peak hours of the day That all traffic rules are obeyed by the drivers To engage security personnel in traffic control and management 	Medium
	Disturbance of the vegetative cover due to site clearing and preparation	Medium	<p>KSMA&LD shall ensure:</p> <ul style="list-style-type: none"> That vegetation clearing will be limited to the surveyed area That plants of economic value are transplanted To limit vegetation clearing to approved widths and, as practicable, to minimum required ; and for disturbed areas that are no longer required for project operations, monitor regrowth and, if necessary, initiate actions to enhance regrowth or re-vegetation with appropriate species consistent with operation requirement 	Low
	Littering of the environment due to waste from wood, sand paper; domestic waste from laydown area and camp site (material and wood)	High	<p>KSMA&LD shall ensure:</p> <ul style="list-style-type: none"> All other wastes generated including environmentally deleterious materials generated by the project activities shall be disposed offsite in an appropriate, legal, and safe manner. Generation of all wastes are minimize as much as practically possible Reuse waste materials wherever possible and use designated disposal site; There is collaboration with relevant waste management agencies to enforce appropriate sanitation and other bye laws. 	Low
	Contamination of surface water as a result of siltation caused by increased erosion during site preparation	Medium	<p>KSMA&LD shall ensure:</p> <ul style="list-style-type: none"> Implement effective site drainage on the construction yard to allow for the directed flow of surface water off site. This shall include cut-off drains to divert surface runoff from exposed soils or construction areas. Install oil/water separators and silt traps before effluent, leaves the site. Minimise bare ground and stockpiles to avoid silt runoff. Bundling of areas where hazardous substances are stored (e.g fuel, 	Low



Project Phase/Activity	Associated and Potential Impacts	Significance rating	Mitigation Measures	Residual Impact Rating
			<p>waste areas).</p> <ul style="list-style-type: none"> • That processed wastewater is treated before discharging to nearby water bodies. • That treated waste water is reused to minimize its discharge volume. • An inventory of waste is developed and maintained • Remove all water accumulation within bunds using manually controlled positive lift pumps not gravity drains. • Regular checking and maintenance of all plant and equipment to minimize the risk of fuel or lubricant leakages. • Training of relevant staff in safe storage and handling practices, and rapid spill response and clean-up techniques. • Backfill foundation pits by the excavated soils which will resemble the order of the original soil layers. • Protect excavated soil materials from erosion. • That the land is physically restored (include revegetation where possible) during the rainy season subsequent to the construction activities. • Use of existing track for transport of man and material to the extent possible. • Construction of foundations to be undertaken in the dry season. 	
<p>Construction/ Installation Civil work, Mechanical and Electrical work which include;</p> <ul style="list-style-type: none"> • Drainage • Foundation (trenching, Piling etc). • Building erection • Cabling and Conductor wire stringing • Painting and coating 	<p>Workplace accidents from burns, bruises, trips and falls, object at height leading to injury/ fatalities.</p>	<p>Medium</p>	<p>KSMA&LD shall ensure:</p> <ul style="list-style-type: none"> • Provision of adequate PPE especially gloves and helmet to workers. • All employees will be required to wear the appropriate PPE whilst performing their duties. • Unregistered labourers and touts shall not be employed. • Health and Safety Plan shall be developed and implemented. The plan shall provide for recording, reporting, and investigating accidents and near misses, and developing measures to prevent recurrence • workers shall be sensitized and monitored on the need to be safety conscious. • Daily toolbox talks prior to commencement of work activities shall be carried out. • Safety training focused on safe working practices, information on 	<p>Low</p>



Project Phase/Activity	Associated and Potential Impacts	Significance rating	Mitigation Measures	Residual Impact Rating
<ul style="list-style-type: none"> • Transportation and logistics etc. • Commissioning /Testing • Waste management 			specific hazards, first aid and fire- fighting shall be included in the induction programme for workers.	
	Employment of local labour and skills acquisition for workers taking advantage on new opportunities	Beneficial	KSMA&LD shall ensure: <ul style="list-style-type: none"> • Local contractors are engaged, and prompt payment for engaged labour is made regularly. • Only specialised professional workers will be recruited from outside the communities • To encouraging contractors to maintain a list of short-term employees for future call-ups when required • Adopt procurement practices that favour local merchants and service providers where practicable consultation with the locals shall be carried out in terms of provision of jobs. • Prepare a Local Content Plan and strictly adhered to it in order to facilitate involvement of local labour. 	Positive
	Increased business and economic activities as well as diversification of income sources due to supply contracting and sub-contracting	Beneficial		
	Increase in revenue opportunities for local population due to presence of non-resident workers and travelers	Beneficial		
	Generation of dust and automobile/heavy duty equipment emissions from construction earthworks.	High	KSMA&LD shall ensure: <ul style="list-style-type: none"> • Engine to comply with international standards for exhaust gases; • Maintenance of engines and exhaust gas check; • Adoption of engine off policy at the site • Use of the cleanest fuel economically available shall be adopted • Maintain and operate all vehicles and equipment engines in accordance with manufacturers recommendations • Use experienced drivers and fuel-efficient equipment, vehicles and machineries throughout the project phases. 	Medium
	Flora/habitat loss and disturbance through vegetation clearing and earthworks along access roads and building sites.	Medium	KSMA&LD shall ensure: <ul style="list-style-type: none"> • Ensure that vegetation clearing will be limited to the surveyed area • Ensure that plants of economic value are transplanted • for disturbed areas that are no longer required for project operations, monitor regrowth and, if necessary, initiate actions to enhance regrowth or revegetation with appropriate species consistent with operation requirement 	Low
	Fauna disturbance and displacement as a result of migration away from construction area (e.g. birds, rodents and reptiles)	Medium	KSMA&LD shall ensure: <ul style="list-style-type: none"> • Workers are warned not to kill fauna species but allow them to move back to the forest 	Low



Project Phase/Activity	Associated and Potential Impacts	Significance rating	Mitigation Measures	Residual Impact Rating
			<ul style="list-style-type: none"> • Work force are provided with and use appropriate PPE (cover all, safety boots, hard hats, hand gloves and safety goggles) before venturing into the bush; • Work force are provided assistants/experienced guides from the local communities to look out for signs of wild animals (including bees and wasps) in the bush; and trips into the work in inclement weather e.g., periods of low visibility, are avoided 	
	Soil/groundwater contamination resulting from improper waste disposal and accidental leakages and spill of hazardous substances (diesel, lubricants, hydraulic oil etc.)	Medium	<p>KSMA&LD shall ensure:</p> <ul style="list-style-type: none"> • Install oil/water separators and silt traps before effluent, leaves the site. • Bunding of areas where hazardous substances are stored (e.g fuel, waste areas). • An inventory of waste is developed and maintained • Remove all water accumulation within bunds using manually controlled positive lift pumps not gravity drains. • Training of relevant staff in safe storage and handling practices, and rapid spill response and clean-up techniques. • Waste bins shall be provided at designated locations on site for temporary storage of different waste streams. • General waste that cannot be reused or recycled shall be disposed of at an approved dumpsite. • Hazardous substances and materials (e.g. fuel, lubricating oil, etc.) shall be stored in appropriate locations with impervious hard standing and adequate secondary containment. • Portable spill containment and clean-up kits shall be available onsite. 	Low
	Risks injury/death and loss of assets resulting from accidents associated with road transportation to and from construction sites	High	<p>KSMA&LD shall:</p> <ul style="list-style-type: none"> • use standard warning notice (e.g. signal lights and horn) to other road users; • ensure a practicable journey management programme is developed and adhered to; • maintain speed limits for road vehicles • ensure that mobilization is carried out after due consultation with relevant road authorities and other stakeholders to minimize interference along the road ways 	Low



Project Phase/Activity	Associated and Potential Impacts	Significance rating	Mitigation Measures	Residual Impact Rating
	Traffic congestion during haulage of plant components to site for installation	Medium	KSMA&LD shall ensure: <ul style="list-style-type: none"> • the creation of awareness amongst commercial communities by signages on the potential of increase in traffic, and the need for extra precautions through public enlightenment. • compliance with journey management policy • to minimize movement at the peak hours of the day • that all traffic rules are obeyed by the drivers 	Low
	Risk of injury from fall from height and building collapse due to unstable geotechnical conditions	Medium	KSMA&LD shall ensure: <ul style="list-style-type: none"> • Provision of adequate PPE especially gloves and helmet to workers. • All employees will be required to wear the appropriate PPE whilst performing their duties. • Unregistered labourers and touts shall not be employed. • Health and Safety Plan shall be developed and implemented. The plan shall provide for recording, reporting, and investigating accidents and near misses, and developing measures to prevent recurrence • workers shall be sensitized and monitored on the need to be safety conscious. • Daily toolbox talks prior to commencement of work activities shall be carried out. • Safety training focused on safe working practices, information on specific hazards, first aid and fire- fighting shall be included in the induction programme for workers. • Test structures for integrity prior to undertaking work. • Implement a fall protection program that includes training in climbing techniques and the use of fall protection measures; inspection, maintenance, and replacement of fall protection equipment; and rescue of fall-arrested workers, among others. • Provide an adequate work-positioning device system for workers. 	Low
	Risk of electrocution and burns (to onsite workers) during electrical installation processes	Medium	KSMA&LD shall ensure: <ul style="list-style-type: none"> • Appropriate PPE shall be provided for workers. • Workers shall imbibe the workplace safety rules via proper sensitization procedures. • Strict compliance to the SOPs shall be ensured. • A conduit type of wiring shall be adopted instead of a surface to 	Low



Project Phase/Activity	Associated and Potential Impacts	Significance rating	Mitigation Measures	Residual Impact Rating
			<p>prevent shock.</p> <ul style="list-style-type: none"> • Only allowing trained and certified workers to install, maintain, or repair electrical equipment; • Deactivating and properly grounding live power distribution lines before work is performed on, or close to, the lines; • ensuring that live-wire work is conducted by trained workers with strict adherence to specific safety and insulation standards. • Prior to excavation works, all existing underground cable installations should be identified and marked. Drawings and plans should indicate such installations. 	
	Reduction in wildlife population as a result of poaching due to easier access created by access roads	High	<p>KSMA&LD shall ensure:</p> <ul style="list-style-type: none"> • Workers are warned not to kill fauna species but allow them to move back to the forest. • Poachers are not allowed access to the site • Work force are provided with and use appropriate PPE (cover all, safety boots, hard hats, hand gloves and safety goggles) before venturing into the bush; • Work force are provided assistants/experienced guides from the local communities to look out for signs of wild animals (including bees and wasps) in the bush; and trips into the work in inclement weather e.g., periods of low visibility, are avoided 	Low
	Inhalation by onsite workers of cement dust and toxic fumes during foundation works and welding for building components	High	<p>KSMA&LD shall:</p> <ul style="list-style-type: none"> • Cover properly loose materials and keep top layers moist • Use binder material for erosion and dust control for long term exposed surfaces. • Regular cleaning of equipment, drains and roads to avoid excessive buildup of dirt. Spray surfaces prior to excavation • Use covered trucks for the transportation of materials that release dust emissions. • Speed limits on-site of 15 k/h should be recommended and enforced 	Medium
	Noise nuisance from construction activities e.g. Piling resulting to irritation in humans and temporal migration of sensitive mammals	High	<p>KSMA&LD shall ensure that:</p> <ul style="list-style-type: none"> • Vehicles are fitted with effective silencers; • regular maintenance of heavy duty vehicles are performed; • Vehicles are switched off when not in use; • Maintain and operate all vehicles and equipment engines in 	Low



Project Phase/Activity	Associated and Potential Impacts	Significance rating	Mitigation Measures	Residual Impact Rating
		High	<p>accordance with manufacturers recommendations</p> <ul style="list-style-type: none"> • Use experienced drivers and fuel-efficient equipment, vehicles and machineries throughout the project phases. • Develop a detailed plan that relates to noise control for relevant work practices and discuss this with workers during health & safety briefings • Select-low noise' equipment or methods of work • Use temporary noise barriers for equipment (e.g. sound proofing walls around stationary power generating sources). • Avoid dropping materials from height, where practicable • Avoid mobile plant clustering near residences and other sensitive land uses. • Ensure periods of respite are provided in the case of unavoidable maximum noise level events • Inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration. 	
	Visual intrusion as a result of alterations from accidental ignition of onsite diesel storage tanks	Medium	<p>KSMA&LD shall:</p> <ul style="list-style-type: none"> • Maintain construction site in orderly condition and do not distribute material over many sites before usage. 	Low
	<p>Waste Disposal</p> <ul style="list-style-type: none"> • Scrap metal, wood, sand, concrete, paper • Spent-oil and replaced /obsolete equipment parts that may contaminate soil/ground water • Waste from laydown area and building sites causing unsightliness 	High	<p>KSMA&LD shall ensure:</p> <ul style="list-style-type: none"> • All other wastes generated including environmentally deleterious materials generated by the project activities shall be disposed offsite in an appropriate, legal, and safe manner. • Generation of all wastes are minimize as much as practically possible • Reuse waste materials wherever possible and use designated disposal site; • There is collaboration with relevant waste management agencies to enforce appropriate sanitation and other bye laws. 	Low
DEMobilisation -Demobilization after construction phase	Workplace accidents from burns, cuts, bruises, trips and falls, object at height leading to injury of fatalities.	Medium	<p>KSMA&LD shall ensure:</p> <ul style="list-style-type: none"> • Provision of adequate PPE especially gloves and helmet to workers. • All employees will be required to wear the appropriate PPE whilst performing their duties. • Unregistered labourers and touts shall not be employed. 	Low



Project Phase/Activity	Associated and Potential Impacts	Significance rating	Mitigation Measures	Residual Impact Rating
			<ul style="list-style-type: none"> • Health and Safety Plan shall be developed and implemented. The plan shall provide for recording, reporting, and investigating accidents and near misses, and developing measures to prevent recurrence • workers shall be sensitized and monitored on the need to be safety conscious. • Daily toolbox talks prior to commencement of work activities shall be carried out. • Safety training focused on safe working practices, information on specific hazards, first aid and fire- fighting shall be included in the induction programme for workers. • Test structures for integrity prior to undertaking work. • Implement a fall protection program that includes training in climbing techniques and the use of fall protection measures; inspection, maintenance, and replacement of fall protection equipment; and rescue of fall-arrested workers, among others. • Provide an adequate work-positioning device system for workers. 	
	Soil/groundwater contamination resulting from accidental leakages and spill of hazardous substances (diesel, lubricants, hydraulic oil etc.)	Medium	<p>KSMA&LD shall ensure:</p> <ul style="list-style-type: none"> • Install oil/water separators and silt traps before effluent, leaves the site. • Bunding of areas where hazardous substances are stored (e.g fuel, waste areas). • Remove all water accumulation within bunds using manually controlled positive lift pumps not gravity drains. • Training of relevant staff in safe storage and handling practices, and rapid spill response and clean-up techniques. • Hazardous substances and materials (e.g. fuel, lubricating oil, etc.) shall be stored in appropriate locations with impervious hard standing and adequate secondary containment. • Portable spill containment and clean-up kits shall be available onsite. 	Low
	Traffic congestion during transportation of demobilized equipment and personnel	High	<p>KSMA&LD shall ensure:</p> <ul style="list-style-type: none"> • The creation of awareness amongst commercial communities by signages on the potential of increase in traffic, and the need for extra precautions through public enlightenment. • Compliance with journey management policy 	Low



Project Phase/Activity	Associated and Potential Impacts	Significance rating	Mitigation Measures	Residual Impact Rating
			<ul style="list-style-type: none"> To minimize movement at the peak hours of the day That all traffic rules are obeyed by the drivers To engage security personnel in traffic control and management 	
	Generation of dust and automobile/heavy duty equipment emissions	Medium	KSMA&LD shall ensure: <ul style="list-style-type: none"> Engine to comply with international standards for exhaust gases; Maintenance of engines and exhaust gas check; Adoption of engine off policy at the site Use of the cleanest fuel economically available shall be adopted Maintain and operate all vehicles and equipment engines in accordance with manufacturers recommendations Use experienced drivers and fuel-efficient equipment, vehicles and machineries throughout the project phases. 	Low
	Waste disposal (scrap metal, wood, sand, concrete, paper)	Medium	KSMA&LD shall ensure: <ul style="list-style-type: none"> All other wastes generated including environmentally deleterious materials generated by the project activities shall be disposed offsite in an appropriate, legal, and safe manner. Generation of all wastes are minimize as much as practically possible Reuse waste materials wherever possible and use designated disposal site; There is collaboration with relevant waste management agencies to enforce appropriate sanitation and other bye laws. 	Low
	Loss of employment and business opportunities due to completion of construction phase	Medium	KSMA&LD shall: <ul style="list-style-type: none"> Counsel worker and occupant who losses job. Give enough notice Pay Workers all entitlement due to them prior to job loss 	Low
	Illegal access to building site leading to accident, asset damage and loss	Medium	KSMA&LD shall: <ul style="list-style-type: none"> Make security plan and emergency response and contacts with security forces. Professional security outfit be engaged in preventing illegal access to the building sites Prepare a Local Content Plan to facilitate involvement of locals in the security network. 	Low



Project Phase/Activity	Associated and Potential Impacts	Significance rating	Mitigation Measures	Residual Impact Rating
OPERATION AND MAINTENANCE <ul style="list-style-type: none"> • Building inspection and checks • Power generation/ servicing • Transportation of raw materials and finished product • Agro-products processing for export. • Plant maintenance • Industrial waste discharges • Emergence of small-scale enterprises • Green Buffer development around each industrial plot. • Recruitment of workers 	Risk of injury from fall from height/trip or being hit by an object	Medium	KSMA&LD shall ensure that: <ul style="list-style-type: none"> • A comprehensive HSE Policy must be displaced openly, and enforced through monitoring within the site; • All staff must be trained and retrained on regular basis for HSE compliance; • Develop a training program including a code of conduct for all workers; • Well-equipped Clinic should be put up for emergency attention, while referral system should be arranged with a Secondary Hospital 	Low
	Security threat such as kidnapping and banditry attack	High	KSMA&LD shall: <ul style="list-style-type: none"> • Engage trained security personnel • Avoid lone working • Avoid working at nights • Avoid night journeys 	Medium
	Air pollution by gaseous emission (CO, SO ₂ , NO ₂) and particulates from power generator	High	KSMA&LD shall ensure: <ul style="list-style-type: none"> • Generator to comply with international standards for exhaust gases; • Maintenance of generator and exhaust gas check; • Use of the cleanest fuel economically available shall be adopted 	Low
	Soil contamination resulting from accidental leakages and spill of hazardous substances from generator servicing (diesel, spent oil etc.)	Medium	KSMA&LD shall ensure: <ul style="list-style-type: none"> • Install oil/water separators and silt traps before effluent, leaves the site. • Bunding of areas where hazardous substances are stored (e.g fuel, waste areas). • Remove all water accumulation within bunds using manually controlled positive lift pumps not gravity drains. • Training of relevant staff in safe storage and handling practices, and rapid spill response and clean-up techniques. • Hazardous substances and materials (e.g. fuel, lubricating oil, etc.) shall be stored in appropriate locations with impervious hard standing and adequate secondary containment. • Portable spill containment and clean-up kits shall be available onsite. • Conduct bioremediation of polluted soil immediately to inhibit further spread 	Low



Project Phase/Activity	Associated and Potential Impacts	Significance rating	Mitigation Measures	Residual Impact Rating
	Generation of dust and gaseous pollutants from automobile emissions	High	KSMA&LD shall ensure: <ul style="list-style-type: none"> • Engine to comply with international standards for exhaust gases; • Maintenance of engines and exhaust gas check; • Adoption of engine off policy at the site • Use of the cleanest fuel economically available shall be adopted • Maintain and operate all vehicles and equipment engines in accordance with manufacturers recommendations • Use experienced drivers and fuel-efficient equipment, vehicles and machineries throughout the project phases. • Preference for usage of clean fuel like LPG, low sulphur diesel should be explored; • Energy conservation should be adopted by opting the alternate energy options like solar power; • Power Generators and equipment should be provided with stacks of adequate height (higher than nearest building) to allow enough dispersion of emission; • Enclosure of dust producing equipment, • Use of local exhaust ventilation; • Use of dust extraction and recycling systems to remove dust from work areas; • Regular checking and maintenance of all plant and equipment to minimize the risk gas leakage 	Low
	Odour disturbances from the processing of Rice, Tomato, Edible oil etc	High	KSMA&LD shall <ul style="list-style-type: none"> • Ensure all processing equipment are installed in an enclosed plant and processing activities are taking place within an enclosed system. • Ensure provision of appropriate PPE (respiratory protection) for workers and enforce usage. • Ensure that project staff are not exposed to more than nine hours at a go on any equipment generating noise level of more than 90 dBA 	Medium
	Increase in noise level nuisance from operation machines and from vehicles plying the access roads	High	KSMA&LD shall ensure that: <ul style="list-style-type: none"> • Vehicles are fitted with effective silencers; • regular maintenance of heavy duty vehicles are performed; • Vehicles are switched off when not in use; • Maintain and operate all vehicles and equipment engines in 	Low



Project Phase/Activity	Associated and Potential Impacts	Significance rating	Mitigation Measures	Residual Impact Rating
			<p>accordance with manufacturers recommendations</p> <ul style="list-style-type: none"> • Use experienced drivers and fuel-efficient equipment, vehicles and machineries throughout the project phases. • Develop a detailed plan that relates to noise control for relevant work practices and discuss this with workers during health & safety briefings • Select-low noise' equipment or methods of work • Use temporary noise barriers for equipment (e.g. sound proofing walls around stationary power generating sources). • Avoid dropping materials from height, where practicable • Avoid mobile plant clustering near residences and other sensitive land uses. • Ensure periods of respite are provided in the case of unavoidable maximum noise level events • Inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration. • Machineries to be used should comply with the noise standards prescribed by FMEnv. • Workers shall be given PPE (ear plugs) and enforce compliance; 	
	Traffic congestion along agro-products transportation route	Medium	<p>KSMA&LD shall ensure:</p> <ul style="list-style-type: none"> • The creation of awareness amongst commercial communities by signages on the potential of increase in traffic, and the need for extra precautions through public enlightenment. • Compliance with journey management policy • To minimize movement at the peak hours of the day • That all traffic rules are obeyed by the drivers • To engage security personnel in traffic control and management 	Low
	Threat to community culture, safety and security due to presence of workers and business opportunists	Medium	<p>KSMA&LD shall:</p> <ul style="list-style-type: none"> • Develop an induction program including a code of conduct for all workers. Code of conduct to address the following: <ul style="list-style-type: none"> ○ Respect for local residents; ○ unauthorized taking of products; ○ Zero tolerance of illegal activities such as child sexual exploitation and underage sex, prostitution, harassment of women, Gender Based Violence (GBV,) purchase or use of 	Low



Project Phase/Activity	Associated and Potential Impacts	Significance rating	Mitigation Measures	Residual Impact Rating
			<ul style="list-style-type: none"> illegal drugs, ○ Disciplinary measures and sanctions (e.g. dismissal) for infringement of the code of conduct and/or company rules; ○ Commitment / policy to cooperate with law enforcement agencies investigating perpetrators of GBV. ● Limit the number of migrant workers by engaging local workers. 	
	Reduction of water tables and source of water for production processes	High	<p>KSMA&LD shall ensure:</p> <ul style="list-style-type: none"> ● Water conservation measures should be practiced ● Waste water should be recycled for reuse. ● Rain water harvesting. ● Adoption of continuous horizontal washers and vertical spray washers or vertical, double-laced washers. ● Adoption of counter current washing (e.g. reuse the least contaminated water from the final wash for the next-to last wash). ● Use of water flow-control devices to ensure that water only flows to a process when needed. 	Low
	Metallic materials generation from plant parts, retrofitting/upgrade of parts during plant servicing	Medium	<p>KSMA&LD shall ensure:</p> <ul style="list-style-type: none"> ● Recyclable materials should be sorted and sold to scrap metal converters ● Regular checking and maintenance of all plant and equipment to minimize the risk of fuel or lubricant leakages. 	Low
	Potential for land contamination from industrial waste disposal	Medium	<p>KSMA&LD shall ensure:</p> <ul style="list-style-type: none"> ● All other wastes generated including environmentally deleterious materials generated by the project activities shall be disposed offsite in an appropriate, legal, and safe manner. ● Generation of all wastes are minimize as much as practically possible ● Reuse waste materials wherever possible and use designated disposal site; ● There is collaboration with relevant waste management agencies to enforce appropriate sanitation and other bye laws. 	Low
	Pollution of surface water bodies by wastewater generated from industrial waste discharges	High		
	Creation of job and acquisition of skills by individuals to be employed as operators	Beneficial	<p>KSMA&LD shall ensure:</p> <ul style="list-style-type: none"> ● Local contractors are engaged, and prompt payment for engaged labour is made regularly. ● Only specialised professional workers will be recruited from outside the communities 	Positive



Project Phase/Activity	Associated and Potential Impacts	Significance rating	Mitigation Measures	Residual Impact Rating
			<ul style="list-style-type: none"> To encouraging contractors to maintain a list of short-term employees for future call-ups when required Adopt procurement practices that favour local merchants and service providers where practicable consultation with the locals shall be carried out in terms of provision of jobs. Prepare a Local Content Plan and strictly adhered to it in order to facilitate involvement of local labour. 	
Decommissioning/ Abandonment <ul style="list-style-type: none"> Removal of electrical cables and wires, water and sewage treatment plant pipelines. Demolition of buildings for facilities retrieval Waste generation Transportation of Plant components for sale/another site Re-vegetation of site 	Risk of accident and injury to workers during demolition of structures	Medium	KSMA&LD shall ensure that: <ul style="list-style-type: none"> A comprehensive HSE Policy must be displace openly, and enforced through monitoring within the site; All staff must be trained and retrained on regular basis for HSE compliance; Develop a training program including a code of conduct for all workers; Well-equipped Clinic should be put up for emergence attention, while referral system should be arranged with a Secondary Hospital 	Low
	Increased dust and vehicular emissions during haulage of plant components from site by heavy-duty vehicles	Medium	KSMA&LD shall ensure: <ul style="list-style-type: none"> Engine to comply with international standards for exhaust gases; Maintenance of engines and exhaust gas check; Adoption of engine off policy at the site Use of the cleanest fuel economically available shall be adopted Maintain and operate all vehicles and equipment engines in accordance with manufacturers recommendations Use experienced drivers and fuel-efficient equipment, vehicles and machineries throughout the project phases. 	Low
	Risk of soil and adjoining surface water contamination from accidental oil and hazardous substance leakages	Medium	KSMA&LD shall ensure: <ul style="list-style-type: none"> Install oil/water separators and silt traps before effluent, leaves the site. Bunding of areas where hazardous substances are stored (e.g fuel, waste areas). Remove all water accumulation within bunds using manually controlled positive lift pumps not gravity drains. Training of relevant staff in safe storage and handling practices, and rapid spill response and clean-up techniques. Hazardous substances and materials (e.g. fuel, lubricating oil, etc.) shall be stored in appropriate locations with impervious hard 	Low



Project Phase/Activity	Associated and Potential Impacts	Significance rating	Mitigation Measures	Residual Impact Rating
			standing and adequate secondary containment. <ul style="list-style-type: none"> Portable spill containment and clean-up kits shall be available onsite. 	
	Traffic obstruction from transportation of decommissioned structures and equipment	Medium	KSMA&LD shall ensure: <ul style="list-style-type: none"> The creation of awareness amongst commercial communities by signages on the potential of increase in traffic, and the need for extra precautions through public enlightenment. Compliance with journey management policy To minimize movement at the peak hours of the day That all traffic rules are obeyed by the drivers To engage security personnel in traffic control and management 	Low
	Abandoned structures possibly taken-over by miscreants/criminals	High	KSMA&LD shall: <ul style="list-style-type: none"> Make security plan and emergency response and contacts with security forces. Re-vegetate the site with local plant species 	Medium
	Availability of land for alternative uses such as community hall, farmland e.t.c	Beneficial	KSMA&LD shall ensure: Use local plant species to re-vegetate the abandoned site	Positive
	Improved Ecology, Air Quality and Aesthetics	Beneficial		



6.5 Impact Mitigating Measures for Pre-Construction and Construction Phase

6.5.1 Vegetation Clearance and Disturbance

Clearance of vegetation at the project site to pave way for construction shall take place within the perimeter of the acquired land. This will be aimed at ensuring that any disturbance to flora and fauna is restricted to the actual project area and avoid spillover effects on the neighbouring areas. In the same vein, there will be strict control of construction vehicles to ensure that they operate only within the area allocated with access routes and other works; deviation works shall be confined close to the road to avoid spread of vegetation destruction; avoid encroachment into drainage. Since sustainable development equally recognizes that vegetation must inevitably give way to developmental projects, adequate care will be taken in order that some native plants within the project radius (2km) will be conserved. Specifically, only trees at the project right of way shall be cut. In addition, the proponent shall re-vegetate some of the disturbed areas through implementation of a well-designed landscaping programme. It is recommended that part of the topsoil excavated from the construction site be re-spread in areas to be landscaped to enhance plant health.

6.5.2 Run-off and Soil Erosion

The contractors shall put in place measures aimed at minimizing run-off and spillover effects on neighbouring land as well as sources of water during rainy season or when wet activities are being conducted on the site. These measures will include clearing the project site of excavated materials or protect excavated sections from storm water, back filling and creating proper channels for waste water and solid waste disposal, develop emergency measures and procedures for protection of soils and streams downstream from effect of siltation, design adequate culverts to accommodate peak flows; stabilize cut-surfaces with gabions, concrete walls, vegetation etc.; direct all surface runoff into existing natural drains and stabilize the drains downstream.

6.5.3 Dust Generation and Emission

Dust emission during construction shall be minimized through strict enforcement of speed controls in the host community as well as limiting unnecessary traffic within the



project site from vehicle delivering materials. Some dust generating activities shall be carried out under wet condition within the project site by damping with water regularly to reduce amount of dust generated by the construction trucks and other heavy equipment. The workers will also be provided with nose masks to protect them against dust effects.

6.5.4 Noise and Vibration

Noise and vibration shall be minimized in the project site and surrounding areas through sensitization of construction truck drivers to switch off vehicle engines, avoid gunning of vehicle engines or hooting during movement and while offloading materials. Construction machinery including generators and heavy duty equipment shall be insulated or placed in enclosures to minimize ambient noise levels, construction activities to be conducted during the day in order to avoid noise nuisance to the resident around the areas, excavation to be undertaken with ordinary earth movers, ensure good maintenance of vehicles and equipment. Engine mufflers shall be incorporated into all project equipment to reduce noise pollution.

6.5.5 Mitigation Measures for Energy Consumption Impact

There shall be proper planning of material transportation; this will ensure that fossil fuels (diesel, petrol) are not consumed in excessive amounts. Complementary to these measures, the contractor will monitor energy use during construction and set targets for reduction of energy use. Renewable energy sources at the project site office as a sustainable alternative are recommended.

6.5.6 Exhaust Emissions

This shall be achieved through proper planning of transportation of materials to ensure that vehicle fills are increased within axle weight limits in order to reduce the number of trips or the number of vehicles on the road. Truck drivers shall be sensitized to avoid unnecessary racing of vehicle engines at loading/offloading areas, and to switch off or keep vehicle engines off at these points. Machineries for construction and other combustion sources shall be provided with equipment to enhance high-efficiency burners that will minimize the emission of noxious gases.



6.5.7 Construction Waste Impact

Construction wastes shall be reused to ensure that materials that would otherwise be disposed of as waste are diverted for productive uses. In this regard, the contractor shall be committed to ensuring that construction materials left over at the end of construction is used in the same or other projects rather than being disposed of. In addition, damaged or waste construction materials including gravel, cement, off-cut of rods, wood and roofing sheets, damaged blocks and waste oil among others shall be recovered for use in other projects. Such measures will involve the sale or donation of such recyclable/reusable materials to construction companies, local community groups, institutions and individual residents (secondary users). An integrated solid waste management system shall be employed by the contractors. Solid wastes arising from construction works shall be contained and disposed in approved disposal site by the service of Katsina State Environmental Protection Agency's registered waste contractors. Priority shall be given to reducing waste at source. Other measures to be employed in minimizing solid waste during construction of the project shall include:-

- Use of durable, long-lasting materials and equipment's that will not need to be replaced as often, thereby reducing the amount of construction waste generated over time.
- Provision of facilities for proper handling and storage of construction materials to reduce the amount of waste caused by damage or exposure to the elements of weather.
- Use of construction materials that have minimal packaging to avoid the generation of excessive packaging waste.
- Use of construction materials containing recycled content when possible and in accordance with accepted standards.

6.5.8 Water Use and pollution of water sources

The contractor shall ensure that water shall be used efficiently at the site by sensitizing construction staff to avoid irresponsible water usage. No solid waste, fuels/oil shall be discharged into drains. Washing of construction equipment and trucks shall be carried out in a designated area. Waste water from project site and from the site office shall be



channeled into the appropriate channel to avoid contamination of water bodies (both surface and ground) and soils.

6.5.9 Mitigation Measures for Landscape related impacts

The proposed project and Associated Services will affect the surrounding landscape, which encompasses natural relief, vegetation, water courses and other object of aesthetic value. As a result, the project activities will follow the natural relief as far as practicable and cutting of native trees will be minimized.

6.5.10 Mitigation Measures for Human Health and Safety Impact

Since the proposed project will be instrumental in the contamination of water body, air and noise pollution, road accidents, poor signage and traffic control systems worsen the situation if not properly managed. The ESIA report recommends that the project team through the PRO in conjunction with the host and neighbouring Community Leaders and FRSC to carry out comprehensive awareness to prevent outbreaks of communicable diseases including STIs, Screen and treat the affected persons, control dust by spraying water and assign high priority to accident preventive measures, enforce mandatory use of seatbelts, compulsory driver training and testing, prohibition and punishment of driving while those impaired with drugs or alcohol, traffic safety education, testing and inspection of all vehicles to comply with national safety standards, Improve road safety features for non-motorized vehicles, provide proper safety feature for vulnerable road users like pedestrians and cyclists, and reducing congestion.

6.6 Mitigation for Operation and Maintenance Phase Impacts

6.6.1 Efficient Solid Waste Management

Katsina State Environmental Protection Agency's accredited waste contractor shall be responsible for efficient management of solid waste that shall be generated by the project during its operation and maintenance phase. In this regard, waste handling facilities such as waste receptacles for temporarily holding of domestic waste generated shall be provided. In addition, they will ensure that the waste is disposed off regularly and appropriately.



6.6.2 Social Impact

Immigration of workers will be controlled through employment of locals. Locals' capacity building will be conducted to prepare them for challenging assignment. The contractor will discourage labour yard by allowing workers to live at their homes; this is to reduce vices that will be induced by immigrating labourers as this normally increases incidence of illicit behavior.

6.6.3 Energy Consumption

The contractor shall use energy-efficient lighting systems to light the entire area. This will contribute immensely to energy saving during the operational phase of the project. This will ensure adequate management of the power supply.

6.6.4 Mitigation Measures for Environmental Pollution and Contamination impact

All measures will be put in place to avoid environmental pollution and contamination. Oil spillage management measures will be put in place (through storage, and disposal) including use of bio-diesel; materials will be covered to avoid pollution caused by elements of weather such as wind, rain etc; enclose plants and usage and materials transfer facilities, smoking equipment's during site clearing and trucks will be installed with pollution control devices including; control leakages during maintenance and cleaning of vehicles and construction equipment; noisy equipment's shall be installed with sound proof; proper drainage and erosion structures shall be developed to reduce effects of erosions; contaminated soils shall be stabilized before disposal, avoid disposal of oil residuals, asphalt, and engine parts; hold top soils from material sites for rehabilitation and stabilize cut sections. Professional handling of pollution point sources during the project development and decommission of the potential point sources of pollution will be necessary. Quality control of the streams shall be conducted downstream; culverts shall be kept clear at all times and channeled into natural drains, control soil loss from the neighbouring land through storm water flows, introduce appropriate vegetation in the project area and compel occupant to take responsibility of their own pollutants by depositing them in the appropriate bins for evacuation.



6.6.5 Occupational Health and Safety Impact

Contractors of the project shall ensure adherence to the occupational health and safety rules and regulations. They shall be committed to provision of security, insurance of both personnel and equipment, train and develop capacity especially for inexperienced labourers/workers, compensate for losses and injuries, provide appropriate personal protective equipment, as well as ensuring a safe and healthy environment for construction workers as outlined in the ESMP. Other critical practices that shall be ensured to enhance safety are: evaluation of risks, inform host community on schedule and activities, workers shall be trained on health and safety procedures, reflective signage shall be installed for safety of workers/users, keep public away from material site. In addition, the construction workers shall be exposed to ‘Daily Safety Briefing’ on health, safety and environment (HSE) to reduce or completely eliminate this impact. Use of PPE shall be enforced. Project workers that shall be engaged with electrical works shall be provided with electrical protective devices such as line hose, gloves, covers and sleeves made of rubber.

6.7 Mitigation for Decommissioning Phase Impacts

6.7.1 Mitigation Measures for Dust Emission Impact

Dust emission during decommissioning shall be minimized through strict enforcement of onsite speed controls as well as limiting unnecessary traffic within the area. Some dust generating activities shall be carried out in wet condition; and unpaved traffic routes within and around the area shall be damped with water regularly to reduce amount of dust generated by trucks. The workers will also be provided with nose masks to protect them against dust effects.

6.7.2 Mitigation Measures for Exhaust Emissions Impact

This shall be achieved through proper planning of transportation of materials outside the area and the dismantling activities to ensure that vehicle fills are increased within axle weight limits in order to reduce the number of trips or the number of vehicles on the road. Truck drivers shall be sensitized to avoid unnecessary racing of vehicle engines at loading/offloading areas, and to switch off or keep vehicle engines off at these points.



Machineries for dismantling and other combustion sources will have high-efficiency burners that will minimize the emission of noxious gases.

6.7.3 Efficient Solid Waste Management Impact

Decommissioning waste shall be recycled or reused to ensure that materials that would otherwise be disposed of as waste are diverted for productive uses. In this regard, the contractor shall be committed to ensuring that materials left over shall be used in the same or other project rather than being disposed of. Such measures will involve the sale or donation of such recyclable/reusable materials to construction companies, refilling of gullies. An integrated solid waste management system shall be employed. Solid wastes arising from decommissioning shall be contained and disposed off in approved disposal site.

6.7.4 Mitigation Measures for Noise and Vibration Impact

Noise and vibration shall be minimized in the project site and surrounding areas through sensitization of truck drivers to switch off vehicle engines, avoid gunning of vehicle engines or hooting during movement and while offloading materials. Machinery including generators and heavy duty equipment shall be placed in enclosures to minimize ambient noise levels, decommissioning activities to be conducted during the day, excavation to be undertaken with ordinary earth movers, ensure good maintenance of vehicles and equipment. The contractor will provide hearing protective devices, specifically ear muff, for all project workers. The use of the ear-muffs at all times on the site shall be strictly enforced.



CHAPTER SEVEN

7.0 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN(ESMP)

7.1 Introduction

This chapter presents the Environmental and Social Management Plan (EMP) developed for the proposed construction of Special Agro-industrial Processing Zone (SAPZ), Katsina, Nigeria. An environmental and social management plan (ESMP) is essentially a management tool and standalone component of an ESIA that provides the assurance that the mitigation measures developed for the significant impacts of a proposed project are implemented and maintained throughout the project lifecycle. It outlines management strategies for safety, health and environment stewardship in the proposed project implementation. It states in specific terms how the project proponent's commitments will be implemented to ensure sound environmental practice.

Katsina State Government has designed the ESMP of the proposed project in line with its Health, Safety and Environment (HSE) policy and in accordance with ISO 14001 Environmental Management System specifications. The ESMP for the proposed project shall be a “life document” which shall be reviewed periodically with the incorporation of various mitigation measures for potential impacts and shall form the basis for the actual project implementation.

Compliance with the legal standards on safety and environment is regarded as the minimum requirement, and must be satisfied during all phases of the Project development. In order to reduce the risk of an adverse effect on the environment to the lowest level that is reasonably practicable, an objective of the engineering design will be to apply the ALARP principle. Figure 7.1 illustrates this principle graphically.

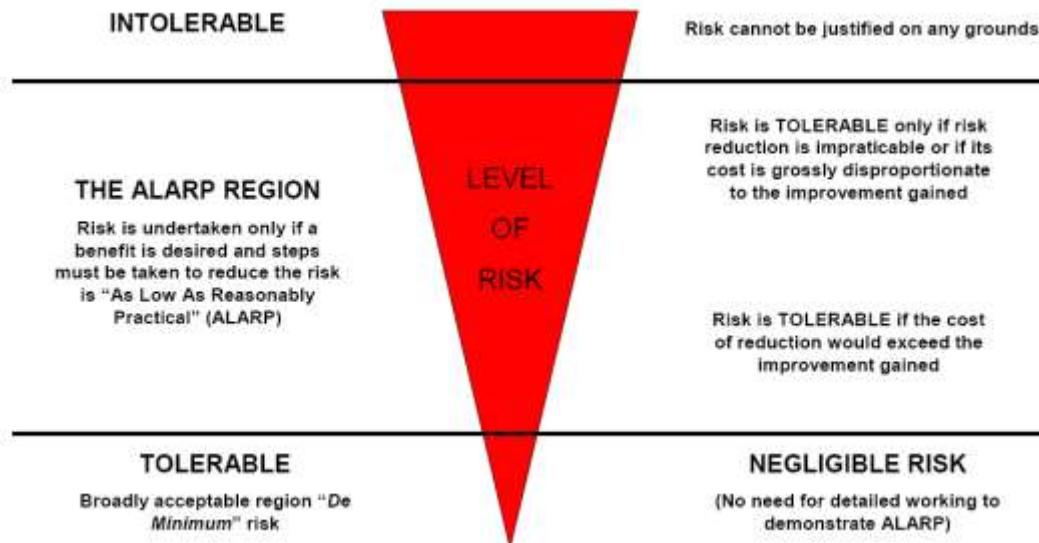


Figure 7.1: Level of Risk and ALARP

7.2 ESMP Objectives

The ESMP is essential for successfully implementing the Project’s 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 performance and helps ensure that environmental risks and liabilities are identified, minimised 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 environmental performance.

Specifically, the ESMP is designed to:

- ensure that all mitigation measures prescribed in the ESIA document for eliminating, minimizing, and enhancing the project adverse and beneficial impacts are fully implemented; and
- provide part of the basis and standards needed for overall planning, monitoring, auditing and review of environmental and socio-economic performance throughout the project activities.

This has been developed to manage negative impacts/effects, enhance benefits and ensure good standards of practice are used throughout the project. These objectives shall be achieved by:



- ensuring compliance with all stipulated legislation on protection of the biophysical and socio-economic environment and Katsina State Ministry of Agriculture and Livestock Development HSE policy;
- integrating environmental and socio-economic issues fully into the project development and operational philosophies;
- promoting awareness on the management of the biophysical and socio-economic environment among workers;
- rationalizing and streamlining existing environmental activities to add value to efficiency and effectiveness;
- ensuring that only environmentally and socially sound procedures are employed during the project implementation; and
- continuous consultations with the relevant regulatory bodies, community leaders (local heads/chiefs, clan heads, landlords, etc), youth leaders, Community Based Organizations (CBOs), and other stakeholders throughout the project lifecycle.

7.3 Core Elements of the ESMP

In line with the objectives summarized in section 7.2 above, the main elements of this ESMP are:

- Overall project organizational chart (including HSE) organogram;
- Preliminary ESMP guidelines;
- Guidelines for waste management;
- Guideline for Consultation;
- Noise Minimization Guideline;
- Overall safety philosophy/guidelines;
- Emergency/Contingency plan;
- Communication plan;
- Security plan;
- Plan for Training and Awareness;
- Environmental monitoring plan;
- Guidelines for audit and review;
- Guidelines on maintenance and facility management; and
- Guidelines for decommissioning and abandonment.



7.4 Structure and Responsibility

The roles and responsibilities (HSE) for the proposed project include:

Resident Engineer

- HSE management on the project
- Provide visible leadership, systems and resources for environmental management
- Initiate action to maintain compliance with requirements
- Specify and participate in project audits/reviews as required

Assistant Project Manager(s)

- Review procedures for environmental aspects
- Follow up actions from project risk assessments and environmental reviews
- Be focal point for environmental matters with subcontractors as required
- Participate in project audits/review as required

HSE Advisor

- Be pro-active in promoting HSE
- Follow-up /monitor requirements with responsible parties
- Provide specialist HSE advice
- Facilitate project risk assessment as required
- Lead/participate in audits, as required
- Maintain HSE Activities matrix and monitor close out of Project Environmental Review
- Development of Project HSE documentation

Environmental Lead

- Provide specialist environmental advice
- Jointly monitor project Environmental aspects with Project Team
- Review relevant project documentation on circulation by Project Team
- Facilitate project environmental review
- Lead / participate in audits and inspections as required
- Review project environmental documentation

7.4.1 Institutional Responsibility

The responsibilities of all incorporated institutions in the implementation of this ESMP are presented in table 7.1 below:

Table 7.1: Roles and Responsibilities of Relevant Institution

S/N	Category	Roles & Responsibilities
1.	Federal Ministry of Environment	<ul style="list-style-type: none"> Provision of advice on screening, scoping, review of draft ESIA report (in liaison with State Ministry of Environment), receiving comments from stakeholders, public hearing of the project proposals, and convening a technical decision-making panel, environmental and social liability investigations, monitoring and evaluation process and criteria.
2	Katsina State Ministry of Agriculture and Livestock Development	<ul style="list-style-type: none"> Overseer all environmental compliance at the State level Review of draft ESIA report (in liaison with Federal Ministry of Environment) Site assessment and monitoring of ESMP implementation.
3.	State Government MDAs (Ministry of Physical Planning, Urban Development, Bureau of Lands etc.	<ul style="list-style-type: none"> Compliance overseer at State Level, on matters of land acquisition and compensation and other resettlement issues, Other MDAs come in as and when relevant areas or resources under their jurisdiction or management are likely to be affected by or implicated projects. They participate in the EA processes and in project decision-making that helps prevent or minimize impacts and to mitigate them. Issuance of consent or approval for an aspect of a project; allow an area to be included in a project; or allow impact to a certain extent or impose restrictions or conditions, monitoring responsibility or supervisory oversight.
	KSEPA	<ul style="list-style-type: none"> Inspection of project premises in order to ensure strict compliance with sanitation and waste management standards in the state. Collaboration with other MDAs at the State and Federal level, NGOs and Donor Agencies in environmental protection and management especially in areas of waste recycling etc.
	Local Government	<ul style="list-style-type: none"> Provision of oversight function across subproject in LGAs for ESMP compliance. Monitoring of activities related to public health, sanitation, waste management amongst others.
	Affected Community	<ul style="list-style-type: none"> Promote environmental awareness. Review environmental and social performance report made available by KSMA&LD Provide comments, advice and/or complaints on issues of nonconformity. Attend public meetings organized by KSMA&LD to disseminate information and receive feedback.
	CDA	<ul style="list-style-type: none"> Ensure community participation by mobilizing and sensitizing community members.
	NGOs/CSOs	<ul style="list-style-type: none"> Assisting in their respective ways to ensure effective response actions, conducting scientific researches alongside government groups to devise sustainable environmental strategies and techniques.



	Others/General Public	<ul style="list-style-type: none"> Identify issues that could disrupt the project and support project impacts and mitigation measures and awareness campaigns.
--	-----------------------	-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

7.5 Framework for Implementing the ESMP

The framework for the implementation of this ESMP is strongly based on a repeated process of continuous improvement which comprises of eleven (11) elements, each with underlying principle and set expectations.

Overview of each of the eleven primary elements is presented as follows.

- Management Leadership, Commitment, and Accountability: Ensures that the workers understand the goals and management commitment to excellence in safety, health, environment, and operational integrity.
- Risk Assessment and Management: Ensures that risks involved in operations are recognized so that they can be appropriately addressed through facility design and/or operating practices.
- Facilities Design and Construction: Ensures elements for the protection of people and the environment are incorporated into the design of facilities and the plans for installation and operation.
- Process and Facilities Information/Documentation: Ensures that the systems designed to protect people and the environments are appropriately documented.
- Personnel and Training: Ensures that personnel understand the systems that are in place and are appropriately trained to perform required roles with respect to their functions.
- Operations and Maintenance: Ensures that facilities are maintained and operated in ways that ensure the protection of people and the environment.
- Management of Change: Ensures that new personnel are informed of existing systems that all affected personnel are informed of changes in the systems, and that safety and environmental aspects are considered when making changes.
- Third Party Services: Through contract, oversight and other mechanisms, third party contractors are held to the same standards as Katsina State Ministry of Agriculture.
- Incident Investigation and Analysis: Seeks to understand the causes of any incidents so that effective controls or systems can be implemented to prevent recurrence.
- Community Awareness and Emergency Preparedness: Though not highly applicable in offshore project far removed from Community, ensures appropriate outreach and awareness programmes are implemented to establish effective emergency procedures and to allay concerns.



- Operations Integrity Assessment and Improvement: Ensures that the safety and environmental performance is monitored against targets to ensure Katsina State Ministry of Agriculture meeting its goals to protect people and the environment and seeks the means to improve the systems and processes, particularly when goals are not being met.

7.6 Katsina State Government

Roles and Responsibilities

Katsina State Government is committed to provide resources essential to the implementation and control of the ESMP in the construction phase of the proposed SAPZ project. The major roles and responsibilities of KSMA&LD is provided in Table 7.2 below. Resources include the appropriate human resources and specialized skills. KSMA&LD will have dedicated personnel competent on the basis of appropriate education, training, and experience that will manage and oversee the HSE aspects of Project construction and operation.

Table 7.2: Roles and 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 SAPZ 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 Officer	Liaise with the host communities and regulators on KSMA&LD 's behalf
Federal Ministry of Environment	Ensure that environmental recommendations in the ESIA to mitigate against construction impacts are implemented
Katsina State Ministry of Environment	Ensure that environmental recommendations in the ESIA to mitigate against construction impacts are implemented

The management and regulatory responsibilities on a project of this magnitude mandate stakeholders' commitments to environmental and socio-economic issues attached to project sustainability. KSMA&LD has a mandatory responsibility under the Nigerian law to perform its operations in the best environmentally and socio-economically sustainable way. So, also, the regulatory agencies (Katsina State Ministry of Environment) are empowered by law to take responsibility for the monitoring of the operations of all



organizations operating within the boundaries of the country/state to ensure environmental and socio-economic sustainability of the recipient communities. The host communities also have an important stake in the environmental and socio-economic sustainability of the project by giving the required support to both the operators and the regulators.

An all encompassing organisational structure for the implementation of the HSE, ESMP and Community Affairs has been designed and approved for the SAPZ project (Figure 7-2). KSMA&LD shall faithfully adopt and implement this organogram for a result oriented HSE systems.

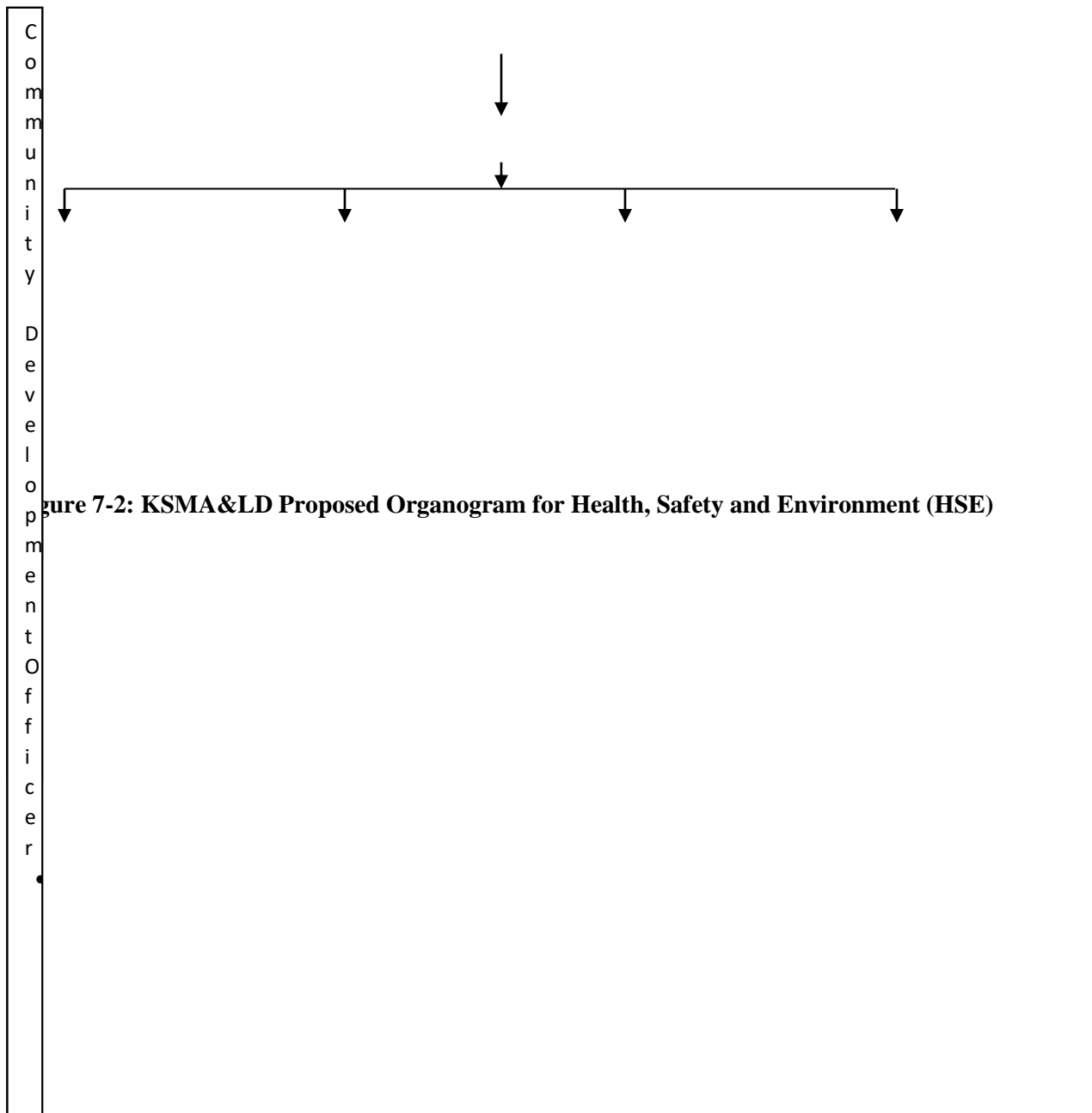


Figure 7-2: KSMA&LD Proposed Organogram for Health, Safety and Environment (HSE)



7.7 ESMP Guidelines

Preliminary ESMP guidelines have been developed to cover the entire project activities. These include: waste management, consultation, noise minimization, overall safety philosophy, emergency/Contingency plan, communication plan, security plan, training and awareness, environmental monitoring etc.

7.7.1 Environmental and Social Management Plan

The necessary objectives, activities, mitigation measures, and allocation of costs and responsibilities pertaining to prevention, minimization and monitoring of significant negative impacts and maximization of positive impacts associated with the construction phase of the proposed project are outlined in Table 7.3 below.

Table 7.3: Environmental and Social Management Plan

Project Activity/ Environmental Aspect	Associated and Potential Impacts	Significance rating	Mitigation Measures	Residual Impact Rating	Parameter for Monitoring	Frequency of Monitoring	Responsible Party	Estimated cost (₹)
Pre-Construction -Permitting -Mobilization -Recruitment -Site Preparation	Economic loss arising from loss of farm lands	High	KSMA&LD shall ensure: <ul style="list-style-type: none"> That due diligence is carried out prior to land acquisition. To carry out census of affected farmers for compensation. That all relevant stakeholders and issues are identified, discussed, and resolved properly prior to mobilization. To implement regular consultations with the local community and other stakeholders (government, community, NGOs, CBOs, etc.) for effective communication and social license; support traditional conflict resolution structures in the project communities. The activation of Grievance Redress Mechanism. To compensate and resettle displaced farmers and miners prior to mobilization. 	Medium	Stakeholder engagement report	Quarterly	KSMA&LD, Project Contractor	20,000,000
	Employment opportunities arising from recruitment of skilled and unskilled personnel	Beneficial	KSMA&LD shall ensure: <ul style="list-style-type: none"> Local contractors are engaged, and prompt payment for engaged labour is made regularly. Only specialised professional workers will be recruited from outside the communities To encouraging contractors to maintain a list of short-term employees for future call-ups when required Adopt procurement practices that favour local merchants and service providers where practicable consultation with the locals shall 	Positive	Stakeholder engagement report, Evidences of workers payment	Monthly	KSMA&LD, Project Contractor	N/A
	Business opportunities for local contractors through subcontracting activities	Beneficial						N/A
	Local support services from road side supply markets and shops etc	Beneficial						N/A

Project Activity/ Environmental Aspect	Associated and Potential Impacts	Significan ce rating	Mitigation Measures	Residual Impact Rating	Parameter for Monitoring	Frequency of Monitoring	Responsible Party	Estimat cost (₦)
	Skill acquisition and enhancements to local indigenes and workforce.	Beneficial	<p>be carried out in terms of provision of jobs.</p> <ul style="list-style-type: none"> Prepare a Local Content Plan and strictly adhered to it in order to facilitate involvement of local labour. 					N/A
	Influx of people (migrant workers, sub-contractors and suppliers) and increased pressure on existing social infrastructure	Medium	<p>KSMA&LD shall ensure:</p> <ul style="list-style-type: none"> To embark on community development programmes in line with the desires and needs of the people. The provision of accommodation for workers. Employment of indigenes. To coordinate with medical posts and emergency services to prepare for water supply, waste management and incidents. To install proper and independent facilities at construction site for water supply, sanitation, solid and liquid waste, so that pressure on community infrastructure is limited. Areal fumigation and use of Insecticide Treated Net should be promoted in the Workers camp Sex education in protected sex, risk of casual sex and counselling services should be provided. Provision should be made for workers to live off-site with their families. 	Low	Employment Record, HSE Record	Once during mobilization	KSMA&LD, Project Contractor	N/A
	Increase of communicable diseases due to influx of people	Medium	<p>KSMA&LD shall:</p> <ul style="list-style-type: none"> Make security plan and emergency response and contacts with security forces. Engage professional security outfit in protecting lives and properties within the project area and the community. This must be registered with the Nigerian Police/NSCDC etc. Prepare a Local Content Plan to facilitate 	Low	Security Report	Monthly	KSMA&LD HSE Supervisor	N/A

Project Activity/ Environmental Aspect	Associated and Potential Impacts	Significance rating	Mitigation Measures	Residual Impact Rating	Parameter for Monitoring	Frequency of Monitoring	Responsible Party	Estimated cost (₹)
			<p>involvement of locals in the security network.</p> <ul style="list-style-type: none"> Develop a code of behaviours for workers. All workers to receive training on community relations and code of behaviour. Ensure that the workers are properly cautioned to respect the culture and place of worship of the people. 					
	Community agitation over unidentified stakeholder, leadership tussles etc.	High	<p>KSMA&LD shall:</p> <ul style="list-style-type: none"> Inform communities about details of construction activities (e.g., employment opportunities, schedule, timing of noise activities, traffic including movements of oversized loads) by billboards, posters and community meeting Set-up and effectively monitor project grievance redress mechanism Engage communities in the monitoring activities to enhance transparency and involvement. Enhance ongoing consultations with local communities (with good representation) to create continuous dialogue, trust and planning of community development activities. Proper consultation with the host communities and youth organizations on the recruitment of labour and work at height. To liaise with local community head and relevant local organizations to work out formula for recruitment from the host communities To be transparent in working out the formula for recruitment 	Low	Stakeholder Engagement Report	Monthly	KSMA&LD, Project Contractor	To be addressed GRM
	Conflicts/community agitations over employment issues (quota and methods)	High	<p>KSMA&LD shall:</p> <ul style="list-style-type: none"> Inform communities about details of construction activities (e.g., employment opportunities, schedule, timing of noise activities, traffic including movements of oversized loads) by billboards, posters and community meeting Set-up and effectively monitor project grievance redress mechanism Engage communities in the monitoring activities to enhance transparency and involvement. Enhance ongoing consultations with local communities (with good representation) to create continuous dialogue, trust and planning of community development activities. Proper consultation with the host communities and youth organizations on the recruitment of labour and work at height. To liaise with local community head and relevant local organizations to work out formula for recruitment from the host communities To be transparent in working out the formula for recruitment 	Low	Stakeholder Engagement Report	Monthly	KSMA&LD, Project Contractor	To be addressed GRM
	Noise and vibrations due to movement from heavy duty equipment and vehicles affecting	Medium	<p>KSMA&LD shall ensure:</p> <ul style="list-style-type: none"> Vehicles are fitted with effective silencers; regular maintenance of heavy duty vehicles are performed; 	Low	Noise Level	Daily	KSMA&LD, Project Contractor	N/A

Project Activity/ Environmental Aspect	Associated and Potential Impacts	Significance rating	Mitigation Measures	Residual Impact Rating	Parameter for Monitoring	Frequency of Monitoring	Responsible Party	Estimated cost (₹)
	site workers, residents and wildlife		<ul style="list-style-type: none"> • Vehicles are switched off when not in use; • Maintain and operate all vehicles and equipment engines in accordance with manufacturers recommendations • Use experienced drivers and fuel-efficient equipment, vehicles and machineries throughout the project phases. • Develop a detailed plan that relates to noise control for relevant work practices and discuss this with workers during health & safety briefings • Select-low noise' equipment or methods of work • Use temporary noise barriers for equipment (e.g. sound proofing walls around stationary power generating sources). • Avoid dropping materials from height, where practicable • Avoid mobile plant clustering near residences and other sensitive land uses. • Ensure periods of respite are provided in the case of unavoidable maximum noise level events • Inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration. 					
	Increase of dust particles and vehicular emissions such as SO _x , NO _x , CO _x , etc	Medium	<p>KSMA&LD shall ensure:</p> <ul style="list-style-type: none"> • Engine to comply with international standards for exhaust gases; • Maintenance of engines and exhaust gas check; • Adoption of engine off policy at the site • Use of the cleanest fuel economically available shall be adopted • Maintain and operate all vehicles and equipment engines in accordance with manufacturers recommendations 	Low	SO _x , NO _x , CO _x , VOC, SPM	Weekly during mobilization	KSMA&LD, Project Contractor, KSME _{env}	N/A

Project Activity/ Environmental Aspect	Associated and Potential Impacts	Significance rating	Mitigation Measures	Residual Impact Rating	Parameter for Monitoring	Frequency of Monitoring	Responsible Party	Estimated cost (₹)
			<ul style="list-style-type: none"> Use experienced drivers and fuel-efficient equipment, vehicles and machineries throughout the project phases. 					
	Increased traffic during mobilization on road with risk of accidents leading to injury/death and loss of asset	High	<p>KSMA&LD shall ensure:</p> <ul style="list-style-type: none"> The creation of awareness amongst commercial communities by signages on the potential of increase in traffic, and the need for extra precautions through public enlightenment. Compliance with journey management policy To minimize movement at the peak hours of the day That all traffic rules are obeyed by the drivers To engage security personnel in traffic control and management 	Medium	Traffic Record	Daily	KSMA&LD, Project Contractor, FRSC	To be addressed under traffic management
	Disturbance of the vegetative cover due to site clearing and preparation	Medium	<p>KSMA&LD shall ensure:</p> <ul style="list-style-type: none"> That vegetation clearing will be limited to the surveyed area That plants of economic value are transplanted To limit vegetation clearing to approved widths and, as practicable, to minimum required ; and for disturbed areas that are no longer required for project operations, monitor regrowth and, if necessary, initiate actions to enhance regrowth or revegetation with appropriate species consistent with operation requirement 	Low	Flora species record	Once before Mobilization	KSMA&LD, Project contractor	N/A
	Littering of the environment due to waste from wood, sand, paper; domestic waste from laydown area and camp site (material and wood)	High	<p>KSMA&LD shall ensure:</p> <ul style="list-style-type: none"> All other wastes generated including environmentally deleterious materials generated by the project activities shall be disposed offsite in an appropriate, legal, and safe manner. Generation of all wastes are minimize as much as practically possible Reuse waste materials wherever possible and use designated disposal site; 	Low	Waste Management Record	Weekly	KSEPA, Project Contractor	5,000,000

Project Activity/ Environmental Aspect	Associated and Potential Impacts	Signifi- can- ce rating	Mitigation Measures	Residual Impact Rating	Parameter for Monitoring	Frequency of Monitoring	Responsible Party	Estimat- ed cost (₹)
			<ul style="list-style-type: none"> There is collaboration with relevant waste management agencies to enforce appropriate sanitation and other bye laws. 					
	Contamination of surface water as a result of siltation caused by increased erosion during site preparation	Medium	<p>KSMA&LD shall ensure:</p> <ul style="list-style-type: none"> Implement effective site drainage on the construction yard to allow for the directed flow of surface water off site. This shall include cut-off drains to divert surface runoff from exposed soils or construction areas. Install oil/water separators and silt traps before effluent, leaves the site. Minimise bare ground and stockpiles to avoid silt runoff. Bunding of areas where hazardous substances are stored (e.g fuel, waste areas). That processed wastewater is treated before discharging to nearby water bodies. That treated waste water is reused to minimize its discharge volume. An inventory of waste is developed and maintained Remove all water accumulation within bunds using manually controlled positive lift pumps not gravity drains. Regular checking and maintenance of all plant and equipment to minimize the risk of fuel or lubricant leakages. Training of relevant staff in safe storage and handling practices, and rapid spill response and clean-up techniques. Backfill foundation pits by the excavated soils which will resemble the order of the original soil layers. 	Low	Water Quality	Monthly	KSMEEnv, Project Contractor	150,000,000

Project Activity/ Environmental Aspect	Associated and Potential Impacts	Signifi- can- ce rating	Mitigation Measures	Residual Impact Rating	Parameter for Monitoring	Frequency of Monitoring	Responsible Party	Estimat cost (₹)
			<ul style="list-style-type: none"> Protect excavated soil materials from erosion. That the land is physically restored (include revegetation where possible) during the rainy season subsequent to the construction activities. Use of existing track for transport of man and material to the extent possible. Construction of foundations to be undertaken in the dry season. 					
Construction/ Installation Civil work, Mechanical and Electrical work which include; <ul style="list-style-type: none"> Drainage Foundation (trenching, Piling etc). Building erection Cabling and Conductor wire stringing Painting and coating Transportation and logistics etc. Commissioning /Testing Waste management 	Workplace accidents from burns, bruises, trips and falls, object at height leading to injury/ fatalities.	Medium	KSMA&LD shall ensure: <ul style="list-style-type: none"> Provision of adequate PPE especially gloves and helmet to workers. All employees will be required to wear the appropriate PPE whilst performing their duties. Unregistered labourers and touts shall not be employed. Health and Safety Plan shall be developed and implemented. The plan shall provide for recording, reporting, and investigating accidents and near misses, and developing measures to prevent recurrence workers shall be sensitized and monitored on the need to be safety conscious. Daily toolbox talks prior to commencement of work activities shall be carried out. Safety training focused on safe working practices, information on specific hazards, first aid and fire- fighting shall be included in the induction programme for workers. 	Low	Incident/ accident rate record	Daily	Project Contractor	10,000,000
	Employment of local labour and skills acquisition for workers taking advantage on new opportunities	Beneficial	KSMA&LD shall ensure: <ul style="list-style-type: none"> Local contractors are engaged, and prompt payment for engaged labour is made regularly. 	Positive	Stakeholder Engagement Report, Evidences of	Monthly	Project Contractor	N/A

Project Activity/ Environmental Aspect	Associated and Potential Impacts	Significance rating	Mitigation Measures	Residual Impact Rating	Parameter for Monitoring	Frequency of Monitoring	Responsible Party	Estimated cost (₹)
	Increased business and economic activities as well as diversification of income sources due to supply contracting and sub-contracting	Beneficial	<ul style="list-style-type: none"> Only specialised professional workers will be recruited from outside the communities To encouraging contractors to maintain a list of short-term employees for future call-ups when required Adopt procurement practices that favour local merchants and service providers where practicable consultation with the locals shall be carried out in terms of provision of jobs. Prepare a Local Content Plan and strictly adhered to it in order to facilitate involvement of local labour. 		workers payment			N/A
	Increase in revenue opportunities for local population due to presence of non-resident workers and travelers	Beneficial						N/A
	Generation of dust and automobile/heavy duty equipment emissions from construction earthworks.	High	<p>KSMA&LD shall ensure:</p> <ul style="list-style-type: none"> Engine to comply with international standards for exhaust gases; Maintenance of engines and exhaust gas check; Adoption of engine off policy at the site Use of the cleanest fuel economically available shall be adopted Maintain and operate all vehicles and equipment engines in accordance with manufacturers recommendations Use experienced drivers and fuel-efficient equipment, vehicles and machineries throughout the project phases. 	Medium	SO _x , NO _x , CO _x SPM	Weekly	Project Contractor	N/A
	Flora/habitat loss and disturbance through vegetation clearing and earthworks along access roads and building sites.	Medium	<p>KSMA&LD shall ensure:</p> <ul style="list-style-type: none"> Ensure that vegetation clearing will be limited to the surveyed area Ensure that plants of economic value are transplanted for disturbed areas that are no longer required for project operations, monitor regrowth and, if necessary, initiate actions to enhance regrowth or revegetation with appropriate species consistent with operation requirement 	Low	Biodiversity Record	Once	Project Contractor	N/A

Project Activity/ Environmental Aspect	Associated and Potential Impacts	Significan ce rating	Mitigation Measures	Residual Impact Rating	Parameter for Monitoring	Frequency of Monitoring	Responsible Party	Estimat cost (₹)
	Fauna disturbance and displacement as a result of migration away from construction area (e.g. birds, rodents and reptiles)	Medium	<p>KSMA&LD shall ensure:</p> <ul style="list-style-type: none"> Workers are warned not to kill fauna species but allow them to move back to the forest Work force are provided with and use appropriate PPE (cover all, safety boots, hard hats, hand gloves and safety goggles) before venturing into the bush; Work force are provided assistants/experienced guides from the local communities to look out for signs of wild animals (including bees and wasps) in the bush; and trips into the work in inclement weather e.g., periods of low visibility, are avoided 	Low	Fauna Species Record	Once before Construction	Project Contractor	N/A
	Soil/groundwater contamination resulting from improper waste disposal and accidental leakages and spill of hazardous substances (diesel, lubricants, hydraulic oil etc.)	Medium	<p>KSMA&LD shall ensure:</p> <ul style="list-style-type: none"> Install oil/water separators and silt traps before effluent, leaves the site. Bunding of areas where hazardous substances are stored (e.g fuel, waste areas). An inventory of waste is developed and maintained Remove all water accumulation within bunds using manually controlled positive lift pumps not gravity drains. Training of relevant staff in safe storage and handling practices, and rapid spill response and clean-up techniques. Waste bins shall be provided at designated locations on site for temporary storage of different waste streams. General waste that cannot be reused or recycled shall be disposed of at an approved dumpsite. Hazardous substances and materials (e.g. fuel, lubricating oil, etc.) shall be stored in appropriate locations with impervious hard standing and adequate secondary containment. 	Low	Soil & Water Quality and Waste evacuation/disposal rate	Monthly	Project Contractor, KSME _{env} , KSEPA	15,000,000

Project Activity/ Environmental Aspect	Associated and Potential Impacts	Significan ce rating	Mitigation Measures	Residual Impact Rating	Parameter for Monitoring	Frequency of Monitoring	Responsible Party	Estimat cost (₦)
			<ul style="list-style-type: none"> Portable spill containment and clean-up kits shall be available onsite. 					
	Risks injury/death and loss of assets resulting from accidents associated with road transportation to and from construction sites	High	<p>KSMA&LD shall:</p> <ul style="list-style-type: none"> use standard warning notice (e.g. signal lights and horn) to other road users; ensure a practicable journey management programme is developed and adhered to; maintain speed limits for road vehicles ensure that mobilization is carried out after due consultation with relevant road authorities and other stakeholders to minimize interference along the road ways 	Low	Incident/accident rate record	Daily	Project Contractor	N/A
	Traffic congestion during haulage of plant components to site for installation	Medium	<p>KSMA&LD shall ensure:</p> <ul style="list-style-type: none"> the creation of awareness amongst commercial communities by signages on the potential of increase in traffic, and the need for extra precautions through public enlightenment. compliance with journey management policy to minimize movement at the peak hours of the day that all traffic rules are obeyed by the drivers 	Low	Traffic Record	Daily	KSMA&LD, Project Contractor, FRSC	N/A
	Risk of injury from fall from height and building collapse due to unstable geotechnical conditions	Medium	<p>KSMA&LD shall ensure:</p> <ul style="list-style-type: none"> Provision of adequate PPE especially gloves and helmet to workers. All employees will be required to wear the appropriate PPE whilst performing their duties. Unregistered labourers and touts shall not be employed. Health and Safety Plan shall be developed and implemented. The plan shall provide for recording, reporting, and investigating accidents and near misses, and developing measures to prevent recurrence workers shall be sensitized and monitored on the 	Low	Result of geotechnical survey	At Foundation	Project Contractor	N/A

Project Activity/ Environmental Aspect	Associated and Potential Impacts	Significance rating	Mitigation Measures	Residual Impact Rating	Parameter for Monitoring	Frequency of Monitoring	Responsible Party	Estimated cost (₹)
			<p>need to be safety conscious.</p> <ul style="list-style-type: none"> • Daily toolbox talks prior to commencement of work activities shall be carried out. • Safety training focused on safe working practices, information on specific hazards, first aid and fire- fighting shall be included in the induction programme for workers. • Test structures for integrity prior to undertaking work. • Implement a fall protection program that includes training in climbing techniques and the use of fall protection measures; inspection, maintenance, and replacement of fall protection equipment; and rescue of fall-arrested workers, among others. • Provide an adequate work-positioning device system for workers. 					
	Risk of electrocution and burns (to onsite workers) during electrical installation processes	Medium	<p>KSMA&LD shall ensure:</p> <ul style="list-style-type: none"> • Appropriate PPE shall be provided for workers. • Workers shall imbibe the workplace safety rules via proper sensitization procedures. • Strict compliance to the SOPs shall be ensured. • A conduit type of wiring shall be adopted instead of a surface to prevent shock. • Only allowing trained and certified workers to install, maintain, or repair electrical equipment; • Deactivating and properly grounding live power distribution lines before work is performed on, or close to, the lines; • ensuring that live-wire work is conducted by trained workers with strict adherence to specific safety and insulation standards. • Prior to excavation works, all existing underground cable installations should be identified and marked. Drawings and plans 	Low	HSE record	Throughout construction phase	Project Contractor	N/A

Project Activity/ Environmental Aspect	Associated and Potential Impacts	Significan ce rating	Mitigation Measures	Residual Impact Rating	Parameter for Monitoring	Frequency of Monitoring	Responsible Party	Estimat cost (₹)
			should indicate such installations.					
	Reduction in wildlife population as a result of poaching due to easier access created by access roads	High	<p>KSMA&LD shall ensure:</p> <ul style="list-style-type: none"> Workers are warned not to kill fauna species but allow them to move back to the forest. Poachers are not allowed access to the site Work force are provided with and use appropriate PPE (cover all, safety boots, hard hats, hand gloves and safety goggles) before venturing into the bush; Work force are provided assistants/experienced guides from the local communities to look out for signs of wild animals (including bees and wasps) in the bush; and trips into the work in inclement weather e.g., periods of low visibility, are avoided 	Low	Biodiversity record	Once before construction	Project Contractor	N/A
	Inhalation by onsite workers of cement dust and toxic fumes during foundation works and welding for building components	High	<p>KSMA&LD shall:</p> <ul style="list-style-type: none"> Cover properly loose materials and keep top layers moist Use binder material for erosion and dust control for long term exposed surfaces. Regular cleaning of equipment, drains and roads to avoid excessive buildup of dirt. Spray surfaces prior to excavation Use covered trucks for the transportation of materials that release dust emissions. Speed limits on-site of 15 k/h should be recommended and enforced 	Medium	Air Quality, HSE Record	Throughout Construction Phase	Project Contractor	
	Noise nuisance from construction activities e.g. Piling resulting to irritation in humans and temporal migration of sensitive mammals	High	<p>KSMA&LD shall ensure that:</p> <ul style="list-style-type: none"> Vehicles are fitted with effective silencers; regular maintenance of heavy duty vehicles are performed; Vehicles are switched off when not in use; Maintain and operate all vehicles and equipment 	Low	Noise Level	Daily	Project Contractor	

Project Activity/ Environmental Aspect	Associated and Potential Impacts	Significance rating	Mitigation Measures	Residual Impact Rating	Parameter for Monitoring	Frequency of Monitoring	Responsible Party	Estimated cost (₹)
			<p>engines in accordance with manufacturers recommendations</p> <ul style="list-style-type: none"> • Use experienced drivers and fuel-efficient equipment, vehicles and machineries throughout the project phases. • Develop a detailed plan that relates to noise control for relevant work practices and discuss this with workers during health & safety briefings • Select-low noise' equipment or methods of work • Use temporary noise barriers for equipment (e.g. sound proofing walls around stationary power generating sources). • Avoid dropping materials from height, where practicable • Avoid mobile plant clustering near residences and other sensitive land uses. • Ensure periods of respite are provided in the case of unavoidable maximum noise level events • Inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration. 					
	Visual intrusion as a result of alterations from accidental ignition of onsite diesel storage tanks	Medium	<p>KSMA&LD shall:</p> <ul style="list-style-type: none"> • Maintain construction site in orderly condition and do not distribute material over many sites before usage. 	Low	Visual Inspection, Incident/Accident record	Monthly	Project Contractor	

Project Activity/ Environmental Aspect	Associated and Potential Impacts	Significan ce rating	Mitigation Measures	Residual Impact Rating	Parameter for Monitoring	Frequency of Monitoring	Responsible Party	Estimat cost (₹)
	Waste Disposal <ul style="list-style-type: none"> Scrap metal, wood, sand, concrete, paper Spent-oil and replaced /obsolete equipment parts that may contaminate soil/ground water Waste from laydown area and building sites causing unsightliness 	High	KSMA&LD shall ensure: <ul style="list-style-type: none"> All other wastes generated including environmentally deleterious materials generated by the project activities shall be disposed offsite in an appropriate, legal, and safe manner. Generation of all wastes are minimize as much as practically possible Reuse waste materials wherever possible and use designated disposal site; There is collaboration with relevant waste management agencies to enforce appropriate sanitation and other bye laws. 	Low	Waste Generation and Evacuation rate	Daily	Project Contractor, KSEPA	5,000,000
DEMOBILISATION -Demobilization after construction phase	Workplace accidents from burns, cuts, bruises, trips and falls, object at height leading to injury of fatalities.	Medium	KSMA&LD shall ensure: <ul style="list-style-type: none"> Provision of adequate PPE especially gloves and helmet to workers. All employees will be required to wear the appropriate PPE whilst performing their duties. Unregistered labourers and touts shall not be employed. Health and Safety Plan shall be developed and implemented. The plan shall provide for recording, reporting, and investigating accidents and near misses, and developing measures to prevent recurrence workers shall be sensitized and monitored on the need to be safety conscious. Daily toolbox talks prior to commencement of work activities shall be carried out. Safety training focused on safe working practices, information on specific hazards, first aid and fire- fighting shall be included in the induction programme for workers. Test structures for integrity prior to undertaking work. 	Low	Accident/Incident Record, HSE record	Daily	Project Contractor	

Project Activity/ Environmental Aspect	Associated and Potential Impacts	Significance rating	Mitigation Measures	Residual Impact Rating	Parameter for Monitoring	Frequency of Monitoring	Responsible Party	Estimated cost (₹)
			<ul style="list-style-type: none"> Implement a fall protection program that includes training in climbing techniques and the use of fall protection measures; inspection, maintenance, and replacement of fall protection equipment; and rescue of fall-arrested workers, among others. Provide an adequate work-positioning device system for workers. 					
	Soil/groundwater contamination resulting from accidental leakages and spill of hazardous substances (diesel, lubricants, hydraulic oil etc.)	Medium	<p>KSMA&LD shall ensure:</p> <ul style="list-style-type: none"> Install oil/water separators and silt traps before effluent, leaves the site. Bundling of areas where hazardous substances are stored (e.g fuel, waste areas). Remove all water accumulation within bunds using manually controlled positive lift pumps not gravity drains. Training of relevant staff in safe storage and handling practices, and rapid spill response and clean-up techniques. Hazardous substances and materials (e.g. fuel, lubricating oil, etc.) shall be stored in appropriate locations with impervious hard standing and adequate secondary containment. Portable spill containment and clean-up kits shall be available onsite. 	Low	Soil & Water Quality, Waste Management Record	Daily	Project Contractor, KSMEEnv, KSEPA	
	Traffic congestion during transportation of demobilized equipment and personnel	High	<p>KSMA&LD shall ensure:</p> <ul style="list-style-type: none"> The creation of awareness amongst commercial communities by signages on the potential of increase in traffic, and the need for extra precautions through public enlightenment. Compliance with journey management policy To minimize movement at the peak hours of the day That all traffic rules are obeyed by the drivers To engage security personnel in traffic control 	Low	Traffic Record	Daily	KSMA&LD, Project Contractor, FRSC	

Project Activity/ Environmental Aspect	Associated and Potential Impacts	Significance rating	Mitigation Measures	Residual Impact Rating	Parameter for Monitoring	Frequency of Monitoring	Responsible Party	Estimated cost (₹)
			and management					
	Generation of dust and automobile/heavy duty equipment emissions	Medium	<p>KSMA&LD shall ensure:</p> <ul style="list-style-type: none"> • Engine to comply with international standards for exhaust gases; • Maintenance of engines and exhaust gas check; • Adoption of engine off policy at the site • Use of the cleanest fuel economically available shall be adopted • Maintain and operate all vehicles and equipment engines in accordance with manufacturers recommendations • Use experienced drivers and fuel-efficient equipment, vehicles and machineries throughout the project phases. 	Low	SO _x , NO _x , CO _x , VOC, SPM	Daily during demobilization	KSMA&LD, Project Contractor, KSMEEnv	
	Waste disposal (scrap metal, wood, sand, concrete, paper)	Medium	<p>KSMA&LD shall ensure:</p> <ul style="list-style-type: none"> • All other wastes generated including environmentally deleterious materials generated by the project activities shall be disposed offsite in an appropriate, legal, and safe manner. • Generation of all wastes are minimize as much as practically possible • Reuse waste materials wherever possible and use designated disposal site; • There is collaboration with relevant waste management agencies to enforce appropriate sanitation and other bye laws. 	Low	Waste Management Record	Daily	Project Contractor, KSEPA	
	Loss of employment and business opportunities due to completion of construction phase	Medium	<p>KSMA&LD shall:</p> <ul style="list-style-type: none"> • Counsel worker and occupant who losses job. • Give enough notice • Pay Workers all entitlement due to them prior to job loss 	Low	Staff welfare record	Once	Project Contractor	

Project Activity/ Environmental Aspect	Associated and Potential Impacts	Significance rating	Mitigation Measures	Residual Impact Rating	Parameter for Monitoring	Frequency of Monitoring	Responsible Party	Estimated cost (₹)
	Illegal access to building site leading to accident, asset damage and loss	Medium	<p>KSMA&LD shall:</p> <ul style="list-style-type: none"> • Make security plan and emergency response and contacts with security forces. • Professional security outfit be engaged in preventing illegal access to the building sites • Prepare a Local Content Plan to facilitate involvement of locals in the security network. 	Low	HSE Record	Daily	Project Contractor	
Operation and Maintenance <ul style="list-style-type: none"> • Building inspection and checks • Power generation/ servicing • Transportation of raw materials and finished product • Agro-products processing for export. • Plant maintenance • Industrial waste discharges • Emergence of small-scale enterprises • Green Buffer development around each industrial plot. • Recruitment of workers 	Risk of injury from fall from height/trip or being hit by an object	Medium	<p>KSMA&LD shall ensure that:</p> <ul style="list-style-type: none"> • A comprehensive HSE Policy must be displayed openly, and enforced through monitoring within the site; • All staff must be trained and retrained on regular basis for HSE compliance; • Develop a training program including a code of conduct for all workers; • Well-equipped Clinic should be put up for emergency attention, while referral system should be arranged with a Secondary Hospital 	Low	Incident/Accident Record	Daily	KSMA&LD	
	Security threat such as kidnapping and banditry attack	High	<p>KSMA&LD shall:</p> <ul style="list-style-type: none"> • Engage trained security personnel • Avoid lone working • Avoid working at nights • Avoid night journeys 	Medium	HSE Record	Weekly	KSMA&LD	
	Air pollution by gaseous emission (CO, SO ₂ , NO ₂) and particulates from power generator	High	<p>KSMA&LD shall ensure:</p> <ul style="list-style-type: none"> • Generator to comply with international standards for exhaust gases; • Maintenance of generator and exhaust gas check; • Use of the cleanest fuel economically available shall be adopted 	Low	SO _x , NO _x , CO _x , VOC, SPM	Monthly	KSMA&LD, KSME _{env}	
	Soil contamination resulting from accidental leakages and spill of hazardous substances from	Medium	<p>KSMA&LD shall ensure:</p> <ul style="list-style-type: none"> • Install oil/water separators and silt traps before effluent, leaves the site. • Bunding of areas where hazardous substances are stored (e.g fuel, waste areas). 	Low	Soil Quality, Waste Management Record	Daily	KSMA&LD, KSME _{env} , KSEPA	

Project Activity/ Environmental Aspect	Associated and Potential Impacts	Significance rating	Mitigation Measures	Residual Impact Rating	Parameter for Monitoring	Frequency of Monitoring	Responsible Party	Estimated cost (₹)
	generator servicing (diesel, spent oil etc.)		<ul style="list-style-type: none"> Remove all water accumulation within bunds using manually controlled positive lift pumps not gravity drains. Training of relevant staff in safe storage and handling practices, and rapid spill response and clean-up techniques. Hazardous substances and materials (e.g. fuel, lubricating oil, etc.) shall be stored in appropriate locations with impervious hard standing and adequate secondary containment. Portable spill containment and clean-up kits shall be available onsite. Conduct bioremediation of polluted soil immediately to inhibit further spread 					
	Generation of dust and gaseous pollutants from automobile emissions	High	<p>KSMA&LD shall ensure:</p> <ul style="list-style-type: none"> Engine to comply with international standards for exhaust gases; Maintenance of engines and exhaust gas check; Adoption of engine off policy at the site Use of the cleanest fuel economically available shall be adopted Maintain and operate all vehicles and equipment engines in accordance with manufacturers recommendations Use experienced drivers and fuel-efficient equipment, vehicles and machineries throughout the project phases. Preference for usage of clean fuel like LPG, low sulphur diesel should be explored; Energy conservation should be adopted by opting the alternate energy options like solar power; Power Generators and equipment should be provided with stacks of adequate height (higher than nearest building) to allow enough dispersion 	Low	SO _x , NO _x , CO _x , VOC, SPM	Weekly	KSMA&LD, KSME _{env}	

Project Activity/ Environmental Aspect	Associated and Potential Impacts	Significance rating	Mitigation Measures	Residual Impact Rating	Parameter for Monitoring	Frequency of Monitoring	Responsible Party	Estimated cost (₹)
			<p>of emission;</p> <ul style="list-style-type: none"> • Enclosure of dust producing equipment, • Use of local exhaust ventilation; • Use of dust extraction and recycling systems to remove dust from work areas; • Regular checking and maintenance of all plant and equipment to minimize the risk gas leakage 					
	Odour disturbances from the processing of Rice, edible oil etc	High	<p>KSMA&LD shall</p> <ul style="list-style-type: none"> • Ensure all processing equipment are installed in an enclosed plant and processing activities are taking place within an enclosed system. • Ensure provision of appropriate PPE (respiratory protection) for workers and enforce usage. • Ensure that project staff are not exposed to more than nine hours at a go on any equipment generating noise level of more than 90 dBA 	Medium	SO _x , NO _x , CO _x , VOC, SPM	Daily	KSMA&LD, KSME _{env}	
	Increase in noise level nuisance from operation machines and from vehicles plying the access roads	High	<p>KSMA&LD shall ensure that:</p> <ul style="list-style-type: none"> • Vehicles are fitted with effective silencers; • regular maintenance of heavy duty vehicles are performed; • Vehicles are switched off when not in use; • Maintain and operate all vehicles and equipment engines in accordance with manufacturers recommendations • Use experienced drivers and fuel-efficient equipment, vehicles and machineries throughout the project phases. • Develop a detailed plan that relates to noise control for relevant work practices and discuss this with workers during health & safety briefings • Select-low noise' equipment or methods of work • Use temporary noise barriers for equipment (e.g. 	Low	Noise level	Daily	KSMA&LD, KSME _{env}	

Project Activity/ Environmental Aspect	Associated and Potential Impacts	Significance rating	Mitigation Measures	Residual Impact Rating	Parameter for Monitoring	Frequency of Monitoring	Responsible Party	Estimated cost (₦)
			<p>sound proofing walls around stationary power generating sources).</p> <ul style="list-style-type: none"> • Avoid dropping materials from height, where practicable • Avoid mobile plant clustering near residences and other sensitive land uses. • Ensure periods of respite are provided in the case of unavoidable maximum noise level events • Inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration. • Machineries to be used should comply with the noise standards prescribed by FMEEnv. • Workers shall be given PPE (ear plugs) and enforce compliance; 					
	Traffic congestion along agro-products transportation route	Medium	<p>KSMA&LD shall ensure:</p> <ul style="list-style-type: none"> • The creation of awareness amongst commercial communities by signages on the potential of increase in traffic, and the need for extra precautions through public enlightenment. • Compliance with journey management policy • To minimize movement at the peak hours of the day • That all traffic rules are obeyed by the drivers • To engage security personnel in traffic control and management 	Low	Traffic Record	Weekly	KSMA&LD, FRSC	
	Threat to community culture, safety and security due to presence of workers and business opportunists	Medium	<p>KSMA&LD shall:</p> <ul style="list-style-type: none"> • Develop an induction program including a code of conduct for all workers. Code of conduct to address the following: <ul style="list-style-type: none"> ○ Respect for local residents; ○ unauthorized taking of products; ○ Zero tolerance of illegal activities such as child sexual exploitation and underage 	Low	HSE training report	Monthly	KSMA&LD	

Project Activity/ Environmental Aspect	Associated and Potential Impacts	Significance rating	Mitigation Measures	Residual Impact Rating	Parameter for Monitoring	Frequency of Monitoring	Responsible Party	Estimated cost (₹)
			<p>sex, prostitution, harassment of women, Gender Based Violence (GBV,) purchase or use of illegal drugs,</p> <ul style="list-style-type: none"> ○ Disciplinary measures and sanctions (e.g. dismissal) for infringement of the code of conduct and/or company rules; ○ Commitment / policy to cooperate with law enforcement agencies investigating perpetrators of GBV. <ul style="list-style-type: none"> ● Limit the number of migrant workers by engaging local workers. 					
	Reduction of water tables and source of water for production processes	High	<p>KSMA&LD shall ensure:</p> <ul style="list-style-type: none"> ● Water conservation measures should be practiced ● Waste water should be recycled for reuse. ● Rain water harvesting. ● Adoption of continuous horizontal washers and vertical spray washers or vertical, double-laced washers. ● Adoption of counter current washing (e.g. reuse the least contaminated water from the final wash for the next-to last wash). ● Use of water flow-control devices to ensure that water only flows to a process when needed. 	Low	Water Quality	Monthly	KSMA&LD, KSMEEnv	
	Metallic materials generation from plant parts, retrofitting / upgrade of parts during plant servicing	Medium	<p>KSMA&LD shall ensure:</p> <ul style="list-style-type: none"> ● Recyclable materials should be sorted and sold to scrap metal converters ● Regular checking and maintenance of all plant and equipment to minimize the risk of fuel or lubricant leakages. 	Low	Waste Management Record	Daily	KSMA&LD, KSEPA	
	Potential for land contamination from industrial waste disposal	Medium	<p>KSMA&LD shall ensure:</p> <ul style="list-style-type: none"> ● All other wastes generated including environmentally deleterious materials generated 	Low	Soil & Water Quality, Waste Management	Daily	KSMA&LD, KSMEEnv, KSEPA	

Project Activity/ Environmental Aspect	Associated and Potential Impacts	Significance rating	Mitigation Measures	Residual Impact Rating	Parameter for Monitoring	Frequency of Monitoring	Responsible Party	Estimated cost (₹)
	Pollution of surface water bodies by wastewater generated from industrial waste discharges	High	<p>by the project activities shall be disposed offsite in an appropriate, legal, and safe manner.</p> <ul style="list-style-type: none"> • Generation of all wastes are minimize as much as practically possible • Reuse waste materials wherever possible and use designated disposal site; • There is collaboration with relevant waste management agencies to enforce appropriate sanitation and other bye laws. 		Record			
	Creation of job and acquisition of skills by individuals to be employed as operators	Beneficial	<p>KSMA&LD shall ensure:</p> <ul style="list-style-type: none"> • Local contractors are engaged, and prompt payment for engaged labour is made regularly. • Only specialised professional workers will be recruited from outside the communities • To encouraging contractors to maintain a list of short-term employees for future call-ups when required • Adopt procurement practices that favour local merchants and service providers where practicable consultation with the locals shall be carried out in terms of provision of jobs. • Prepare a Local Content Plan and strictly adhered to it in order to facilitate involvement of local labour. 	Positive	Stakeholder Engagement Record	Monthly	KSMA&LD	
Decommissioning /Abandonment <ul style="list-style-type: none"> • Removal of electrical cables and wires, water and sewage treatment plant pipelines. • Demolition of buildings for 	Risk of accident and injury to workers during demolition of structures	Medium	<p>KSMA&LD shall ensure that:</p> <ul style="list-style-type: none"> • A comprehensive HSE Policy must be displaced openly, and enforced through monitoring within the site; • All staff must be trained and retrained on regular basis for HSE compliance; • Develop a training program including a code of conduct for all workers; • Well-equipped Clinic should be put up for emergence attention, while referral system 	Low	Incident/Accident Record	Daily	Project Contractor	

Project Activity/ Environmental Aspect	Associated and Potential Impacts	Signifi- can- ce rating	Mitigation Measures	Residual Impact Rating	Parameter for Monitoring	Frequency of Monitoring	Responsible Party	Estimat cost (₹)
facilities retrieval • Waste generation • Transportation of Plant components for sale/another site • Re-vegetation of site			should be arranged with a Secondary Hospital					
	Increased dust and vehicular emissions during haulage of plant components from site by heavy-duty vehicles	Medium	KSMA&LD shall ensure: <ul style="list-style-type: none"> • Engine to comply with international standards for exhaust gases; • Maintenance of engines and exhaust gas check; • Adoption of engine off policy at the site • Use of the cleanest fuel economically available shall be adopted • Maintain and operate all vehicles and equipment engines in accordance with manufacturers recommendations • Use experienced drivers and fuel-efficient equipment, vehicles and machineries throughout the project phases. 	Low	SO _x , NO _x , CO _x , VOC, SPM	Daily	KSMA&LD, Project Contractor, KSME _{Env}	
	Risk of soil and adjoining surface water contamination from accidental oil and hazardous substance leakages	Medium	KSMA&LD shall ensure: <ul style="list-style-type: none"> • Install oil/water separators and silt traps before effluent, leaves the site. • Bunding of areas where hazardous substances are stored (e.g fuel, waste areas). • Remove all water accumulation within bunds using manually controlled positive lift pumps not gravity drains. • Training of relevant staff in safe storage and handling practices, and rapid spill response and clean-up techniques. • Hazardous substances and materials (e.g. fuel, lubricating oil, etc.) shall be stored in appropriate locations with impervious hard standing and adequate secondary containment. • Portable spill containment and clean-up kits shall be available onsite. 	Low	Soil & Water Quality, Waste Management Record	Daily	Project Contractor, KSME _{Env} , KSEPA	

Project Activity/ Environmental Aspect	Associated and Potential Impacts	Significance rating	Mitigation Measures	Residual Impact Rating	Parameter for Monitoring	Frequency of Monitoring	Responsible Party	Estimated cost (₦)
	Traffic obstruction from transportation of decommissioned structures and equipment	Medium	KSMA&LD shall ensure: <ul style="list-style-type: none"> The creation of awareness amongst commercial communities by signages on the potential of increase in traffic, and the need for extra precautions through public enlightenment. Compliance with journey management policy To minimize movement at the peak hours of the day That all traffic rules are obeyed by the drivers To engage security personnel in traffic control and management 	Low	Traffic Record	Daily	KSMA&LD, Project Contractor, FRSC	
	Abandoned structures possibly taken-over by miscreants/criminals	High	KSMA&LD shall: <ul style="list-style-type: none"> Make security plan and emergency response and contacts with security forces. Re-vegetate the site with local plant species 	Medium	Stakeholder Engagement Record	Once at decommissioning	Project Contractor	
	Availability of land for alternative uses such as community hall, farmland e.t.c	Beneficial	KSMA&LD shall ensure: Use local plant species to re-vegetate the abandoned site	Positive	Stakeholder Engagement Record, Biodiversity Record	Once at decommissioning	Project Contractor	
	Improved Ecology, Air Quality and Aesthetics	Beneficial						
Estimated Cost								205,000,000.00

Environmental and Social Management Plan for the proposed ATC Project

Anticipated impact	Proposed Mitigation measures	Monitoring indicators	Responsibility/ Institution	Cost estimate (₦)
CONSTRUCTION PHASE				
Limited access to employment:	<ul style="list-style-type: none"> ▪ Design recruitment strategy with respective District and Ward/ Village council to ensure local people are given priority ▪ Technical positions to be recruited on professional merit, with special consideration of local experts ▪ Recruitment strategy to stipulate 50% of all non-professional occupations to be given to females. 	Transparent recruitment strategy in place which stipulated gender considerations, locality and skills	Project Supervisor/ Local Village/ Katsina governments	N/A
Conflict/competition in basic resources threatening sustainable water access/supply for project and surrounding communities	<ul style="list-style-type: none"> ▪ Establish secure and separate water supply connection with Municipal Water supply source. ▪ Construction of existing Dam ▪ Project should have its own water source 	Water supply sources for community and facilities identified. Community-facility platforms for GRM in place and meeting.	Katsina State Water Board	50,000,000.00
Dust pollution during construction phase	<ul style="list-style-type: none"> ▪ Minimize dust generation by using sprinklers ▪ Put speed limits to control construction vehicle speed ▪ Workers should use respirators 	Workers and truck drivers be sensitized on speed.	Site environmental officer/ KSEPA	N/A
Bio-diversity loss (degradation of vegetation and disturbance of fauna)	<ul style="list-style-type: none"> ▪ Enhance natural environment by planting indigenous trees, shrubs, and grass around project site. ▪ Ensure re-vegetation around project site, by planting indigenous trees and shrubs to stimulate natural regeneration 	Facility environmental management policy	Site Environmental Officer/Katsina State Forestry Division	10,000,000.00
Increase in waste generation (solid, liquid)	<ul style="list-style-type: none"> ▪ Ensure that effective solid waste collection and disposal systems are in place during operations ▪ Ensure that all waste water is treated before disposal ▪ Ensure debris generated during construction is disposed-off appropriately to minimize pollution 	Facility Waste management policy Sensitization of workers on environmentally sound waste disposal	Facility supervisor/ Katsina State Waste Management	5,000,000.00
Contamination of water sources at Makera, Kabomo and Are project site	<ul style="list-style-type: none"> ▪ Construct facilities for storage of contaminated water. Maintain facilities to prevent overflow ▪ Ensure waste and other debris is not disposed near water sources. ▪ Protect nearby water sources, rivers and streams from degradation due to project activities. 	Protocols for water source protection in place and disseminated	Project supervisor/ KSEPA	20,000,000.00
Spread of infectious diseases – HIV, STIs	<ul style="list-style-type: none"> ▪ Sensitize workers and community members on protective sex 	Frequency of sensitization campaigns on infectious diseases and material distributed	Site Health worker/ Health Officers	N/A

Gender-based violence (GBV)	<ul style="list-style-type: none"> ▪ Introduce anti-GBV protocols in workers' employment contracts ▪ Promote GBV support services with local Community Development (CD) and Social Welfare (SW) authorities ▪ Support community sensitization on GBV and Violence against Women and Children 	Frequency of Sensitization seminars to workers and Community	Project supervisor with relevant authorities	Nil
Child abuse	<ul style="list-style-type: none"> ▪ Introduce child abuse protocols in workers' employment contracts ▪ Promote GBV support services with local Community Development and Social Welfare authorities ▪ Support community sensitization on GBV and Violence against Women and Children 	Child protection policy	Project supervisor with relevant authorities	Nil
Occupational and Workers health	<ul style="list-style-type: none"> ▪ Establish workplace health and safety procedures and train workers and management to avoid, minimize exposure to infections and accidents. ▪ Provide quality respiratory protection to capture dust and micro-organisms ▪ Ensure proper storage of chemicals within production or processing sites ▪ Ensure that first aid facilities are in place in designated locations and easily accessible. ▪ Design training and sensitization sessions to the general public on the possible health hazards generated by project operations and how they can mitigate or avoid them. 	<p>Frequency of training sessions on workplace health and safety standards</p> <p>Workplace occupational health and safety policy in place</p> <p>First Aid Kit in accessible locations within facility</p>	Project supervisor/ OSHA officer	Nil
OPERATIONAL PHASE				
Limited access to employment	<ul style="list-style-type: none"> ▪ Design recruitment strategy with respective District and Ward/ Village council to ensure local people are given priority ▪ Technical positions to be recruited on professional merit, with special consideration of local experts ▪ Recruitment strategy to stipulate 50% of all non-professional occupations to be given to females 	Transparent recruitment strategy in place which stipulated gender considerations, locality and skills	Project Supervisor Local Village/ Katsina State government	N/A
Conflict/competition in basic resources threatening sustainable water access/supply for project and surrounding communities	<ul style="list-style-type: none"> ▪ Establish secure and separate water supply connection with Municipal Water supply source. ▪ Project should have its own water source. 	Water supply sources for community and facilities identified	Katsina State Water Board	1m

Decline in business by some traders	<ul style="list-style-type: none"> ▪ Establish trading and marketing linkages along the value chain of each product ▪ Deliberate promotion of local private investors to collaborate in the marketing linkages of targeted products to ATCs 	Equal rights policy in trade and procurement Mobilization for networking and farmers' organizations	District Heads/ Trader Unions/ Associations	Nil
Competitive edge by local producers	<ul style="list-style-type: none"> ▪ Establish local centers for developing skills such as value addition for crops local producers, and women. ▪ Link collection with farm-based extension to improve quality of produce. 	Capacity building and training to local producers	District Heads/ Katsina State Ministry of Agriculture	5,000,000.00
Dust pollution during construction phase	<ul style="list-style-type: none"> ▪ Minimize dust generation by using sprinklers ▪ Put speed limits to control construction vehicle speed ▪ Workers should use respirators ▪ Ensure debris generated during construction is disposed off appropriately to minimize pollution. 	Workers and truck drivers sensitized on speed	Site environmental officer/ KSEPA	Nil
Bio-diversity loss (degradation of vegetation and disturbance of fauna)	<ul style="list-style-type: none"> ▪ Enhance natural environment by planting indigenous trees, shrubs, and grass around project site. ▪ Ensure re-vegetation around project site, by planting indigenous trees and shrubs to stimulate natural regeneration 	Facility environmental management policy	Site Environmental Officer/ Forestry Department	10,000,000.00
Increase in waste generation (solid, liquid)	<ul style="list-style-type: none"> ▪ Ensure that effective solid waste collection and disposal systems are in place during operations ▪ Ensure that all waste water is treated before disposal ▪ Ensure debris generated during construction is disposed off appropriately to minimize pollution 	Facility Waste management policy Sensitization of workers on environmentally sound waste disposal	Facility supervisor	5,000,000.00
Potential of aflatoxins in crops	<ul style="list-style-type: none"> ▪ Educate farmers and monitor the process and quality of all harvesting, handling and drying equipment and storage bins prior to harvest, and during post-harvest to control contamination of aflatoxins. 	Household level training on proper crop storage	Katsina State Ministry of Agriculture Officer/ KSEPA	N/A
Contamination of water sources at Makera, Kabomo and Are project site	<ul style="list-style-type: none"> ▪ Construct facilities for storage of contaminated water. Maintain facilities to prevent overflow ▪ Ensure waste and other debris is not disposed near water sources. ▪ Protect nearby water sources, rivers and streams from degradation due to project activities. 	Protocols for water source protection in place and disseminated	Project supervisor/ KSEPA	Nil
Spread of infectious diseases – HIV, STIs	<ul style="list-style-type: none"> ▪ Sensitize workers and community members on protective sex. 	Frequency of sensitization campaigns on infectious diseases and material distributed	Local Health facilities/ Community Development Officer (CDO)	N/A

Gender-based violence (GBV)	<ul style="list-style-type: none"> ▪ Introduce anti-GBV protocols in workers' employment contracts ▪ Promote GBV support services with local Community Development (CD) and Social Welfare (SW) authorities ▪ Support community sensitization on GBV and Violence against Women and Children 	<p>Frequency of Sensitization seminars to workers and Community on GBV</p> <p>Facility anti-GBV policy</p>	Project authorities	Nil
Child abuse	<ul style="list-style-type: none"> ▪ Introduce child abuse protocols in workers' employment contracts ▪ Promote GBV support services with local Community Development and Social Welfare authorities ▪ Support community sensitization on GBV and Violence against Women and Children 	Facility child protection policy	Project authorities	Nil
Occupational and Workers health	<ul style="list-style-type: none"> ▪ Establish workplace health and safety procedures and train workers and management to avoid, minimize exposure to infections and accidents. ▪ Provide quality respiratory protection to capture dust and micro-organisms ▪ Ensure proper storage of chemicals within production or processing sites ▪ Ensure that first aid facilities are in place in designated locations and easily accessible. ▪ Design training and sensitization sessions to the general public on the possible health hazards generated by project operations and how they can mitigate or avoid them. 	<p>Frequency of training sessions on workplace health and safety standards</p> <p>Workplace occupational health and safety policy in place First Aid Kit in accessible locations within facility</p>	Project Supervisor / OSHA officer	Nil
DECOMMISSIONING PHASE				
Loss of employment due to cessation of contracts	<ul style="list-style-type: none"> ▪ Ensure facility workers are prepared for decommissioning 	Trainings on alternative income generation to workers	Facility supervisor	N/A
Inadequate waste management (debris from facilities)	<ul style="list-style-type: none"> ▪ Ensure that effective solid waste collection and disposal systems are in place during operations ▪ Ensure that all waste water is treated before disposal 	Facility waste management protocol to include decommissioning phase	Facility supervisor	5,000,000.00
Total Costs (projected)				111,000,000.00

7.7.2 Training and Awareness – Site Induction

Training is essential for ensuring that the ESMP provisions are implemented efficiently and effectively. The contractors shall be required to undertake general HSE awareness for their project workforce and specific training for those whose work may significantly have impact on the environment. This is to ensure that they are fully aware of the relevant aspects of the ESMP and are able to fulfil their roles and functions. The contractors shall ensure among others to provide the following training to their personnel as shown in table 7.4.

Table 7.4: Proposed Training Program for the Implementation of ESMP

Capacity Building Activity	Proposed Topics	Objectives	Target Audience	Duration
Module 1: Training on Environmental and Social Management Plan Implementation	<ul style="list-style-type: none"> • Overview of Environmental and Social Impact Assessment • Overview of Potential Impacts of Project • Environmental Pollution & Control • Environmental and Social Management Plan • Basic Environmental and Social Management • Environmental Performance Monitoring – Monitoring Mitigation Measures in ESMP • Environmental Reporting 	To enhance competence in environmental sustainability and regulatory practice	KSMA&LD Rep., relevant staff of FMEnv (EA Dept), KSMEEnv, KSEPA, other relevant MDAs, LGA departments, Project Contractors, NGOs.	5 days
Module 2: Training on Construction HSE	<ul style="list-style-type: none"> • Introduction to Construction HSE • Overview of Health and Safety Hazards in Construction • Incidents: Causation, Investigation & Reporting • Excavation Safety • Construction Site Inspection • Personal Protective Equipment 	To promote safe & healthy working conditions as well as the health of workers and regulators who may be involved in monitoring during project implementation	KSMA&LD Rep., relevant staff of FMEnv (EA Dept), KSMEEnv, KSEPA and other relevant MDAs, LGA departments, Project Contractors, NGOs.	4 days

Module 3: Training on Social and Community Engagement	<ul style="list-style-type: none"> • Listening to & understanding the opinions and perspectives of a diversity of stakeholders; • Negotiation and partnership contracting; • Interpersonal communication; • Relationship-building; • Facilitation; • Principles of cross-cultural awareness and cross-cultural communication; • Equity and diversity principles; and • Public sector values and codes of conduct. 	To ensure effective engagement with communities around the project area, public officials and public relation team. To facilitate relationships with communities for continuous stakeholder engagement and peaceful co-existence with the project host communities.	KSMA&LD Rep., KSMEEnv, KSEPA and other relevant MDAs, Project Contractors	
Projected cost		45,000,000.00		

All personnel who have attended the Environmental Induction will sign a Register which will be kept on the Project Files. Toolbox talks, based on the specific activities being carried out, will be given to personnel by the nominated project representative. These will be based on the specific activities being carried out. These talks will take place on-site and will include environmental issues particular to the proposed project, namely:

- Oil/Diesel spill prevention offshore including safe refueling practice.
- Emergency response procedures used to deal with an oil/diesel spill.
- Minimizing disturbance to wildlife such as cetaceans.

7.7.3 Communications

Environmental issues will be communicated to the workforce on a regular basis. Daily project meetings, which follow a set agenda incorporating Health, Safety and Environmental issues will be held on-site and a daily report will be generated and distributed.

All staff and sub-contractors involved in all phases of the project will be encouraged to report environmental issues.

Environmental Reporting: The contractor will report the status of project environmental activities to Katsina State Ministry of Agriculture on a regular basis. These reports will summarize the key environmental issues in the period and identify any non-conformances and the status of corrective actions.

Communication of Initiatives and Project Information: Communication of initiatives and project information will be developed as the project progresses. Typically, these will include campaigns to raise environmental awareness, circulars to inform staff of key environmental issues such as lessons learnt from incidents or accidents and the impact of any new legislation.

Subcontractor Environmental Reporting: All external communications with local interest groups, external agencies and also the response to any complaints will be conducted by Katsina State Ministry of Agriculture. Contractors shall notify the onsite Katsina State Ministry of Agriculture representative if any communications are received from external stakeholders.

7.7.4 Environmental Audit and Review

Katsina State Ministry of Agriculture shall conduct periodic HSE audits (monthly/quarterly/annually, etc) of the project activities in the project area in order to ascertain extent of compliance with policy and regulatory requirements. The audits shall be carried out by certified auditors and in accordance with ISO 14001 guidelines. The scope of the audits must include the following, as a minimum:

- compliance with all necessary codes, standards and procedures;
- examine line management systems, plant operations, monitoring practices etc.;
- identify current and potential environmental problems especially during the operational phase of the project;
- check the predictions in ESIA and assure implementations and application of recommended practices and procedures; and
- make recommendation for the improvement of the management system of the operation.

After every audit exercise, the environmental auditor shall produce an Environmental Audit Report (EAR) which shall be submitted to Katsina State Ministry of Agriculture for review.

7.7.5 Environmental Monitoring Programme

The Federal Ministry of Environment (FMEnv) guidelines require an environmental monitoring plan as part of an EIA. The aim of the monitoring programme is to ensure that the negative environmental and social impacts already identified in this ESIA are effectively mitigated in the design, construction, operation and decommissioning stages of the project. It also instils confidence in the host Community, the proponent of the project (Katsina State Ministry of Agriculture) and regulatory bodies that the identified impacts are adequately mitigated.

Environmental monitoring of this project is therefore advocated in order to ensure that the mitigation processes put in place have adequately taken care of the predicted impacts. This shall necessitate stable programmes to address the following:

- Alteration to the biological, chemical and physical characteristics of the recipient environment;*
- Social and health issues;*
- Alterations in the interactions between project activities and environmental sensitivities and interactions between the sensitivities;*
- Determination of long term and residual effects; and*
- Identification of project specific cumulative environmental effects.*

Katsina State Ministry of Agriculture and Regulators shall monitor the project from mobilisation through operation stages to keep track of the entire project development life cycle. The monitoring plans for the project including the environmental components, parameters and frequency of monitoring as well as responsibilities are presented in Table 7.5.

Table 7.5: Monitoring Plan for the Project

Environmental Components	Indicator Parameters	Frequency	Location	Responsibility
Air Quality	<ul style="list-style-type: none"> • NO_x, SO_x, CO₂, CH₄, SPM • Noise level 	Monthly during construction and operation	Project site	FMEnv, SMEnv, LGA
Surface Water Quality	<ul style="list-style-type: none"> • Turbidity • TSS • pH • Biological Oxygen Demand (BOD) • Coliform analysis 	Once every month during construction and 3 months after construction	Water bodies around the site	FMEnv, SMEnv, LGA
Sediment Quality	<ul style="list-style-type: none"> • Ph • THC 	Once every month during construction and 3 months after construction	Water bodies around the site	FMEnv, SMEnv, LGA
Hydrobiological Components (plankton, benthos)	<ul style="list-style-type: none"> • Diversity and abundance • Stress 	At the end of construction and then on a one (1) year interval	Water bodies around the site	FMEnv, SMEnv, LGA
Biodiversity (vegetation/forest resources and wildlife)	<ul style="list-style-type: none"> • Diversity and abundance • Pressure on species 	6 months interval from beginning to end of project	Project site	FMEnv, SMEnv, LGA
Socio-economic	<ul style="list-style-type: none"> • Population • Health status • Infrastructure 	At the project peak and before commissioning	Identified host community of the Project	KSMA&LD

7.7.6 Guideline for Waste Management

General

The provision of adequate waste management guideline and disposal facility is vital to the implementation of the proposed project. Table 7.6 presents overview of waste stream in all phases of the project and specifies proactive management approach to prevent environmental pollution and degradation. Waste shall be managed in accordance with Katsina State Ministry of Agriculture Waste Management Plan. The principle of waste reduction, recycling, recovery and reusing shall be practiced.

Some of the waste management options and waste disposal systems that shall be considered for this project are highlighted below:

(a) Solid Waste / Used Containers (Garbage and Inert Materials)

Katsina State Ministry of Agriculture shall apply the following principles in handling of general garbage (wood, plastics, paper, and food wastes):

- *Segregate components such as wood, plastic and paper, for recycling or reuse.*
- *Reduce packaging wastes such as paper and plastic by the use of bulk handling systems.*
- *Dispose all wastes at government designated dump sites.*
- *Refilling and reusing of containers.*

All construction waste shall be collected segregated and transported to a third party contractor management and disposal. No dumping of waste in water bodies shall be permitted.

(b) Sanitary Waste

Appropriate septic tanks shall be provided. Sewage shall be treated to residual chlorine level of 0.8 – 2.0mg/l before disposal.

Waste Handling Guidelines

Wastes handling and disposal procedures shall be well defined at source and a waste inventory register kept. The waste contractor shall define, and document appropriately, all wastes generated and transferred in the course of his work. The general information required, as a minimum, for adequate definition of wastes include: Waste stream identification; Proper waste categorization; Waste segregation; Appropriate handling and disposal practice; and Recommended Management practices.

Waste Minimization Guidelines

The four principles of waste minimization process; recycle, reduce, reuse and recovery shall be adopted as applicable, to ensure reduction to the possible extent, of the volume or relative toxicity of liquid or solid wastes.

A large proportion of the excavated material shall be used for landscaping or other remedial works on site. All wastes associated with hydrocarbons, oils, hydraulic fluids, oily sump water, etc. shall be treated and channelled to the waste treatment facility.

Waste Segregation Guidelines

All wastes to be generated from the proposed project shall be segregated at source, into clearly designated bins at strategic locations.

Waste Disposal Guidelines

All debris, spoil materials, rubbish and other waste, except excavated soil, shall be cleared regularly from the site and disposed of accordingly at government designated sites for such wastes. Instructions on material safety handling sheet (MSDS) shall be strictly adhered to and shall form the basis for the disposal of wastes related to such products. Adequate treatment measures shall be undertaken, where applicable, in line with applicable guidelines, for all waste before final disposal. All wastes in transit shall be tracked by waste consignment note. The waste consignment note records shall be kept and should include as a minimum the following information: Date of dispatch, Description of waste, Waste quantity/container type, designated disposal site and method, Consignee /driver name and means of transportation, and Confirmation of actual disposal (time and date).

Table 7.6: Waste Streams and Management

S/NO	SOURCE	WASTE TYPE	WASTE STREAMS	MANAGEMENT
PRE-CONSTRUCTION				
1	Movement of vehicles on earth road and engine exhaust	Gaseous Emission and Particulates	CO _x , SO _x , NO _x , CO, Particulate Matter	<ul style="list-style-type: none"> • Use water suppression to prevent dust emission • Maintain vehicles and machineries to reduce emission • Maintain low speed to reduce dust and gaseous emission.
2	Installation of temporary workers camp, offices and workshops	Non-Hazardous solid waste	<ul style="list-style-type: none"> • Vegetal Waste /Overburden waste • Industrial Waste: Metal scraps, packaging waste 	<ul style="list-style-type: none"> • Vegetal waste shall be supplied to farmers for use as compost. • Woody vegetal shall be supplied to host communities for domestic uses including as fuel wood for cooking. • Overburden waste shall be stockpiled for backfilling of pit and levelling of landscape. • Segregated and stored on site to be collected at least once a month for reuse or recycle through licensed third-party facilities.
3	Spills of oil and fuels from vehicles and equipment	Hazardous liquid waste	Spent oil and used grease from repairs of mechanical device	Stored and reuse/ sold to vendors were available in much quantity
4	Workers' camp	Domestic and Sanitary	<ul style="list-style-type: none"> • Food remnant, kitchen wastes. Food packaging etc. • Domestic Sewage 	<ul style="list-style-type: none"> • To be transferred to locals for use as compost and animal feeds. • Plastic and other packaging to be recycled through licensed recycling third parties. • Use of Mobile toilets and transferred to licensed carrier for disposal

CONSTRUCTION				
1	Movement of vehicles on earth road and engine exhaust	Emission	CO _x , SO _x , NO _x , CO, Dust	<ul style="list-style-type: none"> • Use water suppression to prevent dust emission • Maintain vehicles and machineries to reduce emission • Maintain low speed to reduce dust and gaseous emission.
2	Construction of access roads, civil works on site, installation of equipment. Workers' camp/offices	Non-Hazardous /Industrial	<p>Waste Packaging such as Scrap, wood, scrap metal, steel, glass, plastic, paper and cardboard, empty metal containers, excess concrete, broken equipment, or components</p> <p>Domestic-type waste: waste paper and food scraps, metal cans</p>	<ul style="list-style-type: none"> • Segregated and kept securely in closed containers on site. To be transferred to approved recycling third parties for reuse/recycling. • Non-recyclables to be removed by approved KSEPA waste contractor for onward disposal at approved sites. • To be transferred to locals for use as compost and animal feed. • Plastic and other packaging to be recycled through licensed recycling third parties.
3	Civil works on site, construction of different complexes/building section	Hazardous Waste	<p>Solid Wastes: Domestic-type waste: wastepaper and food scraps, metal cans, Material waste (pipes, planks, empty metal containers, excess concrete, broken equipment etc.)</p>	<ul style="list-style-type: none"> • Segregated and kept securely in closed containers on site. To be transferred to approved recycling third parties for reuse/recycling. • Non-recyclables to be removed by approved KSEPA waste contractor for onward disposal at approved sites. • To be transferred to locals for use as compost and animal feed. • Plastic and other packaging to be recycled through licensed recycling third parties. <p>Stored on site in closed containers with secondary containment and evacuated by an accredited waste management contractor with off-site permitted hazardous waste treatment, storage, or disposal facilities</p>
	Civil works		Waste Water		Waste water from equipment washing and concrete production	Discharged to the ground as only very small quantity is envisaged at this stage.
4	Workers' camp	Domestic and Sanitary	<ul style="list-style-type: none"> • Food remnant, kitchen wastes. Food packaging etc. • Domestic Sewage 	<ul style="list-style-type: none"> • To be transferred to locals for use as compost and animal feeds. • Plastic and other packaging to be recycled through licensed recycling third parties. • Use of Mobile toilets and transferred to licensed carrier for disposal

OPERATION AND MAINTENANCE				
1	Movement of vehicles on unpaved surface and engine exhaust	Emission	CO _x , SO _x , NO _x , CO, Dust	<ul style="list-style-type: none"> • Use water suppression to prevent dust emission • Maintain vehicles and machineries to reduce emission • Maintain low speed to reduce dust and gaseous emission.
2	Maintenance of facilities Workers' camp/offices	Non-Hazardous /Industrial	<ul style="list-style-type: none"> • Packaging waste, scrap metals, plastic, paper and cardboard, empty metal containers, broken equipment, or components • Domestic-type waste: wastepaper and food scraps, metal cans 	<ul style="list-style-type: none"> • Segregated and kept securely in closed containers on site. To be transferred to approved recycling third parties for reuse/recycling. • Non-recyclables to be removed by approved KSEPA waste contractor for onward disposal at approved sites. • To be transferred to locals for use as compost and animal feed. • Plastic and other packaging to be recycled through licensed recycling third parties.
3	Maintenance of facilities	Hazardous	<p>Solid Wastes: Domestic-type waste: wastepaper and food scraps, metal cans, Material waste (pipes, planks, empty metal containers, excess concrete, broken equipment etc.)</p> <p>Liquid Waste: spent lubricating oils, hydraulic fluids, brake fluids, battery electrolyte, and dielectric fluids, chemical cleaning agents, paints, primers, thinners, and corrosion control coatings; sealants and adhesives etc.</p>	<ul style="list-style-type: none"> • Segregated and kept securely in closed containers on site. To be transferred to approved recycling third parties for reuse/recycling. • Non-recyclables to be removed by approved KSEPA waste contractor for onward disposal at approved sites. • To be transferred to locals for use as compost and animal feed. • Plastic and other packaging to be recycled through licensed recycling third parties. <p>Stored on site in closed containers with secondary containment and evacuated by an accredited waste management contractor with off-site permitted hazardous waste treatment, storage, or disposal facilities</p>
	Emissions from high temperature ovens	Hazardous	Volatile organic components	Using appropriate control technologies (e.g. diversion of stack emissions through boilers; installation of scrubbers with activated carbon slurries; or incineration of extracted vapors in a combustion system).

DECOMMISSIONING				
1	Movement of vehicles on unpaved surface and engine exhaust	Hazardous	CO _x , SO _x , NO _x , CO, Dust	<ul style="list-style-type: none"> • Use water suppression to prevent dust emission • Maintain vehicles and machineries to reduce emission • Maintain low speed to reduce dust and gaseous emission
2	Demolition of structures	Nonhazardous	Concrete, scrap metals, woods, plastic,	<ul style="list-style-type: none"> • Segregated and kept securely. • To be transferred to approved recycling third parties for reuse/recycling. • Non-recyclables to be removed by approved KSEPA waste contractor for onward disposal at approved sites.
3	Removal of Industrial plant and other equipment	Hazardous	Spent lubricating oils, hydraulic fluids, brake fluids, battery electrolyte, and dielectric fluids, sealants and adhesives etc.	<ul style="list-style-type: none"> • Reuse materials in other construction site. • Recycle materials through licensed third parties • Waste materials shall be stored on site in closed containers with secondary containment and transferred to a registered waste contractor with off-site permitted hazardous waste treatment, storage, or disposal facilities.



7.7.7 Emergency Response Plan

This Emergency response plan is to address unexpected occurrence within or adjacent to the project site which could give rise to any or several of the following consequences. It may be impossible to anticipate every eventuality or combination of circumstances, but the following are foreseeable emergency situations that may arise:

- An Emergency Preparedness and Response Plan (EPRP) will be prepared to assist project staff in effectively responding to emergencies associated with project hazards. The EPRP will comply with the IFC Occupational Safety guidelines and performance standards. The EPRP will include:
 - Roles and responsibilities of emergency personnel;
 - Emergency contacts and communications systems/protocols, including procedures for interaction with local and regional emergency authorities;
 - Specific emergency response procedures;
 - Design and implementation of an emergency alarm system audible across the entire site at the sub-stations;
- An evacuation plan will be read and practice by all employees and contractors. The evacuation plan will include emergency escape routes, procedures for accounting for employees after an evacuation, and roles and responsibilities of personnel during an evacuation;
- Identification of supplies and resources to be utilized during an emergency event, including emergency equipment, facilities, and designated areas; and
- A training plan, which includes specific training and drill schedules for personnel
- Who are responsible for rescue operations, medical duties, spill response, and fire response?

If an emergency develops, all persons on site will be notified immediately and efforts will be coordinated with others in the vicinity surrounding the project area in order to reduce impacts, if applicable. The military personnel and police officials, and all necessary authorities will be immediately notified. If an emergency is imminent, but has not yet begun, steps will be initiated to immediately advise person in the vicinity of the emergency to evacuate and notifications will be made to military personnel and police officials and all other authorities which have responsibility regarding the emergency.



If there is a slowly developing emergency or unusual situation where an emergency is not imminent, but could occur if no action is taken, project personnel will notify the military personnel and police officials, and all other authorities of the potential problem and keep them advised of the situation. These agencies will be requested to indicate if there are any immediate actions that should be taken to reduce the risk or severity of the emergency and if necessary, what preventative actions will be implemented. In an emergency situation, equipment and supplies will be needed on short notice. Therefore, the Katsina SAPZ will maintain an accurate inventory of emergency response equipment and supplies.

The EPRP will include an evacuation plan which will be read and practiced by all employees and contractors. The evacuation plan will include emergency escape routes, procedures, for accounting for employees after an evacuation, and roles and responsibilities of personnel during an evacuation. In general, the following evacuation procedures should be followed:

- Alert the Emergency Response Team to assist in the evacuation.
- Use communications tools that are appropriate for the type of incident and the time of occurrence, such as alarms or loud speakers.
- When communicating an evacuation, speak clearly and succinctly: “we have a [state the type of emergency]. Evacuate to [state the assembly point]”.
- Turn equipment off, if possible.
- Take emergency supplies and staff roasters, if possible.
- Account for personnel.
- Wait at the assembly point for further instructions.

The EPRP will have specific information on the fire safety and explosion response, which will provide additional details specific to these emergencies.



7.7.8 Project Traffic Management Plan

This Traffic Management Plan describes procedures and protocols for site access, traffic routing and management, and contractor company guidelines with respect to vehicle and employee transportation in delivering their obligations on this intervention project. Public, employee and contractor safety is the primary goal of this plan. It is vital that the Contractor recognizes that the traffic within the project area will be dynamic throughout the course of execution of this works and the safety of other road users is absolutely essential during this time.

General Site Access

In the interest of site security and public safety, access to operational areas related to the execution of this contract will be restricted to authorized site personnel through the usage of signs and gates where appropriate. Facilities that potentially present danger to persons or wildlife such as the electrical, equipment staging area and workers camp will be fenced or barricaded as appropriate to prevent general access.

Traffic Management

All traffic on routes to and from the site will be radio controlled. Where this is not possible, signage will be installed at appropriate locations in order to warn the public along these routes. In the event that temporary closure occurs, access to the sites will be further restricted through the use of fences and gates as appropriate. Access to work areas such as temporary excavated places, or confined spaces where work is on going will be securely blocked by means of a temporary but robust barrier or barricade. Buildings and ancillary facilities will be locked and secured. A number of additional general measures related to site access, road management and public safety and construction events notification are presented here:

- Private employee off-road vehicles or private transport buses will be prohibited from entry into the site.
- Signage will be posted near all construction sites.
- Notifications will be provided for activities that would be carried out over the weekend or public holiday periods. These would be disseminated through existing



social institutions such as the village or district heads of communities, Local Government Councilors and NGO's or CBO's

- Speed limit maintained at 10 km/hr speed limit within or near the communities;
- Install reverse alarm fitted on all trucks, heavy duty equipment and off road vehicles
- Employ or engage the use of a minimum of two flagmen around excavated areas, one for traffic approach and one to direct traffic away from the sites
- In accordance with the Occupational Health and Safety Regulations for public roads, use of flashing devices/trafficators on all vehicles/machinery and equipment that will cross, travel on or may otherwise pose a risk to users of public roads.

Employee Transportation

To the extent possible employees will use buses provided by the contractor as transportation to and from the site, thereby reducing overall vehicle traffic. Project vehicles or will be utilized by staff, only when necessary.

Speed Limits

Speed limits will be enforced to and from the site and signage(s) shall be posted along the access and site roads (maximum 40 km/hr, reduced to 20 km/hr at blind corners and bridge crossings. Traffic along other access roads will be radio controlled for safety and speed control. Furthermore, employees and contractors will be educated on safety including traffic protocols and speed limits during mandatory orientation. Routine traffic inspections and/or speed indicator signs will be used to encourage safe and responsible driving.

Communications and Notification Protocols

It is anticipated that the intervention project will require only single-lane temporary closures. Signage warnings of construction activities on the roads will be placed at appropriate distances from the construction site, in consultation with SPIU, Ministry of Transports, department of Highways & Public Works. For significant work activity (those requiring more than one day to complete), written notification will be distributed to residents and the SPIU, Ministry of Transport, department of Highways & Public Works will be notified. A public notice would be posted at multiple locations in the metropolis to communicate to residents any new activities that may be occurring or scheduled. Contact information for the Contractors senior management will be included



in this notice and any concerns regarding the intervention work/project or traffic management can be forwarded through this notification system.

Traffic Routing and Volumes

Alternative traffic routing shall be mapped out and provided in the event that there will be complete closure of the road due to this intervention work activity. Traffic officers and appropriate road diversion signage(s) shall be deployed to ensure diversions routes are properly identified and traffic is directed along the mapped route. The flagmen shall be properly kitted in their Personal Protective Equipment (PPE), such as reflector vests and safety boots, to ensure that safety on the job is given due priority.

Reporting

Records on traffic management and implementation of this plan should be kept and updated by the contractor as evidence of on going mitigation compliance, which will be submitted to SPIU as part of routine reports on progress of work.

7.7.9 Environmental Health and Safety Plan

A Health and Safety Plan will be prepared for the construction, operation and decommissioning phases of the project to ensure compliance with the Ministry of Health Guidelines for Occupational Health and Safety and IFC guidelines. To ensure its employees' health and safety plan will address the following topics:

- Safety device to protect employees from injuries or hazardous conditions;
- Safe drinking water;
- Immunizations, as applicable;
- Clean eating area;
- First aid facilities;
- Sanitary conditions;
- Waste management, including bathrooms, and proper disposal procedures;
- Appropriate signage;
- Fire prevention facilities, training, and awareness; and
- Personal Protective Equipment (PPE).



A safety specialist assigned by Katsina-SAPZ will be responsible for the preparation, implementation and maintenance of a comprehensive safety program, which will be periodically evaluated. The safety specialist will be provided with written safety instructions including instructions on correct storage handling and disposal of hazardous waste, and written contingency Plans / guidelines of action for accidents, spills, and fire. The responsibility of the safety specialist includes performing safety training and conducting safety inspections, sessions and practice. The safety specialist will also be responsible for the investigation of accidents. A safety committee should be formed by Katsina-SAPZ and regular safety meetings should be organized.

7.7.10 Spill Contingency Management Plan

The Katsina-SAPZ will prepare and implement a spill contingency management plan that identifies this procedure to prevent, contain, cleanup, and report spill and release of fuel oil and their hazardous materials. Mitigation measure to prevent contamination from hazardous materials are primarily aimed at preventing their release into the environment in the first place and will include:

- Keeping equipment maintained.
- Inspecting equipment and containers for spill and leaks, corrosion, or other signs of deterioration
- Maintaining spill response equipment near material storage areas and on heavy equipment.
- Training employees on material storage, transfer, and transportation procedures, spill response procedures, and reporting requirements.

If a fuel spill occurs at the project sites, prompt action will be taken to contain the leakage or spillage in the event of a spill or leak, all combustible, flammable, and ignition sources (such as running engines) likely to result in a fire will be removed from the vicinity of the spill and anyone in the area will be advised to stay upwind. Spill kits will be kept at the project sites and the transport vehicles to readily clean up small spills. Large spills will be contained by constructing a berm around the spill area to control runoff to surface water. All soil contaminated by previous spills will be excavated and disposed of in accordance with the Katsina-SAPZ hazardous waste management procedures.



7.7.11 Contractor Management

Katsina-SAPZ will expect its contractors to follow IFC Guidelines for Occupational Health and Safety and Environmental Management. Katsina-SAPZ will issue a set of Environmental, Social, Health and Safety safeguards to the construction contractor to follow, which include standards that are expected to be followed and programs that the contractors are expected to have in place (e.g. Environmental Health and Safety Management System)

7.7.12 Air Quality: Generation of Air Emissions from Disturbance

Control techniques for minimizing temporary particulate matter (PM) emission during construction will involve watering of surfaces, chemical stabilization, or surface wind speed with windbreak or source enclosures. Furthermore, surface improvements offer long-term control techniques. These includes covering the road surface with a new material of lower site content, such as covering a dirt road with gravel or slag. Also, regular maintenance practices, such as grading of gravel roads, help to retain larger aggregate size on the traveled portion of the road and thus help reduce emissions. The amount of emissions reduction is tied directly to the reduction in surface site content.

Other mitigation measures include, maintaining good housekeeping prates throughout the construction phase. These low-cost measures include:

- Proper site enclosure through appropriate hoarding and screening
- On-site mixing and unloading operations.
- Proper handling of cement material.
- Maintain minimal traffic speed on-site and on access roads to the construction sites.
- Covering all vehicles hauling materials likely to give off excessive dust emissions.
- Ensure adequate maintenance and repair of construction machinery and vehicle
- Avoid burring of material resulting from site clearance
- Cover any excavated dusty materials or stockpile of dusty materials entirely by impervious sheeting.



- Proper water spraying when necessary.

7.7.13 Generation of Air Emission from Vehicles and Equipment Engines

In addition to PM generation, emissions will consist of combustion emission from diesel engine-driven electrical generators and vehicles and diesel-driven mobile construction equipment (such as, concrete trucks, dump trucks, excavators, and backhoes). The engines emit primarily CO₂, Co, NO₂, Sox, and HC. Measures to reduce combustion emissions include proper truck and engine maintenance, adoption of a traffic management plan while avoiding congested routes, proper maintenance of construction equipment, and the quality of diesel fuel used. In addition, equipment will be turned off when not in use, while would reduce power needs as well as emissions of pollutants. The supervising consultant will have the responsibility of ensuring the implementation of these measures by the contractor.

7.7.14 Degradation of Water Quality due to Storm Water Runoff

The removal of vegetation and disturbance of soil in the construction work areas may result in erosion and sedimentation causing increased turbidity in water within the project area.

Additionally, degradation of water quality may occur from pollutants in storm water runoff from material and equipment storage areas and spills and leaks from construction equipment. Special care must be taken to decrease impacts where work is or near the marshland/wetland areas so as to keep disturbance of the ecosystems to a minimum.

Prior to commencement of construction activities, Katsina-SAPZ will require its contractors to prepare and implement an Erosion and sediment Control Plan. Its purpose will be to assist Katsina-SAPZ, its contractor, and subcontractors in the implementation of control measure for storm waste runoff from the project site, and material storage areas to prevent degradation of water quality. The plan will achieve this purpose by specifying the best management practices, required to assess the effectiveness of construction storm water management practices, especially during the rainy season. Katsina-SAPZ will demonstrate, to the satisfaction line route will not occur during any stage of construction. Briefly, the erosion and sediment control measures to be implemented during the construction phase of the project include:



- Minimizing land cleaning activities to the project location work areas, access points, and material storage area
- Minimizing the time of exposure of erodible land exposed to storm water runoff during the rainy season
- Maintaining a riparian Management Zone (RMZ) between the construction work areas and surface water bodies to filter sediments in storm water runoff
- Covering open stockpiles of construction materials with tarpaulin or similar fabric during rainstorm events to prevent erosion and resultant sedimentation of receiving waters.
- Compacting soil as soon as the foundations are formed to prevent erosion, especially during the wet season
- Restoring the construction working areas as soon as possible once construction is complete at the location.

7.7.15 Degradation of Water Quality due to accidental spills and leaks

Katsina-SAPZ will develop and implement a spill contingency plan to prevent and mitigate spills of oils or hazardous material to surface water bodies and groundwater. Storage of fuel and hazardous material should not occur within 30m of a surface water body. If any pumps are needed for removal of water during site construction within 30m of marshland/wetland water body. They will utilize proper secondary containment. Oil leakage or spillage will be contained and cleaned up immediately. Spent oil and lubricants will be collected and stored for recycling or proper disposal. In addition, all fuel tanks and chemical storage areas will be provided with locks and located within secondary containment structure. Oil/water separators will be installed at storm water channels to remove oils from contaminated waters such as from workshops.

7.7.16 Soil Contamination and Erosion due to erosion

Prior to commencement of construction activities, Katsina-SAPZ will implement an erosion and sediment control Plan, Katsina-SAPZ will demonstrate, to the satisfaction of the FMEnv that any substantial risk of increased sediment discharges from the project sites will not occur during any stage of the project. Cleaning of vegetation will be limited to where it is strictly needed so as to decrease the risk of soil erosion, and Riparian



Management Zone (RMZ) between the construction areas and surface water bodies. Unpaved roads will be graded so that to decrease the risk of erosion during rainstorms.

- Soils excavated for foundations will be used for re-filling and will not be left exposed to wind or water for long periods
- The contractor will avoid steep terrain during the transportation material by using alternative route or use light vehicles where appropriate
- Heavy machinery will be used as needed in the clearance of construction work areas in order to minimize soil compaction, which makes the soil susceptible for erosion.
- Riverine and surface water body associated vegetation will be minimally disturbed during the construction phase to reduce soil erosion and safeguard bank protection
- Disturbed areas will be replanted with local species common in the area complement natural vegetation regeneration to improve cover
- In are prone to soil erosion, suitable sediment binding grasses will be planted in degraded substrates.

7.7.17 Noise Management

Typical mitigation measures that will be enforced during construction to minimize noise levels are:

- Effectively utilizing material stockpiles and other structures, where feasible; to reduce noise from on-site construction activities
- Choosing inherently quiet equipment
- Operating only well-maintained mechanical equipment on-site
- Keeping equipment speed as low as possible
- Shutting down or throttling down to minimum equipment that may be intermittent in use, between work periods
- Utilizing and properly maintaining silencer or mufflers that reduce vibration on construction equipment during construction works
- Restricting access to the site for truck traffic outside of normal working hours
- Utilizing proper site logistics and planning



- Limiting site working hours the morning hour
- Scheduling noisy activities strictly during the morning hours
- Consulting with local communities and informing the locals when noisy activities are planned
- Enforcing noise monitoring
- Enforce the use of hearing protection actively when the equivalent sound level over 8 hours reaches 85 dB(A), the peak sound levels reach 140dB(C), or the average maximum sound level reaches 110db(A)
- Installing warning signs in area high noise levels
- Consider the use of acoustic insulating materials, isolation of the noise source, and other engineering controls to minimize noise impact.

The noise control measure will be included within the construction contracts and be considered as requirements from contractors. The supervising consultant will have the responsibility of ensuring the implementation of these measure.

7.7.18 Hazardous Materials Management

Katsina-SAPZ will require its contractor to prepare and implement a spill contingency Plan that identifies the procedures to prevent, contain, cleanup, and report spills and releases of oil and hazardous material Mitigation measures to prevent contamination from hazardous materials are primarily aimed at preventing their release into the environment in the first place and will include:

- Storing oil and hazardous materials within secondary containment structures in designated area.
- Using portable oil collection pans during refueling operations.
- Storing pesticides and herbicides in designated areas according to FAO Guideline standards any pesticides to be used will be manufactured, packaged, labeled, handled, stored, disposed of, and applied according to standards such as the minimum standards of FAO's Guidelines for packaging and storage of pesticides, Guidelines on Good labeling practice for pesticides.
- Ensuring that no storage of oil and hazardous materials occurs within 30m of a surface waste body



- Keeping equipment maintained
- Inspecting equipment and containers for spill and leaks, corrosion, or other signs of deterioration
- Maintaining spill response equipment near material storage areas and on heavy equipment
- Ensuring all working dealing with such substances are adequately informed about the risks
- Training employees on material storage, transfer, and transportation procedures, spill response procedures, and reporting requirements.

Katsina-SAPZ will keep an accurate inventory of all oil, hazardous material, and waste stored on site and material safety Data sheets will be available for these material.

If a fuel/oil spill occurs at the project site, on any of the access roads to the site, or into a water body or wetland, prompt action will be taken to contain the leakage of spillage. In the event of a spill or leak, all combustibles, flammables, and ignition sources (such as running engines) likely to result in a fire will be removed from the vicinity of the spill and anyone in the area will be advised to stay upwind. Spill kits will be kept at the project site and on the transport vehicles to readily clean up small spills. Large spills will be contained by constructing a berm around the spill area to control runoff surface water, or deploying a spill boom if the spill is in a water body. All soil contaminated by the spills will be excavated and disposed of in accordance with the Katsina-SAPZ hazardous waste management procedures.

7.7.19 Recurring Environmental and Social Issues

Environmental and Social issues and their management plan. They include public/stakeholders' consultation, labour and gender-based violence.

- **Public / Stakeholders Awareness Consultations Management Plan**
 - Regular public sensitization and meetings during the project implementation to reduce incidences that may arise as a result of ignorance, incomplete knowledge and forgetfulness of the basic rules that guide the site.



- Have bi-Monthly Public/Stakeholders consultation and awareness meetings geared towards review, revalidate and documentation of the ESMP.
 - Environmental Committee (EC) shall be formed and chaired by ESO.
 - There must be representatives of the stakeholders, farmers and women among the committee.
 - EC shall oversee the coordination of public stakeholder consultations and awareness on Environmental and Social Management issues.
 - EC shall hold meetings twice every month, and more during emergency.
 - The meetings shall read out and review its rules including health and safety rules among others.
 - Flyers that contain basic rules shall be printed and shared to participants if need be.
 - The minutes of meetings and consultations if adopted shall be inculcated in the rules.
 - Each participant shall be able to know his obligation, roles and reasonability as a stakeholder.
- **Labour Management Plan**
- Workers admitted as labourers must be of age 18 years and above.
 - Community members who possess the required skills and are ready to work shall be given preferential treatment during recruitment.
 - Payment of wages shall be made as and when due.
 - The Contractor shall be responsible for the safety and Health of its employees at the work place.
 - He shall provide PPE, train and inform all workers of any known hazards on the site.
 - Workers shall not be allowed to form labour unions in the site.
 - Labour Grievance Redress Desk shall be instituted.
 - If a labourer is dismissed, he shall be given reasons for dismissal and the right to lodge complaints to Grievance Redress Desk.
 - No worker shall be stigmatized due to his or her social status in the communities.
 - Physically impaired workers shall be given due considerations.
 - Severance allowance should be paid to casual workers during decommissioning.



- **Gender Based Violence Management Plan**

- Females with requisite skills should be given equal consideration as men during hiring
- No male shall solicit for sex or any kind of favor in exchange for work
- The management shall advocate against Gender Based violence, sexual exploitation and work place sexual harassment among his team, employees or community members.
- The Contractor shall accord female employees the same treatment as their male counterpart, such as equal payment for equal work.
- There shall be no form of physical or verbal abuse of women, especially those depicting them as less important.
- Female counterpart shall be incorporated in decision making body in the site.
- Women shall be given due recognition and award like male counterpart when they merited it.
- No woman or man shall be stigmatized due to his or her social status in their communities.
- Male workers involved in gender violence shall be penalized.



CHAPTER EIGHT

8.0 REMEDIATION PLANS AFTER DECOMMISSIONING/CLOSURE

8.1 Introduction

All project initiatives have a lifespan after which it is decommissioned. The project proponent does not expect to terminate the operation of the Special Agro-Industrial Processing Zone (SAPZ) for at least 50 years. However, a ‘phased-out’ of out-modeled or 314 outdated machinery may make decommissioning inevitable. Decommissioning involves activities that result in the stabilization and restoration of unneeded site(s) to a more natural state. For this project, Katsina State Ministry of Agriculture and Livestock Development (KSMA&LD) will ‘return’ the project site to its initial and unblemished natural state, through rehabilitation and enhancement in accordance with a plan and standard procedures that meet local regulatory requirements and international standards as prescribed by the environmental statutes and in recognition of multi-stakeholders’ decision.

This chapter describes the activities that will be completed to restore the project location to an acceptable condition for its intended use. The incorporation of remediation plans into the overall project planning is essential because it allows proponents to understand the need for restoring the environment into its original, or near its original status when abandonment plans are being conceptualized.

Before decommissioning, KSMA&LD will develop plans that include the following:

- Identification of components of the project that will be removed;
- The choice of environmentally sound methods for removal, re-use, recycling or disposal of special wastes that may arise from the decommissioning process.
- Expressly outline the time frame/schedule for the decommissioning and post-decommissioning process, and communicate the same to FMEnv and other relevant regulatory agencies as well as the affected or concerned persons and groups;
- Proper rehabilitation and decommissioning process;
- Appropriate site rehabilitation, remediation and enhancement techniques and technologies; and



- There shall be post-decommissioning assessments to compare ameliorated project-related impacts, relative to the baseline conditions.

8.2 Consultation

The project decommissioning and abandonment plan will include consultation with various stakeholders including employees from various departments. The decommissioning team will include competent personnel from the KSMA&LD as well as the regulatory authorities.

8.3 Reporting

As required by regulations, a post-decommissioning report will be prepared and submitted to FMEnv. The report will include the following details:

- Overview of decommissioned facilities
- Details of methods used for decommissioning
- Nature of decommissioning (partial or whole)
- Record of consultation meetings
- Details of recyclable / reusable materials / facility components
- Decontaminated facilities
- State of the surrounding environment
- Waste Management Plan
- Plans for restoration and remediation where necessary.

8.4 Decommissioning Activities

At the end of the facilities utility, all equipment and structures will be decommissioned. All installed facilities on project site will be adequately dismantled and removed to allow for proper remediation of the project site. In general, the activities to be carried out during the decommissioning phase shall include the following:

- Dismantling of all surface equipment and structures
- Dismantling of buildings including excavation
- Removal of foundations
- Removal of decommissioning waste



KSMA&LD will ensure safety of personnel and the public during decommissioning as well as minimize negative environmental and social impacts. Particular attention will be paid to the following:

- Protection from air pollutant emissions;
- Protection from noise; and
- Waste handling

All the components that can be used or recycled will be identified and quantified. Cleared locations will be re-vegetated using fast growing native plant species, which can either be purchased from a nursery plantations/farms or nursery of these seedlings will be developed by capable agronomists. Disturbed areas on the facility will be identified and restored using native species.

8.5 Decommissioning and Abandonment Plans

Decommissioning of the houses is not foreseen, however, decommissioning of other facilities especially project site offices and workshops are inevitable. KSMA&LD will prepare a written abandonment plan within 30 days of determining decommissioning. The Plan will detail how the decommissioning will be carried out. The abandonment plan will be subject to approval by KSMEnv, FMEnv / NESREA. An Environment Project Report (EPR) will be prepared prior to implementation of this plan, to assess and minimize potential environmental and social impacts arising from the abandonment of operations. This abandonment EPR Study will be submitted to FMEnv / NESREA for consideration. Upon completion of the abandonment operations, an assessment of contaminated land will be prepared recording the final contamination status of the location of the project facilities. This assessment will be subjected to FMEnv/NESREA for approval.

8.6 Recommended Mitigation Measures for Decommissioning Phase

Some basic mitigation measures will be required to be undertaken once all operational activities of the project have ceased. The necessary objectives, mitigation measures, allocation of responsibilities, time frames, prevention, minimization and monitoring of all potential impacts associated with the decommissioning and closure phase of the project are outlined in table 8.1

8.7 Decommissioning phase ESMP

In addition to the mitigation measures provided in chapter 6 of this report, it is necessary to outline some basic mitigation measures that will be required to be undertaken once all operational activities of the proposed project have ceased. The necessary objectives, mitigation measures, allocation of responsibilities, time frames and costs pertaining to prevention, minimization and monitoring of all potential impacts associated with the decommissioning and closure phase of the project are outlined in the table 8.1.

Table 8.4: Decommissioning phase Environmental and Social Management Plan

Impact	Mitigation Measures	Responsible Persons	Frequency
Demolition waste	<ul style="list-style-type: none"> Use of an integrated solid waste management system i.e. through a hierarchy of options: 1. Source reduction 2. Recycling 3. Reuse All buildings, machinery, equipment, that will not be used for other purposes Shall be removed and recycled/reused as far as possible All foundations shall be removed and recycled, reused or disposed of at an approved disposal site Where recycling/reuse of the machinery, equipment, implements, structures, partitions and other demolition waste is not possible, the materials shall be taken to an approved waste disposal site Reusable demolition waste shall be donated to charitable organizations, individuals and institutions 	KSMA&LD	Throughout the demolition period
Noise and Vibration	<ul style="list-style-type: none"> Sensitization of workforce including drivers of construction vehicles shall be undertaken Installation of portable barriers to shield compressors and other small stationary equipment where necessary shall be in place Proper maintenance of all equipment shall be carried out Workers in the vicinity of high level noise shall wear safety and protective ear mug 	KSMA&LD	Throughout demolition period
Dust	KSMA&LD shall; <ul style="list-style-type: none"> Spray demolished piles of earth with water Avoid pouring dust materials from elevated areas to 	KSMA&LD	Throughout demolition period



	<p>ground</p> <ul style="list-style-type: none"> • Cover all trucks hauling soil, sand and other loose materials • Provide dust screen where necessary 		
Site degradation	<p>KSMA&LD shall</p> <ul style="list-style-type: none"> • Implement an appropriate re-vegetation programme to restore the site to its original status as much as possible. • Consider use of indigenous plant species in re-vegetation 	KSMA&LD	Throughout the demolition period

Source: Field study, 2024

8.8 Remediation Plans after Decommissioning

The incorporation of remediation plans into the overall project planning is essential because it allows proponents to understand the need for restoring the environment into its original, or near its original status when abandonment plans are being conceptualized. Operating projects beyond the designed lifespan makes it economically unproductive as returns from such investment become unattractive. Therefore, investors make appropriate plans for either temporarily or permanent closures of facilities after the expiration of the project useful life. The useful life of any project is determined by a number of factors, among which are:

- Specifications of materials,
- Durability of equipment and machinery,
- Profitability of the proposed project and
- Importance of the end product.

The activities to be carried out during the decommissioning phase shall include the following:

- Dismantling of the facility and other ancillary equipment and
- Removal of all structures.

The potential impacts that might result from the decommissioning phase of the proposed project have been earlier identified and discussed in Chapter 5.

The strategy to be adopted for site remediation shall depend on the prevailing biophysical and social environmental attributes and the attendant impacts that may result from such an action.



CHAPTER NINE

STAKEHOLDER ENGAGEMENT AND GRIEVANCE REDRESS MECHANISM

9.1 Introduction

Consultations are an important tool in identifying the major environmental and social issues that form a vital aspect of the preparation of this ESIA. A Stakeholder Engagement Plan (SEP) which aims at facilitating the development and sustainable implementation of various stages of the Project's life cycle from (pre-construction to, construction, operations, and decommissioning) was done during preparation of this ESIA document. It describes the process by which stakeholders were identified; the means by which they were consulted; and the outcomes of the consultations to date. It also describes the actions that the Project took to disclose pertinent information to stakeholders.

9.2 Stakeholder Engagement

A Stakeholder Engagement Plan (SEP) is the process of managing stakeholder expectations which influences project decisions throughout the life cycle of the project. This process provides a plan to interact effectively with stakeholders and support the project interest. It is very important to plan these activities well so that they appraise the contribution of stakeholders on projects, manage their expectations also achieve project objectives. Stakeholder engagement process focusing on free, prior and informed consultation (FPIC) shall be conducted with the community and other stakeholders, and take into account modalities of vulnerable and marginalized communities may be involved. The consultation shall include prior disclosure of information in a manner accessible and understandable to communities, key informant interviews, focus group discussion (male & female, youth) and public consultation. The consultation shall be documented with required facts, figures and evidence including participant list with contact details, photographs. Information shall be disclosed as per the requirement of National Regulations EIA Act No. 86 of 1992 (as amended by the EIA Cap E12 LFN 2004) and the African Development Bank's Integrated Safeguards System.



9.3 Objectives of Stakeholder Engagement

The objectives of public participation in an ESIA are to provide sufficient and accessible information to potentially interested and affected parties/stakeholders in an objective manner to assist them identify issues of concern, and provide suggestions for enhanced benefits and alternatives. The stakeholder engagement process was designed to conform to the Nigerian EIA Act and international standards. For this Project, the key objectives for stakeholder engagement are:

- Identify key stakeholders that can influence the Project and its activities;
- Inform and educate stakeholders about the proposed Project;
- Gather local knowledge to improve the understanding of the environmental and social context;
- Better understand the locally-important issues;
- Identify the most effective methods and structures through which to disseminate project information, and to ensure regular, accessible, transparent and appropriate consultation;
- Provide a means for stakeholders to have input into the Project planning Process;
- Take into account the views of stakeholders in the development of effective mitigation measures and management plans; and
- Lay the foundation for future stakeholder engagement.

9.4 Disclosure and Participation Plan

Information disclosure is an important activity not just as a form of engagement but for also enabling the other engagement activities to be undertaken in an informed and participatory manner. This section outlines the process to be followed for the disclosure and participation as part of the EEP implementation.

It is required under the AfDB operational Safeguards that the Proponent will maintain and disclose as part of the environmental and social assessment, a documented record of stakeholder engagement, including a description of the stakeholders consulted, a summary of the feedback received and a brief explanation of how the feedback was taken into account, or the reasons why it was not.



9.4.1 Disclosure Mechanism

The process of information disclosure can be undertaken in two ways: either voluntary disclosure or disclosure as part of the regulatory requirements (EIA requirements, public hearing). While regulatory disclosure involves the provisioning of information as required by the authorities and agencies involved in the project, voluntary disclosure refers to the process of disclosing information to the various stakeholders in a voluntary manner.

This disclosure not only allows for trust to be built amongst the stakeholders through the sharing of information, but it also allows for more constructive participation in the other processes of consultation and resolution of grievances due to availability of accurate and timely information.

9.4.2 Process for Disclosure of Information

As a standard practice, this ESIA will be released for public review according to the AfDB disclosure procedures, and for a period of 21 days in accordance with Nigerian Regulatory Frameworks. Distribution of the disclosure material will be done by making them available at venues and locations convenient for the stakeholders and places to which the public have unhindered access. The language of the ESIA is in English. The report will be made accessible for the general public at the following locations:

- The EA Department of the Federal Ministry of Environment;
- Katsina State Ministry of Environment
- Ministry of Agriculture and Natural Resource and
- Other designated public locations to ensure wide dissemination of the materials.

Electronic copies of the ESIA report will be placed on the website of the AfDB. This will allow stakeholders with access to Internet to view information about the planned development and to initiate their involvement in the public consultation process. The mechanisms which will be used for facilitating input from stakeholders will include press releases and announcements in the media, notifications of the aforementioned disclosed materials to local, regional and national NGOs, relevant professional bodies as well as other interested parties.



9.4.3 Timetable for Disclosure

The disclosure process associated with the release of project E&S documentation will be implemented within the following timeframe:

- Placement of the ESIA report in public domain (FMEnv and AfDB website)
- 21-day disclosure period – dates to be confirmed by FMEnv.
- Addressing stakeholder feedback received on the entire disclosure package – Dates to be confirmed by FMEnv and AfDB.

The ESIA will remain in the public domain for the entire period of project development and will be updated on a regular basis as the project progresses through its various phases, in order to ensure timely identification of any new stakeholders and interested parties and their involvement in the process of collaboration with the project. The methods of engagement will also be revised periodically to maintain their effectiveness and relevance to the project’s evolving environment. The table 9.1 summarizes the main stakeholders of the project, types of information to be shared with stakeholder groups, as well as specific means of communication and methods of notification.

Table 9.1: Stakeholder Engagement and Disclosure Methods

Stakeholder Group	Project information shared	Means of communication/ disclosure
Project beneficiary	- ESIA report - RAP/eRAP - Regular updates on project development.	- Public/Disclosure notices - Electronic publications and press releases on the Project web-site. - Dissemination of hard copies at designated public locations. - Press release in the local media - Consultation meetings.
AfDB	- ESIA Report - RAP/eRAP - Regular updates on project development.	- Electronic publications and press releases on the AfDB’s web-site. - Submission of hard copies
Non-government Organizations	- ESIA Report - Regular updates on project development.	- Public notices - Electronic publications and press releases on the project web-site. - Dissemination of hard copies at designated locations. - Press releases in the local media.



9.5 Grievance Redress Mechanism

The grievance mechanism is a company process that enables stakeholders to make a complaint or a suggestion regarding the way a project is being implemented. This includes ensuring that all grievances that are received are acknowledged, logged and tracked. It also enables complainants to know what to expect in terms of response and when. Generally, grievances may take the form of specific complaints for damages/injury, concerns about routine project activities, perceived incidents or impacts or requests for more information / clarity on project activities. In relation to resettlement, complaints may be related to compensation, land issues, resettlement assistance or housing, or other relevant issues.

The primary objectives of a grievance mechanism are to:

- enhance trust and positive relationships with stakeholders, particularly as resettlement is a sensitive and complex process;
- prevent the negative consequences of failure to adequately address grievances; and
- identify and manage stakeholder concerns and thus support effective risk management in relation to resettlement and the Project overall.

The grievance mechanism allows stakeholders to submit complaints and comments at no cost, without retribution and with the assurance of a timely response. The key principles and overview of an effective grievance mechanism are:

- *Culturally appropriate*: Tailored to the local language.
- *Accessible*: Accessible to all settlements and stakeholder groups within the project area.
- *Inclusive of vulnerable groups*: Available to those less likely to have the means to voice their concerns or opinions within the Nigerian context (e.g., women, elderly, Fulani).
- *Reliable*: The developer will respond to grievances within an agreed timeframe in order to manage expectations.



- *Publicized:* The developer will publicize the grievance mechanism through engagement activities and advertisements to ensure that stakeholders are aware and understand the process.
- *Logged:* Grievances will be logged and tracked, and
- *Confidential:* Grievances will remain confidential and anonymous

9.6 Grievance Management Standards

The RAP Grievance Mechanism has been designed in accordance with international best practice as summarised in Table 9.1 below.

Table 9.1 Grievance Management Standards

Standard	Summary
Nigerian Legislation	Section 30 of the Land Use Act 1990 6 v states: “Where there arises any dispute as to the amount of compensation calculated in accordance with the provisions of section 29, such dispute shall be referred to the appropriate Land Use and Allocation Committee.”
AfDB Integrated Safeguard System (ISS)	The AfDB ISS includes provisions for establishing a culturally appropriate and accessible grievance and redress mechanism to resolve, in an impartial and timely manner, any disputes arising from the resettlement process and compensation procedures.
International Finance Corporation Performance Standard 5 (IFC PS5)	IFC PS 5 requires that the client establish a grievance mechanism as early as possible in the project development phase. This will allow the client to receive and address specific concerns about compensation and relocation raised by displaced persons or members of host communities in a timely fashion, including a recourse mechanism designed to resolve disputes in an impartial manner.
European Investment Bank (EIB)	EIB Environmental and Social Standard 10 requires that the project promoter shall set up and maintain a grievance mechanism that is independent, free and that will allow prompt addressing of specific concerns about compensation and relocation. The mechanism should be easily accessible, culturally appropriate, widely publicized, and well integrated in the promoter’s project management system. It should enable the promoter to receive and resolve specific grievances related to compensation and relocation by affected persons or members of host communities, and use the grievance log to monitor cases and improve the resettlement process.

As described in the table, key principles of the mechanism include ensuring that the Grievance Mechanism is culturally appropriate, grievances are dealt with in a timely manner and impartially, it should be easily accessible and widely publicised to ensure that it can be accessed by all stakeholders, including vulnerable groups. This includes providing adequate assistance for those who may face barriers including language, literacy, awareness, finance, distance or fear of reprisal.



9.7 Roles and Responsibilities in Grievance Management

This outlines the key bodies that are involved in the Grievance Mechanism process. These include the following:

- **Project Staff:** The Project Community Liaison Officer (CLO) and Resettlement Coordinators (RC) will likely be the first point of contact for complainants and is responsible for receiving, recording and communicating the grievance to the Grievance Officer (GO), or equivalent. The GO is responsible for processing and resolving the grievance with relevant departments and stakeholders, including the complainant, Community Resettlement Committee (CRC) and Land Use and Allocation Committee (LUAC). All resettlement related grievances will be signed off by the Resettlement Manager (RM). Level 3 grievances will also require sign off by the Country Manager (CM).
- **Community Resettlement Committee (CRC):** If needed, the CRC particularly Community Leaders, will assist community members in accessing the grievance mechanism and ensure the Project is aware of the grievance. Additionally, depending on the type and priority level of the grievance, the CRC will play an active role in resolving the grievance. All the members of the CRC have been trained on their responsibilities, including grievance management responsibilities, which includes where required by PAPs and the Developer:
 - reporting grievances raised by PAPs if needed to the Project CLO;
 - keeping the aggrieved parties updated on the progress with respect to addressing their grievance; and
 - supporting the development of solutions to the grievance if the grievance is not resolved.
- **Resettlement Steering Committee (RSC):** As with the CRC, if needed, the RSC or individual members will play an advisory role in grievance resolution at the highest level, and will intervene in the case that it is not resolved.
- **Land Use and Allocation Committee (LUAC):** The LUAC is a key stakeholder regarding the management of land. They will be required to assist with the resolution of grievances related to replacement land allocation.



All bodies will work closely together to ensure that grievances are dealt with fairly and transparently.

Under the PIU, there will be an established Safeguard Unit. This unit will work with the Grievance Redress committee that would be established for this specific purpose comprising administrative heads or an appointed representative of Katsina local governments, community and/or village Heads/Mai Angwa's, Sarki, NGOs/CBOs and other relevant Government organs that will be set up to address complaints. For this reason, handling grievances will begin with the Local Government. A grievance log will be established by the project and copies of the records kept with all the relevant authorities.

The existence, location, purpose and composition of this committee will be publicized, so that complainants are knowledgeable about the availability of this committee for resolving any grievance.

9.8 Expectations when Grievances Arise

When people present their grievances, they expect to receive one or more of the following: acknowledgement of their problem, an honest response to questions/issues brought forward, an apology, adequate compensation, modification of the conduct that caused the grievance and some other fair remedies. In voicing their concerns, they also expect to be heard and taken seriously. The company, contractors, or government officials must therefore convince people that they can voice grievances and work to resolve them without retaliation.

9.9 Setting up a Grievance Redress Mechanism

During the time of implementing of the ESIA, the PIU shall establish a Grievance Redress Mechanism that incorporates the use of existing local grievance redress mechanism available in the community. It will be effective and result oriented to work with existing and functional local structures of dispute resolution than to design an entirely new one, which may be alien to the people.



9.9.1 Membership of the Grievance Redress Committee (GRC)

Membership of the GRC for the 3 levels of grievance uptakes shall comprise as follow:

GRC at the Site/community Level:

- The traditional Ruler/District head of Argungu community at the AIH or a person appointed by them from the council;
- The village heads of Are, Kabomo, Suduje and Makera communities in the ATC's project location site;
- The Woman leader in the communities or her secretary;
- A woman leader of an affinity association;
- 2 Representatives of PAPs including at least a woman;
- 2 members of the site committee including at least a woman.

GRC at the PIU Level:

It is recommended that the state project coordinator shall constitute a team within the PIU to receive, hear and address complaints arising from the project. The Social and Livelihood Officer/Safeguards Officer will head the team. Membership of the team shall be as follow:

- Social and Livelihood Officer;
- Communication officer/ Public relations officer;
- Environmental officer
- Monitoring and Evaluation officer, and
- The project engineer

GRC at the State Steering Committee Level:

The committee at this level shall be headed by the Permanent Secretary/Commissioner, Bauchi State Ministry of Agriculture, while the Project Coordinator shall serve as the secretary of the committee.

Membership of the GRC at this level shall constitute as follows:

- The Permanent Secretary Bauchi State Ministry of Agriculture;
- Director Ministry of Land & Survey



- Director Ministry of Agriculture;
- Director Ministry of Environment
- The State Project Coordinator

9.10 Grievance Redress Process Procedure

The GRM Process would comprise:

Registration

It may be less depending on the severity of the matter under consideration. The first step is the presentation of a grievance at the uptake point at any level. The social contact person or secretary of the committee will receive grievance from the complainant, register and acknowledge receipt of grievance to the grievant within 2 days. The registration will capture the following data: name of the complainant, date of the grievance, category of the grievance, persons involved, and impacts on complainant life, proofs and witnesses. A registration form will have all these bits of information.

Verification

The verification determines among other things whether the matter has relationship with the project activities, and whether the matter can be handled/resolved at the level where it is presented. This will determine if the matter should be referred to the next level or not. Part of the investigations may also be to assess the cost of lost or risk involved in the grievance.

Processing

The processing step is when options for the approach to resolving the case are weighed and determined. Parties involved in the case are brought together for the first attempt at resolution with suggestions from the parties on practical steps to be taken which may also involve site visit for physical inspection and determination of the claim.

Feed back

All responses to the complainant in a grievance redress process that moves beyond a unit level must be communicated in writing and/or by verbal presentation to the complainant. This will include a follow up on the corresponding authority where cases are referred, to

ascertain the status of reported cases. Feedback on outcome of each case should get to the complainant through the secretary of committee or social contact/safeguard person as the case may be. It is expected that reported complaints at each level will be resolved and determined within 21 days from date of receipt of the complaint.

Details are shown in the flow chart illustrated in Figure 9.1.

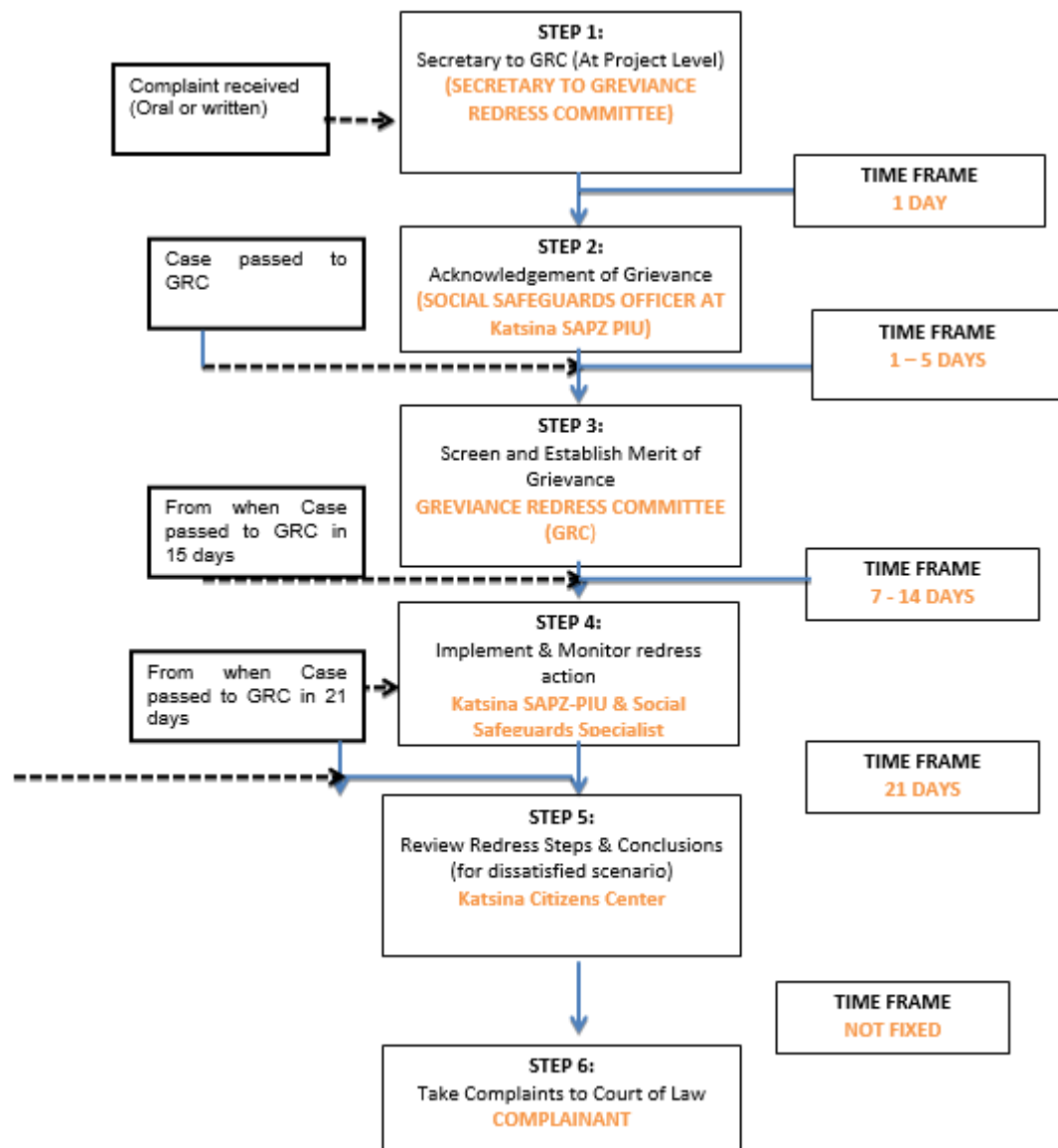


Figure 9.1. Flow Chart of GRM Process for ESIA Implementation



CHAPTER TEN

10.0 CONCLUSION

10.1 Introduction

The conduct of this ESIA for the proposed Special Agro-Industrial Processing Zone (SAPZ) project in Katsina State was executed in strict compliance with acceptable National and International regulatory requirements. The ESIA process involved an extensive literature review, and wide-ranging consultation with all the identified communities and stakeholders, sampling and determination of the conditions of biophysical, social and health environmental components of the project area. The study sought the views and concerns of the host communities on essential aspects of the proposed project through special interaction and incorporated in the impact assessment process.

This ESIA has identified and assessed both positive and negative impacts of the proposed project and accordingly evaluated the associated and potential negative effects on the environment (biophysical), socio-economic and health characteristics of the project area in detail and mitigation measures have also been prescribed for significant negative impacts. For effective implementation of the recommended mitigation measures, an Environmental and Social Management Plan (ESMP) has been developed to ensure environmental sustainability during the construction and operation phases of the proposed Katsina-SAPZ project.

The Environmental and Social Impact Assessment also revealed that the project will have significant transformative impacts on the socio-economic life of the host communities and Katsina State in particular as well as the national economy in general.

The proposed SAPZ would pose limited environmental and social risks, taken into account the proposed mitigation measures. It is recommended that environmental performance should be regularly monitored to ensure compliance and that corrective measures be taken if necessary. In addition, it is very necessary that this information should be made available to the host communities on a regular basis.



The Environmental and Social Management Plan (EMP) should be used as an on-site reference document during all phases (Planning, Construction and Operation) of the proposed SAPZ project.

Environmental auditing should be regularly undertaken, in order to determine compliance with the proposed EMP, and parties responsible for the implementation of the EMP should be held responsible for any inadequacy during the implementation process.



REFERENCES

- Acheampong, P.K. (1988): "Climatic Implications of Resource Use and Management". In Sada, P. O. and Odemergo (ed.) Environmental Issues and Management in Nigeria Development, Ibadan. Evans Brothers (Nigeria Publishers Ltd).
- Addo-Fordjour, P., S. Obeng, A. K. Anning and M. G. Addo. 2009. Floristic composition, structure and natural regeneration in a moist semi-deciduous forest following anthropogenic disturbances and plant invasion. *International Journal of Biodiversity and Conservation*.
- Agboola, S.A. (1979): An Agricultural Map of Nigeria, Oxford Press Oxford Modified by ARST Ibadan, 1996 p.43.
- ASTM International (2009): Annual Book of ASTM Standards, Water and Environmental Technology. Section II Volume 11.05
- Ayoade, J.O. (1988): "On Drought and Desertification in Nigeria" In Sada, P.O. and Odemergo (ed.) Environmental Issues and Management in Nigeria Development, Ibadan Evans Brothers (Nigeria Publishers Ltd.).
- Canter, Larry W. (1977): Environmental Impact Assessment, New York, McGraw-Hill
- Dates, Geoff and Bryne, Jack (1997): Living Waters-Using Benthic Macro invertebrates and Habitat to Assess Your River's Health, Vermont, River Watch Network.
- Earth Survey, Ltd, 1989: Technical Report on Geophysical Structure of 7-Up Site at Ijora, Lagos. Federal Environmental Protection Agency.
- Federal Environment Protection Agency (1991): Regulation "On Calculation Method for Acceptable Limits and/or Temporarily Agreed Standards of Emissions of Harmful Substances into Air".
- Leopold, L.P. et al (1971): A Procedure for Evaluating Environmental Impact (US. Geological Survey Circular No 654), Washington D.C. US. Geological Survey.
- National Environmental (Noise Standards and Control) Regulations 2009, No.35 of 2009, Official Gazette, Vol.96, No.67 dated 19th October, 2009.
- National Environmental (Sanitation and Wastes Control) Regulations 2009, No.28 of 2009, Vol.96, No.60.
- NESREA Act(2007): Acceptable limit concentrations of pollutants in atmospheric air of residential areas, hygiene standards; "On Approval of Qualitative Environmental Standards"



- Nigerian Environmental Study/Action Team (1991): Nigeria's Threatened Environment: A National Profile, Ibadan, Intec Printers Ltd.
- Okafor, J.C. (1978): Development of Forest Tree Crops for Food Supplies in Nigeria, Forest ECCL Manage, 1: 235-247.
- Okafor, J.C. (1979): "Edible Indigenous Woody Plants in the Rural Economy of the Nigerian Forest Zone in Nigerian Ecosystem proceedings of Rain Forest. Man and the biosphere workshop (D.U.U Okah, Editor) University of Ibadan.
- Onyeador, S.O. and Ikwuegbu, N.M. (1999): Environmental Impact Assessment, Enugu, Frank Miller Publishers.
- Peols T. (1995): Environmental Management System Loop - leadership and commitment, London.
- Researchgate.net
- Richards, P.W. (1964): The Tropical Rain Forest: An Ecological Study: Cambridge University Press, p.45.
- Roche, L. (1973): The Conservation of the Environment in Nigeria: An Ecological Perspective. Paper presented at a symposium on the conservation of the environment in Nigeria.
- Sofowora, A. (1982): Medicinal Plants and Traditional Medicine in Africa. Chechester, New York, John Wiley and Sons Ltd.
- Sowumi, M.A. (1981): Aspects of Late Quaternary Vegetational Changes in West Africa, Journal of Biogeography, Vol. 8 457-474.
- Thompson, I. (1981): Hungbton, Miaflin, Boston, Massachusett.
- United Nations Environmental Programme (1978): Environmental Impact Assessment Basic Procedures for Developing Countries.
- Whiteman, A. (1982): Generalized Geological Map of Nigeria p.42.
- World Bank (1999a): Public Consultation in the EA Process: A Strategic Approach, EA Update #26. Washington, DC: World Bank.
- World Bank (1999): OP 4.01 - Environmental Assessment, updated in February 2011. Washington, DC: World Bank.
- World Bank (2001, updated 2007): Involuntary Resettlement. Operational Policy 4.12. Washington DC: World Bank.



World Bank (2006, updated 2007): Physical Cultural Resources. Operational Policy 4.11.
Washington DC: World Bank.

World Bank (1999): OP 4.04 - Natural Habitats, revised in August 2004. Washington, DC:
World Bank.

World Bank (2002): BP 4.36 - Forests. Washington, DC: World Bank.

World Bank (1999): OP 4.11 - Physical Cultural Resources, updated in March 2007.
Washington, DC: World Bank



APPENDICES



APPENDIX 1

ATTENDANCE LIST FOR STAKEHOLDERS' ENGAGEMENT

STAKEHOLDERS MEETING AND ENVIRONMENTAL IMPACT ASSESSMENT
FOR SAPZ IN KATSINA STATE ON 29TH APRIL, 2024

ATTENDANCE

S/N	NAME	ORGANIZATION	DESIGNATION	GSM	SIGN
1	Prof Ahmad Bakari Mohammed	MA & LD	HC	08066145100	
2	Prof. Nasiru Idri	Fahamu Ltd	Lead Consult	0802359000	
3	MUNSTARI SANI	MA & LD	AD Produce	08051853431	
4	Abel Agada	Fahamu Nig. Ltd	Consultant	07036445398	
5	Apeh Jonathan	Fahamu Nig Ltd	Consultant	08157161978	
6	MBA HARRISON	Fahamu Nig Ltd	Consultant	08038987766	
7	EGOPIJA AWAJUNA	Fahamu Nig Ltd	Consultant	08031519150	
8	NURA ABUBAKAR	Katsina State Minof Env	DWM & EA	08069175659	
9	Yusuf Umar	Env. Katsina	Controller	08034889335	
10	A. B. Maima	Foodin - Abuja	Foodin - Abuja	08036129076	
11	Engr. Yusuf Ibrahim A.	KTARDA	Dir. Eng'g	08033794810	
12	Muhammad Musa	MA & LD	PS	08086101800	



**LIST OF ATTENDANCE DURING
SCOPING WORKSHOP**

29/04/2024

MEETING WITH KATSINA STATE SAPZ AFFECTED
COMMUNITY/IES
ATTENDANCE LIST

S/N	NAME	COMMUNITY LGA	POSITION	PHONE NO	SIGN
1.	Alkali MAMMAN	Jibia LGA Saban Gida	Head teacher Islamic	0803287585	[Signature]
2.	Aminu Musa	Danngigaba Jibia LGA	student	07039039518	[Signature]
3.	Nura Musa	Danngigaba	student	08147723063	[Signature]
4.	Dikko Adamu Suleiman	Gahoni	farmer	09127241014	[Signature]
5.	Jabiru Abubakar	Danngigaba	farmer	09032773776	[Signature]
6.	Abubakar Rabiu Kusa	KUSA	student	08186965447	[Signature]
7.	Saidu Haruna	Natsinta	farmer	08068889023	[Signature]
8.	Bishiru Abubakar	Danngigaba	farmer	08100857599	[Signature]
9.	Murtala Musa	Natsinta	volunteer (hospital)	08032600496	[Signature]
10.	Bashim Ishaike	Danngigaba	farmer	09011812969	[Signature]
11.	Murtala Ishaike	Danngigaba	farmer	05036325936	[Signature]
12.	Ahi Musa	Natsinta	farmer	08101912025	[Signature]
13.	Sani Haruna	Gahoni	farmer	09026113788	[Signature]
14.	Kabir Usman	Gahoni	head	08109443922	[Signature]
15.	Sani Adamu Suleiman	Gahoni	farmer	07049331800	[Signature]
16.	Nasiru Hassan	Gahoni	farmer	07061307945	[Signature]
17.	Kabiru Haruna	Gahoni	farmer	08089527899	[Signature]
18.	Abdullahi MAMMAN	Gahoni	farmer	09159915385	[Signature]
19.	Adamu Sule	Gahoni	farmer	-	[Signature]
20.	Bashim Suleiman	Gahoni	farmer	09163138575	[Signature]
21.	Usman Tselha	Gahoni	farmer	09019611374	[Signature]
22.	Mohammed Bello	Natsinta	farmer	-	[Signature]



**LIST OF ATTENDANCE DURING
CONSULTATION WITH THE COMMUNITIES**

LIST OF ATTENDANCE
MEETING WITH KATSINA
STATE SAPZ AFFECTED COMMUNITIES

29/04/2024

S/N	NAME	COMMUNITY/ LGA	POSITION	PHONE NO	SIGN
1	Jibrin Abdurrahman	Gahoni	farmer	08162330049	<i>[Signature]</i>
2	Muhammadu Ibrahim	Gahoni	farmer	09165424802	<i>[Signature]</i>
3	Musa Amadu	Natsinta	farmer		
4	Amadu Harisu	Banbarewa	businessman	08086036905	<i>[Signature]</i>
5	Halte Dayyabu	Natsinta	farmer	09045831515	<i>[Signature]</i>
6	Yusuf Usaini	Natsinta	farmer	08099720228	<i>[Signature]</i>
7	Mubarak Musa	Banakiyaba	farmer	07069406367	<i>[Signature]</i>
8	Ibrahim Dayyabu Bala	Gahoni	farmer	08080988314	<i>[Signature]</i>
9	Rabiu Ishag	Banakiyaba	farmer	08030960953	<i>[Signature]</i>
10	Ummaru Amadu	Natsinta	farmer	08067657821	<i>[Signature]</i>
11	Musa Ado Sambo	Natsinta	farmer	09048210912	<i>[Signature]</i>
12	Shaiyibu Haruna	Garke	farmer	09071644834	<i>[Signature]</i>
13	Usman Shaiyibu	Natsinta	farmer	05145567778	<i>[Signature]</i>
14	Musa Laden	Banakiyaba	ward head	08082060882	<i>[Signature]</i>
15	Rabe Salisu	KUSA	village head	08122630600	<i>[Signature]</i>
16	Haledu Idnis	Natsinta	farmer	08068487628	<i>[Signature]</i>
17	Dayyabu Haruna	Natsinta	ward head	08061230975	<i>[Signature]</i>



APPENDIX 2

DEMOGRAPHIC INFORMATION

1. Educational qualification: No formal education _____
Primary _____ Secondary _____ Tertiary _____
2. Marital status: Married Single Divorced.....Separated.....Widowed.....
3. Marital Pattern: Polygamy..... Monogamy.....
4. Number of children: Male: _____ Female: _____
5. Total No. of people in household: Male: _____ Female: _____
6. Age _____ Sex _____
7. Are you aware of this project? Yes _____ No _____

(B) ECONOMIC INFORMATION

8. What is your occupation?
9. What types of domestic and wild animals do you have around?
10. What is your estimated monthly income: less than N10,000 ___ N10,000 to N50,000 ___
N51,000 to N100,000 ___ N101,000 to N150,000 More than N200,000 _____

(C) SOCIAL INFRASTRUCTURE

11. Do you have markets? _____ (names and the days of function)
12. What recreational facilities do you have in this community? _____
13. What communication network is in use here? _____
14. From which of the following sources is your water supply? Rain ___ River ___ Stored run-off ___
Pipe borne ___ borehole ___ well ___ Spring _____
15. How is water from each of these sources treated before use? _____
16. How is solid waste disposed-off: Burning _____ Burying _____ Dumping _____ Others _____
17. How is human waste disposed-off? Defecation in bushes ___ pail systems ___ pit toilet _____



Water System (WC) _____ Any other (specify) _____

(D) CULTURE AND RELIGION

18. Is there any sacred object in the community? (stream, animal, deity, stones, trees etc)

Mention them and location _____

19. Do you have any historic or archeological site/monuments in your community? If yes, mention their names and the location _____

20. Mention the kinds of festivals celebrated in your community and when _____

21. What are the Dos and Don'ts (taboos) in this community? _____

(E) ENVIRONMENTAL PROBLEMS

22. List the main environmental problems in this community (e.g. deforestation; erosion; dust storm)

S/No.	Environmental problems	Causes

23. How seriously do these problems affect your occupations/jobs?

Little effect _____ Serious _____ has forced us to stop some activities _____

Further information on any serious effect _____

29. Has the government or any other group embarked on any activity to help reduce environmental problems in your community? Yes: _____ No: _____

30. If yes what type of development programmes; which organization; and what has been the impact?

31. How do you think this project will benefit this community?



HEALTH IMPACT ASSESSMENT

1. What type of health care facility do you use?

S/No.	Type	Name	Address
1	General Hospital		
2	Primary Health Care		
3	Private Clinic		
4	Maternity		
5	Pharmacy		
6	Patent Medicine Store		
7	Traditional Healing Homes		
8	Faith Based		

- 2. How many children were born in your household in the past 1 year _____
- 3. Which sicknesses affected your household in the past 1 year? _____
- 4. Have you been to a healthcare facility for medical check or counseling in the past 2 years?
Yes...../No.....
- 5. If No, why? _____
- 6. If yes, where? _____

COMMUNITY HEALTH NEEDS

- 7. What in your opinion is the most important health needs of your community (score in order of priority)
 - Safe Drinking Water
 - Health Services/Clinic
 - Electricity
 - Others

PROJECT RELATED

- 8. Do you have any concern about the effect the proposed project may have on the people of the community?

- 9. What benefits do you expect the project will have on the people in the area in order of importance?



- a. Economic Boom (increased commercial activity)
- b. Employment Benefit
- c. Infrastructural Development
- e. Housing
- f. Others. Please specify

10. What are your fears about the proposed project in order of importance?

- a. Loss of land
- b. Damage to farmland
- c. Pollution of Air
- d. Noise Pollution
- e. Water Pollution
- f. Health Problems
- g. Socio-cultural Interference
- h. High cost of living
- i. Increased population
- j. Disruption of business activities
- k. Disruption of traffic
- Others – specify.....

Explain your fears in detail

.....

.....

.....

11. What causes death in this community most?

.....

12. What are the important needs of the community in order of preference?



.....

.....

Name and position Telephone number



QUESTIONNAIRE: COMMUNITY PROFILE

IDENTIFICATION

Town/Village/Settlement.....

Location..... GPS Reading.....

LGA.....

BRIEF HISTORY OF ORIGIN OF COMMUNITY (Describe in a separate sheet)

Field worker.....

S/N	Description	Remarks
1.	Leader: 1. What is the name of the leader in this community? 2. What is the predominant tribe and languages spoken? 3. What is the average number of household size? 4. Are you aware of this project? (probe for baseline knowledge)	
2.	Ethnic Group a. Major ethnic group b. Minority ethnic group	
3.	Culture and Religion 1. What religions are practiced here? 2. Are there any sacred plants, water, animal, artefact or forest? 3. What are the festivals celebrated and month of celebration? 4. What is regarded as a taboo in this community?	
4.	Economic 1. What are the means of livelihood? 2. What are the common crops farmed here? 3. What livestock do you keep around here? 4. What is the average monthly income?	
5.	Social Infrastructure 1. What types of transportation services are available? 2. Are there markets in this community? 3. Are there financial institutions around here? 4. How does the community manage her waste? 5. What toilet types are available here?	
6.	Number of Houses: (Use census approach) a. Huts b. Bungalows c. Storey Buildings	
7.	Housing characteristics: Bricks, mold, zinc, thatch	



8.	<p>Political structure: 1. Is the community leadership by election, appointment or is it hereditary? Organogram (indicating leadership and hierarchy in community level decisions)</p>	
9.	<p>Groups and Leaders: a. Community Head (Title and Name) b. Chiefs-in-Council c. Men’s Group d. Women’s Group e. Youth Group</p>	
10.	<p>Social Environment 1. Are there any social groups in this community? 2. What common foods are eaten here?</p>	
11.	<p>Demography: a. Total population b. Number of houses c. Average household size d. Adults..... Youths Males..... Females Infants (0 - 5) Children..... Mortality</p>	
12.	<p>Education: a. Government nursery school b. Private nursery school c. Government primary school d. Private school e. Government secondary school f. Private secondary school g. Tertiary institutions h. Net enrolment rate i. Gender disparity</p>	
13.	<p>Roads: a. Tarred roads entering community b. Untarred roads entering community</p>	
14.	<p>Source of domestic water a. River b. Rain c. Well d. Borehole e. Pipe bone (Tap)</p>	
15.	<p>Available social facilities: a. Petrol station within 5km radius b. GSM c. Electricity d. Public toilets e. Police stations f. Fire stations g. Markets h. Banks i. Pharmacy</p>	



	<p>j. Chemist/patent medicine store k. Recreational facilities l. Archaeological sites</p>	
16.	<p>Health Facilities: Government Facility: a. Hospital b. Comprehensive health centres c. Maternity/PHC d. Dispensaries</p> <p>Private health facility: a. Hospital/clinics b. TBAs c. Traditional/spiritual homes d. Faith based e. NGOs</p>	
17.	<p>Morbidity:</p> <p>Communicable</p> <p>a. b. c. d.</p> <p>Non communicable</p> <p>a. b. c. d.</p>	
18.	<p>Economic Activity:</p> <p>Men</p> <p>a. b. c.</p> <p>Women</p> <p>a. b. c.</p> <p>Youth</p> <p>a. b. c.</p>	
19.	<p>Waste/Refuse Disposal: a. Bush b. Open space within homestead c. Rivers/streams d. Incinerators e. others</p>	
20.	<p>Major transport in the community: a. Roads b. Water c. Rail</p>	



21.	Special features: a. Sacred areas b. Shrines c. Forest reserves d. Common taboos	
22.	Properties owned by members of the community: 1. Farmland 2. Poultry 3. Plantation 4. Houses 5. Others	
23.	Pattern of land ownership: 1. Inheritance 2. Tenant/Lease 3. Family 4. Outright purchase 5. Communal	
24.	Farming Methods 1. Garden 2. Fallow 3. Shifting cultivation 4. Rotational bush fallow 5. Others	
25.	Power Source: 1. Electricity 2. Generator 3. Lantern 4. Candle	

APPENDIX 3



ABUJA ENVIRONMENTAL PROTECTION BOARD

PLOT 776 CADASTRAL AO OFF Z. MAIMALARI STREET

CENTRAL BUSSINESS DISTRICT-ABUJA

PMB 152 GARKI

LABORATORY UNIT

ACCREDITED BY FED. MIN. OF ENVIRONMENT

(REG NO: 0004265)

FAHAMU NIGERIA LIMITED

PROPOSED SPECIAL AGRO-INDUSTRIAL

PROCESSING ZONES (SAPZ) KATSINA

CERTIFICATE OF ANALYSIS

Date sample collected: 30/04/2024

Date sample delivered to the Lab: 01/05/2024

Time sample received in the lab: 09:00am

TABLE 1

PROPOSED SPECIAL AGRO-INDUSTRIAL PROCESSING ZONE KATSINA

PHYSICAL/CHEMICAL PARAMETERS OF GROUND WATER SAMPLE.

S/ N	PARAMETERS	KAT GW1	KAT. GW2	FME _{env} LIMIT
		13 ⁰ 2' 37.87"N 7 ⁰ 31' 17.35"E	13 ⁰ 2' 36.17"N 7 ⁰ 31' 43.11"E	
A	PHYSICAL TEST			
1	Odour	Odorless	Odorless	Odorless
2	TEMPERATURE (°C)	32.7	31.9	<40
3	pH	7.3	7.5	6-9



4	ELECTRICAL CONDUCTIVITY (µS/cm)	242.0	328.0	1000
5	DISSOLVED OXYGEN (mg/l)	3.2	3.0	7.5
6	TOTAL DISSOLVED SOLIDS (mg/l)	158.0	171.0	500
7	SALINITY (%)	0.01	0.02	0.0
8	ALKALINITY (m/l)	19.0	22.0	100
9	TOTAL SUSPENDED SOLID mg/l)	0.0180	0.0140	<10
B	CHEMICAL TEST			
10	TOTAL HARDNESS (mg/l)	136.96	308.16	200
11	MAGNESIUM HARDNESS (mg/l)	34.24	85.6	50
12	CALCIUM HARDNESS (mg/l)	102.72	222.56	150
13	PHOSPHATE (mg/l)	0.395	0.621	5
14	NITRATE as NITROGEN (mg/l)	4.40	8.10	10
15	TOTAL CHLORIDE (mg/l)	40.0	60.0	250
16	BOD (mg/l)	-	-	7.5
17	COD (mg/l)	-	-	30
18	SULPHATE (mg/l)	25.2	63.3	250
C	HEAVY METAL			
19	MANGANESE (mg/l)	0.110	0.284	0.2
20	IRON TOTAL (mg/l)	0.221	0.541	1.5
21	COPPER (mg/l)	0.003	0.005	0.1
22	CADMIUM (mg/l)	0.007	0.008	0.05
23	ZINC (mg/l)	0.110	0.213	0.1
24	LEAD (mg/l)	0.009	0.0011	0.05
25	NICKEL (mg/l)	0.002	0.004	0.05
D	BATERIOLOGICAL			
26	Total Coliform count (CFU/100ml)	2.1	2.7	1.8
27	<i>Escherichia Coli</i> (cfu/ml)	1.2 X 10 ¹	1.2 X 10 ²	Absent
28	<i>Salmonella</i> (cfu/ml)	0.0	0.8 X 10 ²	Absent
29	<i>Shigella</i> (cfu/ml)	0.0	0.0	Absent
30	<i>staphylococcus</i> (cfu/100ml)	0.0	0.0	Absent



ABUJA ENVIRONMENTAL PROTECTION BOARD

PLOT 776 CADASTRAL AO OFF Z. MAIMALARI STREET

CENTRAL BUSSINESS DISTRICT-ABUJA

PMB 152 GARKI

LABORATORY UNIT

ACCREDITED BY FED. MIN. OF ENVIRONMENT

(REG NO: 0004265)

FAHAMU NIGERIA LIMITED

PROPOSED SPECIAL AGRO-INDUSTRIAL

PROCESSING ZONES (SAPZ) KATSINA

CERTIFICATE OF ANALYSIS

Date sample collected: 30/04/2024

Date sample delivered to the Lab: 01/05/2024

Time sample received in the lab: 09:0am

TABLE 2

PROPOSED SPECIAL AGRO-INDUSTRIAL PROCESSING ZONE KATSINA

PHYSICAL/CHEMICAL PARAMETERS OF SOILS SAMPLES

S/N	PARAMETERS (Units in mg/kg) accepted stated	Kat SS 1 0-15cm	Kat- SS 1 16-30cm	Kat- SS 2 0-15cm	Kat- SS 2 16-30cm	Kat- SS 3 0-15cm	Kat-SS3 16-30cm
		13° 2' 40 .88"N 7° 32' 37.85"E					
	PHYSICAL TEST						
1	TEMPERATURE (°C)	37.4	36.7	37.0	36.7	36.4	36.1
2	PARTICLE SIZES/TEXTURE	SAND/SILT/CLAY 46.74/36.06/16.2	SAND/SILT/CLAY 47.42/39.58/13	SAND/SILT/CLAY 41.78/39.21/19.1	SAND/SILT/CLAY 71.05/20.74/8.21	SAND/SILT/CLAY 58.64/26.02/15.34	SAND/SILT/CLAY 44.62/28.51/26.87
3	pH	7.32	7.19	7.17	6.87	7.31	6.76
4	MOISTURE CONTENT (%)	1.010	1.000	0.920	0.880	0.850	0.780
5	SOIL POROSITY (%)	23.33	25.00	23.33	30.00	33.33	30.00
6	BULK DENSITY (g/cm ³)	0.880	0.920	0.860	0.840	0.850	1.250
7	WET DENSITY (g/cm ³)	0.960	0.820	1.160	1.020	0.940	1.020
8	DRY DENSITY (g/cm ³)	0.680	0.710	0.740	0.590	0.610	0.640
	ORGANICS						
9	TOTAL ORGANIC CARBON	1.00	1.20	1.40	1.90	2.10	1.60
	EXCHANGEABLE IONS						
10	PHOSPHATE (mg/kg)	16.00	10.60	24.80	13.85	14.65	15.10
11	SULPHATE (mg/kg)	53.0	39.60	41.44	38.30	50.73	45.33



12	NITRATE (mg/kg)	18.23	16.24	21.30	17.61	23.27	20.00
13	CALCIUM (mg/kg)	32.80	31.70	36.60	29.80	32.30	28.80
14	MAGNESSIUM (mg/kg)	16.50	16.10	18.30	15.10	16.50	15.10
15	CHLORIDE (mg/kg)	3.60	3.00	2.70	2.15	2.30	1.93
	HEAVY METALS						
16	MANGANESE (mg/kg)	0.210	0.182	0.194	0.205	0.310	0.249
17	COPPER (mg/kg)	0.415	0.373	0.627	0.5510	0.335	0.300
18	IRON (mg/kg)	7.650	8.140	11.040	10.100	9.410	11.101
19	ZINC (mg/kg)	3.310	2.914	3.120	2.855	2.980	3.640
20	CADMIUM (mg/kg)	0.017	0.013	0.014	0.017	0.015	0.018
22	LEAD (mg/kg)	0.012	0.010	0.012	0.009	0.012	0.013
22	NICKEL (mg/kg)	0.007	0.005	0.005	0.004	0.007	0.006
	BACTERIAL ISOLATE						
23	Total Heterotrophic Bacteria (cfu/100 ml)	4.6 X 10 ²	3.8 X 10 ²	5.1 X 10 ²	4.1 X 10 ²	5.0 X 10 ²	4.8 X 10 ²
24	Total Heterotrophic fungi (THF) (cfu/100 ml)	3.3 X 10 ²	3.0 X 10 ²	4.1 X 10 ²	4.2 X 10 ²	3.9 X 10 ²	4.1 X 10 ²
25	Total fungi count (TFC) (cfu/100 ml)	2.9 X 10 ²	3.2 X 10 ²	3.2 X 10 ²	3.6 X 10 ²	3.4 X 10 ²	3.7 X 10 ²
26	Feecal Coliform Count (FCC) (cfu/ 100 ml)	2.9 X 10 ²	2.7 X 10 ²	3.4 X 10 ²	2.9 X 10 ²	2.8 X 10 ²	3.1 X 10 ²

TABLE 3

PROPOSED SPECIAL AGRO-INDUSTRIAL PROCESSING ZONE KATSINA

PHYSICAL/CHEMICAL PARAMETERS OF SOILS SAMPLES

S/N	PARAMETERS (Units in mg/kg) accepted stated	Kat- SS 4 0-15cm	Kat- SS 4 16-30cm	Kat- SS 5 0-15cm	Kat- SS 5 16-30cm	Kat- SS 6 0-15cm	Kat-SS6 16-30cm
	PHYSICAL TEST						
1	TEMPERATURE (°C)	37.5	36.7	37.0	36.8	37.3	36.4
2	PARTICLE SIZES/TEXTURE	SAND/SILT/CLAY 45.19/25.6/29.21	SAND/SILT/CLAY 42.26/36.84/20.9	SAND/SILT/CLAY 37.91/37.59/24.5	SAND/SILT/CLAY 27.90/35.11/36.99	SAND/SILT/CLAY 45.65/40.91/13.44	SAND/SILT/CLAY 27.95/43.55/28.50
3	pH	7.48	7.20	7.32	7.09	7.74	7.18
4	MOISTURE CONTENT (%)	0.880	0.970	1.008	1.130	1.170	0.980
5	SOIL POROSITY (%)	28.33	26.66	33.33	30.00	23.33	26.66
6	BULK DENSITY (g/cm ³)	1.040	0.970	0.830	0.930	0.990	0.870
7	WET DENSITY (g/cm ³)	1.180	1.110	0.940	0.860	1.010	0.780
8	DRY DENSITY (g/cm ²)	0.670	0.740	0.720	0.650	0.589	0.600
	ORGANICS						
9	TOTAL ORGANIC CARBON	3.60	4.00	2.70	2.05	3.10	1.70
	EXCHANGEABLE IONS						
10	PHOSPHATE (mg/kg)	28.40	18.75	31.40	25.30	33.00	26.50
11	SULPHATE (mg/kg)	56.80	49.70	59.20	50.20	61.80	52.70
12	NITRATE (mg/kg)	14.45	12.10	20.10	17.54	18.84	1.40
13	CALCIUM (mg/kg)	34.10	31.40	32.20	27.70	32.10	30.80
14	MAGNESSIUM (mg/kg)	17.40	16.00	16.70	14.80	16.60	16.00
15	CHLORIDE (mg/kg)	2.138	2.121	1.89	2.05	3.08	1.90
	HEAVY METALS						
16	MANGANESE (mg/kg)	0.180	0.200	0.260	0.130	0.300	0.210
17	COPPER (mg/kg)	0.551	0.440	0.613	0.585	0.495	0.480
18	IRON (mg/kg)	8.815	6.520	9.010	7.023	7.780	5.200
19	ZINC (mg/kg)	4.794	6.030	7.084	6.403	9.500	5.910
20	CADMIUM (mg/kg)	0.036	0.028	0.027	0.023	0.030	0.028
22	LEAD (mg/kg)	0.019	0.016	0.010	0.011	0.013	0.016
22	NICKEL (mg/kg)	0.004	0.002	0.007	0.005	0.004	0.003
	BACTERIAL ISOLATE						



23	Total Heterotrophic Bacteria (cfu/100 ml)	4.3 X 10 ²	3.8 X 10 ²	4.8 X 10 ²	4.3 X 10 ²	4.5 X 10 ²	4.1 X 10 ²
24	Total Heterotrophic fungi (THF) (cfu/100 ml)	3.7 X 10 ²	3.3 X 10 ²	3.6 X 10 ²	3.7 X 10 ²	3.4 X 10 ²	3.6 X 10 ²
25	Total fungi count (TFC) (cfu/100 ml)	2.9 X 10 ²	3.0 X 10 ²	3.3 X 10 ²	2.9 X 10 ²	3.1 X 10 ²	3.1 X 10 ²
26	Feacal Coliform Count (FCC) (cfu/ 100 ml)	2.4 X 10 ²	2.7 X 10 ²	2.8 X 10 ²	2.5 X 10 ²	2.7 X 10 ²	2.6 X 10 ²

TABLE 4

PROPOSED SPECIAL AGRO-INDUSTRIAL PROCESSING ZONE KATSINA

PHYSICAL/CHEMICAL PARAMETERS OF SOILS SAMPLES

S/N	PARAMETERS (Units in mg/kg) accepted stated	Bau- Control 0-15cm	Bau- control 16-30cm
PHYSICAL TEST			
1	TEMPERATURE (°C)	37.3	36.8
2	PARTICLE SIZES/TEXTURE	SAND/SILT/CLAY 25.55/23.46/17.16	SAND/SILT/CLAY 53.30/38.98/7.72
3	pH	7.03	6.93
4	MOISTURE CONTENT (%)	0.980	1.008
5	SOIL POROSITY (%)	24.22	26.70
6	BULK DENSITY (g/cm ³)	0.930	0.900
7	WET DENSITY (g/cm ³)	0.906	0.806
8	DRY DENSITY (g/cm ³)	0.605	0.654
ORGANICS			
9	TOTAL ORGANIC CARBON	2.10	1.92
EXCHANGEABLE IONS			
10	PHOSPHATE (mg/kg)	24.0	17.0
11	SULPHATE (mg/kg)	41.6	32.0
12	NITRATE (mg/kg)	19.94	14.65
13	CALCIUM (mg/kg)	33.10	30.40
14	MAGNESSIUM (mg/kg)	17.00	15.70
15	CHLORIDE (mg/kg)	3.62	3.10
HEAVY METALS			
16	MANGANESE (mg/kg)	0.195	0.210
17	COPPER (mg/kg)	0.540	0.470
18	IRON (mg/kg)	8.200	6.740
19	ZINC (mg/kg)	3.900	2.773
20	CADMIUM (mg/kg)	0.021	0.028
22	LEAD (mg/kg)	0.015	0.016
22	NICKEL (mg/kg)	0.012	0.008
BACTERIAL ISOLATE			
23	Total Heterotrophic Bacteria (cfu/100 ml)	4.8 X 10 ²	4.4 X 10 ²
24	Total Heterotrophic fungi (THF) (cfu/100 ml)	4.0 X 10 ²	3.5 X 10 ²
25	Total fungi count (TFC) (cfu/100 ml)	3.7 X 10 ²	2.9 X 10 ²
26	Feacal Coliform Count (FCC) (cfu/ 100 ml)	3.1 X 10 ²	2.6 X 10 ²

TITIOLOYE O. CHARLES ASLT

AD (LAB. SCIENCE)

APPENDIX 5

LABORATORY WITNESSING BY FMENV STAFF

