ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA) REPORT

FOR THE PROPOSED ZAMFARA STATE

SPECIAL AGRO-INDUSTRIAL PROCESSING ZONE (SAPZ) PROGRAMME

ZAMFARA STATE, NIGERIA

DRAFT REPORT

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF PLATES

LIST OF ABBREVIATIONS, ACRONYMS AND SYMBOLS

EXECUTIVE SUMMARY

ES 1 Project Background

The Special Agro-industrial Processing Zones (SAPZ) programme is a major investment of the Federal Government of Nigeria (FGN), 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. This clustering approach is to help address investment challenges in developing agro-processing enclaves across Nigeria, including poor access to quality infrastructure, inadequate feedstock supplies, and other challenges confronting the agro-processing environment.

Special Agro-Industrial Processing Zones (SAPZs), therefore, will be developed with the requisite infrastructure for an agro-processing environment, which will help reduce cost absorptions and engender competitiveness in agro-industrial production, which is critical to further unlocking the potential of Nigeria's agriculture to create ready markets and wealth for farming communities and reduce rural poverty. It is a strategic move to rapidly develop modern agro-processing capacity to serve the vast and growing local market, create a sustainable market for farmers, reduce post-harvest losses of local agricultural produce, and thereby create wealth for farmers, promote import substitution, and create sustainable agriculture-related jobs for women and youth.

The SAPZ programme is aligned with national policies and priorities. It seeks to sustainably contribute to poverty alleviation, hunger, and inequality reduction 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 smallholder farmers, women, and youth.

The SAPZ Programme's 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, while the development objective is to support inclusive and sustainable agro-industrial development. Moreover, the programme interventions will seek to improve the competitiveness of the selected value chains.

The SAPZ will be made up of two building blocks, which include the Agricultural Transformation Centre (ATC), which is a community-based rural institution within the host community supported by the provision of quality production drivers for the production of feedstock, the Aggregation Centre (AC) for primary storage, and the Agro-Industrial Hub (AIH), equipped with desirable infrastructure to create a modern agro-processing environment where secondary value addition will take place. The Agro-Industrial Processing Hub (AIH) will draw its processing feedstock from the ATC, where production clusters and Aggregation Centres' activities are coordinated.

The Programme has four (4) broad mutually reinforcing components, namely:

1. Support the development of enabling climate-adapted infrastructure for Agro-Industrial Hubs (AIHs);
2. Improve agricultural productivity and enterprise development to enhance agricultural value chains and job creation in the SAPZ Catchment Areas;
3. Support Agro-Industrial Zone Policy and Institutional Development and
4. Programme Coordination and Management.

The key design features of the program are the following:

- Support economic and social development programmes of the Federal Government of Nigeria (FGN) and Zamfara State;
- Contribute to rural infrastructure development;
- Improve access to agricultural markets;
- Increase agricultural production and productivity;
- Stimulate the adoption of agricultural technology;
- Facilitate climate-smart agricultural production and processing practices;
- Increase value addition and agro-processing; and
- Increase skills acquisition and job creation for all actors along the value chain, including the smallholder farmers, women and youth.

The expected outcomes of the phase I of the SAPZ Programme are:

- Development of infrastructure, including Agro-Industrial Processing Hubs (AIHs),
- Development of Agricultural Transformation Centers (ATCs),
- Development of irrigated lands and farm-to-market access roads;
- Supply of certified agricultural inputs and extension services;
- Skills development for farmers and Micro, Small and Medium Scale Enterprises (MSMEs); and
- Updated agro-industrial zone policy and establishment of regulatory institution/special regulatory regime.

The first phase of the Special Agro-Industrial Processing Zone (SAPZ) Programme is being implemented in seven (7) states, namely Cross River, Imo, Kaduna, Kano, Kwara, Ogun, and Oyo, and the Federal Capital Territory (FCT). The SAPZ phase one is valued at USD538.05 million (net taxes), funded by African Development Bank (AfDB), Islamic Development Bank (IsDB) , Innternational Fund for Agricultural Development (IFAD), Global Climate Fund (GCF), and Federal and State Governments.

The second phase of the SAPZ programme has been receiving relevant attention at appropriate quarters. Expressions of interest (EOIs) from about twenty-seven (21) states, to participate in the second phase have been submitted to the Federal Ministry of Agriculture and Food Security, Abuja. It will commence immediately with the enlistment of interested states based on their readiness levels.

Zamfara State desires to be enlisted in Phase 2 of the SAPZ Programme. Four (4) major specified criteria must be met to qualify for enlistment. To meet this set of criteria, Zamfara State has engaged the services of an agribusiness and environment consultant to conduct a feasibility study suitable to fulfil the eligibility criteria for the state's qualification in the SAPZ programme.

Specifically, the eligibility criteria will include but not be limited to:

- Completed/ Draft Feasibility Studies;
- Comprehensive Environmental and Social Impact Assessment (ESIA) Studies;
- Determination of Value Chain where Zamfara State has comparative advantage;
- Determination of Sites for one AIH and two or more ATCs.

ES 2 Rationale for the Participation of Zamfara State in the SAPZ program

Zamfara State has an agriculturally viable environment since it has high soil fertility, vast farmlands and economically viable rivers sheltered by the delicate tropical climate. Due to these factors, agriculture has remained the primary source of revenue and the backbone of the state's economy. Major crops in the area are millet, guinea - corn, maize, rice, groundnut, cotton, tobacco and beans. Agro-industrial concerns in the state include Gusau Oil Mill, the first vegetable mill in Nigeria to extract oil from cotton seeds, Zamfara Textile Industries Limited, Gusau and the Gusau Sweets Factory and the Cotton Gingery at Gusau. The inhabitants of Zamfara State also weave and sell locally dyed and designed textiles and other types of woven handicrafts. Favourable environmental characteristics that attract the greatest concentration of cattle and other animals have also made the state a primary raw material source for dairy products, hide, and skin.

Zamfara State thus has the potential to be a net producer of food crops, minerals, and industrial items and a net exporter of cash crops such as cotton, groundnuts, rice, and cassava. Its human resources, vast arable land, and substantial irrigation facilities make the state economically vibrant.

Despite its economic potential, Zamfara State has the highest poverty rate in Nigeria. According to the National Bureau of Statistics, the poverty level in Zamfara State was 74 percent above the national average of 40.1 percent in 2019. In the same light, the multidimensional poverty index released in November 2022 stated that 78 percent of Zamfara people are poor, meaning poverty worsened from 74 to 78 percent.

The SAPZ programme has therefore presented a massive opportunity for the Zamfara State Government to focus on agricultural areas with a comparative advantage to revitalize its

economy, reduce poverty, improve youth employment, and reduce the crime rate (banditry and terrorism).

ES 3 Rationale for the ESIA

The SAPZ Programme has been classified as Category 1 in accordance with the African Development Bank Integrated Safeguards System (ISS) and national legislation. This validated category is based on the large-scale, multisectoral, and sensitive nature of the programme. In line with national legislation and the ISS, the Borrower is required to prepare Environmental and Social Impact Assessments for all concerned investments, including Resettlement Action Plans and/or Livelihood Restoration Plans where applicable. Additionally, all associated facilities and investments will require the applicable Environmental and Social Assessments (ESIAs, RAPs LRPs, Audits etc.), to be prepared for disclosure by the Borrower and the Bank. Each of the potential partners (BOI and NIRSAL) is required to prepare Environmental and Social Management Systems for disclosure on their websites as well as on the Bank's website.

ES 4 Objective of the ESIA

The ESIA aims to identify and address possible direct, indirect, and cumulatively significant adverse environmental and social impacts that are likely to arise from the proposed programme for acceptability and sustainability. The primary objective of the ESIA is, therefore, to facilitate effective decision-making and to ensure that the implementation processes during the execution of the proposed programme are sustainable. Some activities to be carried out during the ESIA preparation include:

- ensuring that the programme activities are environmentally sound,
- encouraging community consultation and participation, and
- enhancing social well-being.

Specifically, the ESIA seeks to provide a transparent process that integrates environmental and social considerations into the proposed SAPZ programme, including action plans. The ESIA is site-specific and consists of a well-documented set of mitigation, monitoring, and institutional actions to be taken before and during implementation to eliminate adverse environmental and social impacts, offset them, or reduce them to acceptable levels. The ESIA also includes the measures required to implement these actions, addressing the adequacy of the monitoring and institutional arrangements within the state.

The objectives of the ESIA are to:

i. Initial scoping activities in order to understand the project's field of influence, activities and impacts that will have to be outlined in the Framework.

ii. Reviewing the Operational Safeguards of the AfDB especially OS1, IFAD and IsDB, as well as those of the Federal Government (especially Federal Ministry of Environment) and the State regulations.

iii. Describing the proposed project by providing a description of the project relevant components and presenting plans, maps schematic diagrams, figures and tables;

iv. Provide maps to illustrate the general setting of the project-related development sites, as well as SAPZ adjoining areas, which can be potentially affected.

v. Identify and describe all potential significant changes that may occur as a result of the project. These would encompass environmental and social impacts, both positive and negative, as a result of project interventions- such as involuntary resettlement, social conflicts and disturbance, or environmental risks such as threats to land and natural resources, biodiversity, and natural habitats.

vi. Specific types of projects and associated environmental and social impacts that might require separate assessments in relation to location, project size, and other site-specific factors need to be identified.

vii. Analysis of alternative approaches against current project plans from an environmental, socioeconomic and cultural standpoint. Alternatives should be compared in terms of their potential impacts; capital and operating costs, suitability under local conditions, including skill requirements, public and political acceptability, level of technology as well as their institutional, training and monitoring exigencies.

viii. Analysis of existing environmental policies and legislation, including directives for environmental impact assessment and assess needs for strengthening these policies in the context of this project.

ix. Analysis of the sub-sector specific policies, laws and regulations that have environmental implications. The sectoral investment planning process in terms of objectives, methodology and procedures for review and approval of plans and projects, should be carefully reviewed.

x. Describing and analysing the physical, biological and social environment conditions in the study area before project implementation. This analysis shall include the interrelations between environmental and social components and the importance that the society and local populations attach to these components, in order to identify the environmental and social components of high value or presenting a particular interest; Description of the project environment shall be obtained from a combination of literature review, field sampling, in-situ measurements and laboratory analyses of samples;

xi. Analysis of biophysical issues as related to Climate and meteorology, Air and Noise, Geology, Topography and hydrogeology, Surface Water Quality, drainage pattern and aquifer characteristics, Soil, biological aspects: flora and fauna, endemic and endangered species including sources of data.

xii. Sampling of relevant biophysical parameters within the project area of influence including air, noise, water and soil using in-situ and laboratory analysis as appropriate.

xiii. Discuss the results and its implications for the proposed project. Analyses of samples should be done in an accredited Federal Ministry of Environment Laboratory.

xiv. Collate data on the size and social structure of the local population, and assessment of the groups/people expected to be impacted directly or indirectly by the project: their needs, their demands, their ability to deal with change, physical and economic displacements likely to occur, impact on road users (school children, business owners, etc.), health assessments, waste management practices, the existing human capital in the form of education and skills and the potential for improving that, gender issues, and vulnerable groups, and the need for measures of mitigation;

xv. Preparation of an implementation plan. The plan should include measures for integrative/participatory environmental and social monitoring, and institutional and training requirements to implement them. Such a plan should recommend feasible and cost-effective measures to prevent or reduce significant impacts to acceptable levels and estimate the impacts and costs of those measures.

xvi. Presentation of a summary of the impacted communities for the project: location, access, population (number, demographic and social characteristics); economy (employment rate, income distribution); services (types, capacity, and adequacy) and housing. Concern is the ability to provide work force, service new development and absorb and adjust to growth (worker/family). The report should identify and assess the social impacts identified during the public consultation process and those that, based on consultant's experience, are also likely to occur. In some instances, the affected communities may not be aware of or be in a position to identify all the social impacts that may occur. However, this does not mean that they will not occur. In such cases the consultant should use his experience to identify additional social impacts that have not been raised by the public.

xvii. Submission of an ESIA report in a concise format containing all studies, processes, analyses, tests and recommendations for the proposed intervention. The report shall focus on the findings, conclusions and any recommended actions, supported by summaries of the data collected and citations for any references used in interpreting those data. It should provide a description of the specialist studies undertaken and the report should include a bibliography, maps, photographs, diagrams and any other diagrammatic representation needed to facilitate understanding of the main text, detailed data should be presented in annexes or a separate volume. Unpublished documents used in the assessment should also be included or referenced in an appendix and the location of the originals of such documents indicated.

ES 5 Approach/Methodology for the ESIA Study

The approach and methodology for the ESIA involve the following:

- desktop study; review of design reports and literature;
- Reconnaissance visits and site inspections;
- public/stakeholder consultations and involvement;
- data collation, analysis and reporting;
- identification and assessment of environmental and social impacts;
- development of mitigation measures;
- development of monitoring and management plan.

ES 6 Policy, Legal, Regulatory and Administrative Frameworks

National Policy & Legal Regulatory Requirements

The following policies were reviewed as they pertain to the proposed Zamfara state SAPZ programme (details on their applicability can be found in the body of the report)

- National Policy on the Environment 1989 revised 1991;
- National Erosion and Flood Control Policy 2005;
- Environmental Impact Assessment Act No. 86, *1992 (FMEnv);*
- The National Guidelines and Standards for Environmental Pollution Control in Nigeria 1991;
- National Guidelines on Environmental Management Systems *(1999);*

- National Air Quality Standard Decree No. 59 of *1991;*
- National Environmental Standards and Regulations Enforcement Agency Act (NESREA Act) 2007;
- Land use act *1978 Modified 1990;*
- Endangered Species Act 1985;
- FEPA/ FMEnv. EIA Procedural guidelines 1995;
- S.1.15 National Environmental Protection (Management of Solid and Hazardous Wastes Regulations) 1991;
- Public Health Law;
- Workmen Component Act 1987 Revised 2010.

Zamfara State Policy, Regulatory Instruments & Institutions

- Zamfara State Ministry of Agriculture;
- Zamfara State Ministry of Environment and Natural Resources;
- Zamfara State Environmental Sanitation Agency (ZESA)

ES 7 AfDB Operational Safeguard Policies Applicable to Zamfara State-SAPZ Program

The AfDB OS policies 1-5 are applicable to the proposed Zamfara State SAPZ program

1. OS1: Environmental and social assessment
2. OS2: Involuntary Resettlement: Land Acquisition, Population Displacement and Compensation
3. OS3: Biodiversity and Ecosystem Services
4. OS4: Pollution Prevention and Control, Greenhouse Gases, Hazardous Materials and Resource Efficiency
5. OS5: Labour Conditions, Health and Safety

ES 8 World Bank Environmental and Social Standards Applicable to Zamfara State-SAPZ Program

The World Bank Environmental and Social Standards (ESS 1,2,3,4,5,6,8) are applicable to the proposed Zamfara State SAPZ program

- ESS 1: Assessment and Management of Environmental and Social Risks and Impacts
- ESS 2: Labour and Working Conditions
- ESS 3: Resource Efficiency and Pollution Prevention and Management
- ESS 4: Community Health and Safety
- ESS 5: Land Acquisition, Restrictions on Land Use and Involuntary Resettlement
- ESS 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources
- ESS 8: Cultural Heritage

ES 9 International Conventions, Agreements and Protocols to which Nigeria is Signatory and Applicable to the proposed Zamfara State Special Agro-Industrial Processing Zone (SAPZ) program

The following international conventions, agreements and protocols are applicable to Zamfara State SAPZ

- Vienna convention for the protection of the Ozone Layer and the Montreal protocol for Control of Substances that deplete the ozone layer.
- Basel convention on the prevention of trans-boundary movement of hazardous wastes and their disposal.
- Convention on Biodiversity.
- Convention on climate change.
- Convention on Desertification.
- Convention on Persistent Organic Pollutants.
- World Health Organization (WHO) Health and Safety Component of EIA, 1987.

ES 10 Institutional Framework

The proposed Zamfara State SAPZ Programme will involve many federal and state ministries, departments and agencies (MDAs), local governments, communities, and the civil society. This is because an effective implementation of programmes requires inter-ministerial coordination, collaboration, and information sharing at all levels of government. Thus, each component, sub-component and activity will be implemented through the relevant federal and State MDAs. The various MDAs include those responsible for agriculture, planning, economy and finance, works, environment and water resources. Although, the investments for Zamfara State Special Agro-Industrial Processing Zone (SAPZ) Programme are made through the Zamfara State Project Implementing Unit (ZSPIU), the Zamfara State government has the primary responsibility for land management and land allocation for agriculture purpose.

The Federal Ministry of Agriculture and Food Security (FMAFS) is the lead implementing agency for the SAPZ Programme. The National Coordinating Office, headed by a National Coordinator and hosted by the FMAFS is responsible for the overall coordination of the programme. The Zamfara State Programme Implementing Unit (ZSPIU), headed by the State Programme Coordinator and hosted by the Zamfara State Ministry of Agriculture and Natural Resources will be responsible for the coordination in Zamfara State. Thus, the Zamfara State-PIU is directly responsible for coordinating the activities of the Zamfara State Special Agro-Industrial Processing Zone (ZSAPZ) Programme, including the implementation of this ESIA. Both the federal and State level coordinating units have environmental officers who take responsibility for mainstreaming environmental issues into the SAPZ sub-programmes.

The Proposed Sites for the location of the AIH and ATCs

SN	LOCATION	STATUS	LGA	AGGREGATION CENTERS (to feed the ATCs)
1	Gidan Dawa	AIH	Gusau	Damba
				Bungudu
				Maru
				Magami
2	Yargeda	ATC	Bakura	Birnin Tudu
				Maradun
				Jangebe
3	Gummi	ATC	Gummi	Anka
				Nasarawa Burkullu
4	Bani ga hannu	ATC	Kaura Namoda	Shinkafi
				Kyambarawa
				Moriki
5	Maru	ATC	Maru	Bungudu
				Kanoma
				Nahuce

Agro-Industrial Hubs (AIHs); Agricultural Transformation Centre (ATC)

ES 11 Biophysical Environment

Zamfara is one of the seven states that formed Nigeria's north-western geopolitical zone. With an area of 38,418 square kilometres, it is bordered in the North by the Niger Republic, and to the South by Kaduna State. In the east, it is bordered by Katsina State and to the West by Sokoto and Niger States. It has a population of 3,278,873, according to the 2006 census, and contains fourteen local government areas. It lies within latitude 10o 50'N and 13o 38'N and longitudes 4o 16'E and 7 o 18'E. Gusau is the state capital.

The climate of Zamfara State is tropical savannah, as postulated by Koppen's climate classification system, which is the most recognized system. This climate type is characterized by conventional rainfall, and the amount of precipitation received in the region is relatively high, it is expressed as the contrast between a dry season and a wet season. These two seasons depend on the two prevailing air masses blowing over the country at different times of the year: the dry north-easterly air mass of Saharan origin and the humid maritime air mass blowing from over the Atlantic.

Generally, rainfall is the principal element controlling climate in tropical regions, including in Zamfara State. The computed annual rainfall pattern in the study area from 1995 to 2021 shows that annual rainfall values in the State range from 615.9 mm to 1,442.2 mm. This indicates that annual rainfall in the area could be as low as 615.9 mm and could be as high as 1,442.2 mm. Of the twenty-seven (27) years of records analyzed, it was only in six (6) years that the annual rainfall amount was over 1,000 mm. Therefore, the typical or mean annual rainfall in the study area is about 858.42 mm. Given the average rainfall value in the State and the nature of crops commonly cultivated in Zamfara State, farming activities have been sustainable, and there is potential for a significant increase in farm produce when the planned SAPZ program is mainstreamed.

The temperature of Zamfara mirrors that of the tropical areas, which are high and relatively stable throughout the year, although with indications of seasonal fluctuations. The monthly temperature trend drops insignificantly between July and September, coinciding with the peak

of the rainfall months. The long-term mean minimum and maximum temperature in the study area shows that the mean minimum temperature usually ranges from 16.93 C to 27.08 o C. The mean maximum temperature is 31.26^{o}C to 40.82 ^{o}C. The coolest months around the study area are January and August. January coincides with the harmattan season, while the low temperature in August is due to the peak rainfall months in the area. In other words, as expected, temperature is usually higher during the dry season and lower during the wet season.

Wind speed is relatively high throughout the year across the State. On average, wind velocity exceeds 28 km/h, while lesser winds decline month-on-month. Most days of the month, wind usually exceeds 19 km/h and rarely exceeds 28 km/h. By implication, wind erosion becomes normal all year round but intensifies during the rainy season. During the rainy season, when the intertropical zone of discontinuity moves northwards, permitting the mesoscale processes to interact with the tropical maritime, wind velocity becomes very high, leading to erosional activities. This annual phenomenon starts in the last week of December, where it gathers momentum, and peaks in June, where it occurs at least nine days in the month, and the rest of the month is characterized by winds exceeding 12 km/h. One key factor that drives this occurrence is the absence of high canopy and broadleaved dense trees, which could act as windbreakers.

Zamfara state cuts across three types of Igneous and sedimentary rocks: quaternary and tertiary. Specifically, the geological units where the proposed project sites are located are the Precambrian Basement Complex (Gidan Dawa, Maru, and Bani ga Hannu), undifferentiated sedimentary rocks, and undifferentiated sands gravels and clay. The dominant geological cover is the Precambrian Basement Complex, which covers about 90% of the entire state boundary. Undifferentiated sedimentary rocks characterized the northwest section, while the strand of undifferentiated sands, gravels, and clays underlain a small section in the northernmost region of the State.

Based on the hydrological provinces of Nigeria, Zamfara State's geographical space is within the crystalline zone of the Basement Complex in the Sokoto basin. Groundwater availability in the Basement Complex is very unpredictable, and crystalline rocks, by their nature, are impervious, but fracturing, fissuring, jointing, and weathering may impose secondary aquifer characteristics on these rocks, thus making them favourable to groundwater storage. During the field data gathering exercise, domestic well waters were observed across different communities in the State, which signifies an abundance of groundwater resources availability. However, there is a need to conduct a detailed hydro-geological investigation to determine the locations of best/optimal yield before a borehole is dug; this will prevent borehole failure as well as wastage of valuable resources and workforce concerning the proposed SAPZ project.

Concerning air quality, the measured CO ranged from 0.06 ppm to 2.17 ppm with an overall mean of 0.97 ppm; the highest CO value of 2.17 ppm was observed at AQ1 (Gidan Dawa-Gusau), while the lowest of 0.06 ppm was measured at Gummi location. The high CO value observed at Gidan Dawa is not unconnected to the commercial activities of the Gusau town, particularly the proximity of the project site to the main road. Nevertheless, the measured CO values at all the project sites are within the FMEnv. recommended limit of 10 ppm.

The SO_2 was only observed at three locations and ranged from 0.01 to 0.02 ppm with an overall mean of 0.01 ppm. Similarly, NO2 was measured at three sites with no significant

variation in their values; the NO_2 mean was 0.01 ppm, while the NO average was also 0.01 ppm. The HCl concentration at the project sites ranged from 0.01 to 0.06 ppm, and the average across sites was 0.02 ppm. TVOC was not observed in any of the sample locations; in other words, its concentration in the project site's atmosphere was below the equipment resolution limit of 0.01 ppm. As expected, the RH and ambient air temperature averages are 23.8% and 30.00 C, respectively.

It should be noted that the very low RH in the State was due to the prevailing dry season weather conditions when the sample was conducted. Generally, RH and temperature are usually time—and season-dependent. Relatively, humidity is relatively high in the morning and evening, compared to noon.

None of the measured air pollutants exceeds its regulatory limits. Therefore, as baseline information, the air environment of the proposed project sites is not polluted, and activities that could escalate the condition during the proposed project development and operations would be guided against as much as possible.

Results of the measured PM concentration at the proposed project locations are presented in Table 4.3. The observed PM0.5 ranges from 0.10 to 2.21 $\mu g/m^3$ with an average of 1.16 $\mu g/m^3$, while PM1.0 and PM2.5 are 1.65 μg/m3 and 4.88 $\mu g/m^3$, respectively. Also, PM5.0 and PM10 averages are 6.33 $\mu g/m^3$ and 12.72 $\mu g/m^3$, respectively. The TPM values range from 81.0 at Maru (AQ2) to 113 μg/m3 at the Kaura Namoda location (AQ5), and the overall TPM mean value was 99.2 $\mu g/m^3$.

Observed ambient noise levels at all the proposed project locations are presented in Table 4.4. The measured background noise levels range from 49.6 dB(A) to 76.5 dB(A), and the overall average noise level was 62.82 dB (A). The highest background noise levels of 76.5 dB(A) and 70.9 dB(A) were measured at Maru (AQ2) and Gidan Dawa (AQ1) project sites, respectively. The high noise level at the two locations was caused by automobile movement, particularly articulated vehicles, as a result of their proximity to major roads. Besides the frequent automobile movement (principal noise source), wind action and human voices are other noise sources across the selected sites. Meanwhile, the recommended limit of FMEnv. for eight (8) hours of exposure was not exceeded at any of the sites, while the WHO for the same exposure hours were exceeded at AQ2 and AQ1. However, the observation period was less than the exposure time.

Regarding the water sample, the pH values ranged from 5.40 to 8.30; the lowest and highest pH value was measured at GW04 (Bani ga Hannu), while the highest value of 8.30 was measured at GW01 (Gidan Dawa). It was noticed that the pH at GW04 is acidic and falls below the recommended limit of 6.50 for drinking based on the NSDWQ standard. On average, the pH values across the sample were 7.26. The sample temperature was the same across the samples, and groundwater is expected to be 25.0^0C. However, the temperature values do not contravene the recommended limit of <400C.

Also, the electric conductivity (EC) ranged from 14.25 to 60.6 μS/cm, averaging 40.49 μS/cm. Each sample's individual values and overall mean are within the NSDWQ limit of 250 μS/cm. Other in-situ parameters and their mean values are TDS (25.40 mg/l), Salinity (0.02 ppt), Dissolved Oxygen (2.45 mg/l), and resistivity (39.16 kΩ). Expect at GW04 (hand dug well in Gummi), where the pH value falls short of the range, that all other in-situ parameters across samples are within their respective limits where they are expressly stated.

The total hardness concentrations ranged from 24.2 to 68.5 mg/l with an overall average of 43.42 mg/l; the measured values are well below the limit of 500 mg/l set by NSDWQ, which indicates that they are within the set limit. Dissolved mineral compounds of calcium and magnesium primarily cause hardness in groundwater. Also, the Chloride (Cl^-) concentrations do not vary considerably across the samples, gathering from 21.72 mg/l to 33.28 mg/l with a mean of 28.128.16 mg/l regulatory limit set for the Cl^- to compare whether it constitutes pollution or otherwise. In addition, the samples' chemical oxygen demand (COD) values ranged from 2.19 mg/L to 4.02 mg/l, with a mean value of 3.58 mg/l. Turbidity values were only observed in two of the five samples; the value at Gw01 was 0.10 NTU, while the value at GW04 was 0.80 NTU. As observed, the high turbidity value in GW04 was due to the shallowness of the well and the low water level. Total suspended solids (TSS) were only observed at GW04; the value was 1.60 mg/l. Oil and grease (O&G) were not observed in any samples, as their values were below the equipment resolution limit of <0.001 mg/l. Hence, the sampled groundwater is not polluted with hydrocarbon materials. The measured properties of microbes are THB, THF, THUB, THUF, and E. coli, and they do not indicate polluted water as their values are generally low.

The sampled soil laboratory analysis summary reveals that the soil Hydrogen Ion (pH) concentration ranged from 4.82 to 5.64, averaging 5.13. Generally, the soil pH of the study area varies from very acidic to distinctly acidic based on soil pH classification, as shown in Table 4.9. However, the observed pH values across the sites are all within limits (4.5 to 9.0) that support plant growth and crop yield in natural soil, as stipulated by Alloway, 1991.

The observed electrical conductivity (EC) values in the samples ranged from 167.99 to 189.00 µS/cm with a mean of 180.99 µS/cm. The measured EC in the samples is lower when compared to the maximum limit of 2000µS/cm stipulated by the Food and Agricultural Organisation (FAO), 1974. In other words, the sample's EC values do not contravene the recommended limit. Likewise, the total organic carbon (TOC) overall mean was 1.31%. Only at SS4 and SS5 were the TOC values within the medium range; in other locations, concentration is low based on Udo 1986 soil organic matter classification (Table 4.10).

Nonetheless, the TOC values are within the critical limit of 0.8% specified by Snapp (1998) for optimum yield in most arable crops. Organic matter plays a significant role in soil dynamics as it stores water, provides a living environment for organisms, promotes structural stability, and supplies and stores nutrients. Invariably, the soils of the study possess the TOC needed to support plant growth. This is evident as most soil samples were collected in fallow lands.

The physiognomic of the project sites reveals that spermatophytes dominated the proposed site locations, with dicotyledons predominant. The area is in the semi-arid region possessing thorn scrub vegetation, a degraded stage of the tropical dry forests, modified by human and livestock use over hundreds of years and dispersed grasses. The incident plant types recorded within the sampling locations are presented in Table 4.12. There needed to be more distribution of thorny scrubs, scanty trees and distribution of herbaceous and graminaceous species in many parts of the sites. Loss of vegetation is attributed to grazing animals and clearing processes, especially for agricultural practices. Saccharum officinarum was observed dominating the river bank of the Zamfara River in the Gummi area, while *Hyparrhenia sp*. and some unidentified dried grass dominated the project area. Tree species include *Acacia sp*., *Bauhinia rufescens*, *Azadirachta indica* and Adansonia digitata.

The most prominent anthropogenic activities influencing species diversity within the area are subsistence farming activities, which are a significant source of livelihood for the locals. Species mainly cultivated to generate income include the common grains; *Zea mays, Sorghum bicolor*, and edible vegetable; *Hibiscus sabdariffa*, *Lactuca sativa*, *Abelmoschus esculentus*, *Allium fistulosum*, *Solanum lycopersicum*, and *Solanum macrocarpon*. Hence, the vegetation within the area is said to have been modified.

Numerically, about forty-one (41) species were identified across the project sites and broadly grouped into seventeen (17) families. The richest plant families were Malvaceae, having eight taxa, followed by Poaceae, with six taxa, while Fabaceae, Asteraceae, and Solanaceae have five (5) and three taxa, respectively. Furthermore, the most dominant life forms/habits were herbs ≤ 48% (15 species), shrubs ≤ 18.92 (7 species each), grass ≤ 16.22 (6 species each), and trees ≤ 13.51% (5 species). Generally, herbs and grasses have the most extensive cover in the species population.

Seven fauna groups (Reptilia, Avian, Amphibians, Mammals, Insecta, Arthropoda and Annelida) were observed (Table 4.13) at the study locations; avifauna were recorded as the dominant group. Invertebrates encountered were butterflies, ants, termites, millipedes (*Archispirostreptus sp*.), centipedes (Chilopoda) and earthworms. Invertebrate fauna was diverse and consisted of forest inhabitant species, butterflies and grasshoppers (*Acridomorha sp*.)

ES 12 Socio-Economic Characteristics

Zamfara State has a population of 3,278,873, with a projected population of 5,833,500 in 2022. The population growth is +3.4%/year (2006 - 2022), with a density of approximately 82/km2 and a total land area of 39,762 km^2. Zamfara state's population comprises 50.07% male and 49.93% female. The age distribution showed that 47.97% are between 0 -14 years, while 49.19% are between 15-64 years, with only 2.84% 65 years and above. This population dynamics provide an excellent advantage to Zamfara state, which has a massive youthful population and less than 3% of the elderly, showing a dependency ratio of about one and, hence, a lower social support system.

Male (62%) respondents outnumber female respondents (38%) across the project sites, reflecting the predominance of males in farming and field cropping operations, while females are limited to processing produce. Respondents within the age bracket of 18-45 years (64%) account for the highest proportion in the sample population, followed by a few within 46-65 years (36%). This implies a youth population in the project area and the potential availability of an active workforce. Married respondents make up 90%, while singles constitute 10%. The dominance of married individuals signals stability, potential population growth, and maturity in the project area, reducing the likelihood of youth-related challenges during project implementation.

Islam prevails at 96% among the respondents in the communities. This homogenous religious landscape highlights the clear understanding and respect among community members to promote social cohesion and prevent conflicts. Respondents report standard household sizes, with 41% falling in the range of 6-10 members, 37% having above 16 persons living in their household, 18% having between 11 – 15, and 4% having less than five family members. This suggests the potential for a substantial labour force within families, enabling distributed farm work and increased productivity. The communities are mostly made up of the Hausa ethnic

group (45.0%) and Fulani (12%), which indicates robust cultural diversity. Planning a project in this community requires cultural sensitivity, effective communication, and alignment with the respective values of each ethnic group to ensure successful implementation.

Most respondents (37%) have senior secondary school leaving certificates, 27% have primary school leaving certificates, 19% have obtained tertiary degrees (OND/HND/NCE) and 17% are university graduates. Those with no formal education account for 20%. Fair literacy in the project areas will enable the farmers to understand new techniques and improvements related to their operations. Also, the literacy level in the project area could be exploited for ease of communication that could facilitate mutual understanding.

The main occupation of respondents in the project communities is farming (59%). Their farming practices involve livestock and cultivation of crops such as rice, millet, maize, soybeans, and sorghum, amongst others. Proper care must be taken to reduce the project's impact on farms, as they are the primary source of livelihood for most respondents. Most of the respondents (96%) are permanent residents in the project communities and have lived more than ten years in their communities. This implies that they have stayed long enough to provide reliable information regarding the socio-economic condition of the project communities.

ES 13 Summary of Potential Impacts of the project

The Potential Positive Environmental and Social Impact are

- Improved crop productivity of farmers;
- Increased farm incomes from crop output and ensuring dignity in farming practices;
- Elevation of rural income and national economy;
- Employment creation for community members;
- Improved infrastructure;
- Employment generation for youth and women;
- Enhanced income and livelihoods of farmers; and
- improvement in the revenue base of key institutions and regulatory bodies

The Potential Negative Environmental Impacts of the Proposed Project Activities

- Ambient air pollution from release of dusts and gaseous emissions from construction and large-scale land cultivation and processing;
- Noise and vibration from the use of machineries and motorized equipment owing to construction and the expansion of agricultural and processing activities;
- Loss of soil quality from de-vegetation and erosion owing to construction and the expansion of agricultural and processing activities;
- Vegetation loss from preparation activities such as land clearing and construction activities;
- Generation of vegetal wastes and other cleared materials;
- Fauna habitat alteration due to site clearing and construction activities for largescale farming and processing activities;

- Material sourcing, borrow pit formation and management;
- Generation of spoils and other construction wastes;
- Slope instability arising from excavation to construct processing facilities and agricultural activities;
- Increased surface water run-off due to diversion during construction and agricultural activities;
- Predisposition of soil erosion resulting from improper abandonment of borrow pit;
- Underground water pollution from spillages & leakages from oil storage tanks.

The Potential Negative Social Impacts of the Proposed Project Activities

- Loss of farmland and economic trees due to establishment of largescale farms and processing facilities;
- Poor implementation of occupational health and safety measure in the processing facilities and during the construction activities could lead to the risk of workers involving in accidents;
- Security issues that may lead to kidnapping and stealing of contractor equipment mobilized to site, machines procured to work on the farms and processing machineries and installed in the processing centres;
- Increase in vehicular movement causing traffic congestion and accidents during construction and the expansion of agricultural and processing activities;
- Risks of occupational and social accidents and injuries;
- Risk to community health and safety and exacerbation of the risk of transmission of HIV/AIDS and other STIs due to increase population;
- Increase in crime rate (including prostitution, theft and substance abuse);
- Adverse impacts on community dynamics;
- Threat to community culture due to labour influx;
- Increased burden on public service provision;
- Gender-based violence, including sexual harassment, child abuse and exploitation;
- Local inflation of prices and crowding of local consumer;
- Increased pressure on accommodation and rents;
- Impact on water supply to communities and increased demand on freshwater resources;
- Camp related land use, access roads, noise and lights;

- Increased use/demand on natural resources;
- Risks of occupational accident and injuries such as dizziness, eyes and noise impairment, acute respiratory syndrome from inhalation of dust etc., may occur in construction workers;
- Risks of accidents/incidents from un-reclaimed borrow pits.

This ESMMP will, however, ensure that the negative impacts are reduced to the barest minimum while the beneficial impacts are boosted.

ES 14 Environmental and Social Mitigation Measures

Environmental and Social Mitigation Measures were prepared for all the identified potential impacts. The site-specific measures for each of the sites are outlined in tables 6.1–6.3. The project activities include the following:

- Enhancement of Agricultural Production and Productivity in 50 km Proximity to Agro-Industrial Clusters;
- Agro-Processing activities;
- Processing of Infrastructure development/Construction and/or upgrading of Agro-Industrial Hub infrastructure.

ESS 15 Roles and Responsibility of Institutions in the implementation and monitoring of the ESMMP

S/N	Category	Roles & Responsibilities
1	Federal Ministry of Environment	• Lead role - provision of advice on screening, scoping, review of draft ESIA report (in liaison with the Zamfara State Ministry of Environment), receiving comments from stakeholders, public hearing of the project proposals and social liability investigations, monitoring and evaluation process and criteria.
2	Zamfara State Ministry of Environment and Natural Res,	• Environmental monitoring and compliance overseer at the State level • Site assessment and monitoring of ESMMP implementation. • Monitoring ESMMP implementation particularly waste management and pollution control aspects
3	Federal Ministry of Agriculture and Food Security	• Provision of overall leadership and direction to other MDAs by engaging all the critical stakeholders to support, cooperate with and participate in established policy direction for the SAPZ; and • Pursuance of an agenda of encouraging and ensuring investors comply with all environmental laws and policies
4	Zamfara State Ministry of Agriculture	• Provision of all necessary information and support • Pursuance of an agenda of encouraging and ensuring investors comply with all environmental laws and policies governing the SAPZ in consonance with the Safeguard Unit

5	Safeguard Unit	Environmental Safeguards • Collate environmental baseline data on relevant environmental characteristics of the selected project sites. • Analyze potential community/individual sub-projects and their environmental impacts. • Ensure that project activities are implemented in accordance with best practices and guidelines set out in the ESMMP. • Identify and liaise with all stakeholders involved in environment related issues in the project; and be responsible for the overall monitoring of mitigation measures and the impacts of the project during implementation. Social Safeguards • Develop, coordinate and ensure the implementation of the social aspects of the ESMMP. • Identify and liaise with all stakeholders involved in social related issues in the project. • Conduct impact evaluation and beneficiary's assessment; and • Establish partnerships & liaise with organizations, CBOs and CSOs.
6	Other State MDAs • Ministry of Health, • Ministry of Works, • Ministry of Transport and Energy, • Ministry of water resources • Ministry of women affairs	• Ensure monitoring of mitigation measures and the impacts of the project during implementation as it relates to infrastructure, water resources, gender and health issues respectively. • Establish partnerships & liaise with organizations relevant NGOs as well as CBOs and CSOs.
7	E&S Consultant	• Development of ESMMP • Training of relevant Staff, regulators, MDAs and contractor on ESIA implementation and monitoring. • Implementation of ESMMP
8	Contractors	• Compliance with BOQ specification in procurement of material and construction • Implement ESMMP during project implementation. • Ensure all contractors and workers sign the Code of Conduct (CoC) and are routinely trained on the contents of the CoC. • Prepare C-ESMP for approval of FMEnv. / Zamfara State Ministry of Environment. • Implement C-ESMMP during project implementation. • Ensure that all construction personnel and subcontractors are trained on the content of the C-ESMP and are made aware of the required measures for environmental and social compliance and performance. • Prepare the OHS manual and abide by labour laws as set out in the agreement. • Provide adequate basic amenities and PPEs to workers and ensure that the PPEs are worn by workers during works. • Prepare and maintain records and all required reporting data as stipulated by the ESMMP, for submission to the Supervising Consultant
9	**LGAs**	• Provision of oversight function across project within its jurisdiction for ESMMP compliance. • Monitoring of activities related to public health, sanitation, waste

		management amongst others.
10	Host Communities	• Promote environmental awareness. • Review environmental and social performance report made available by project developer. • Provide comments, advice and/or complaints on issues of nonconformity. • Attend public meetings organized by the project developer to disseminate information and receive feedback. • Participate in security management across the programme area
11	NGOs/CSOs	• Assisting in their respective ways to ensure effective response actions, conducting scientific research alongside government groups to evolve and devise sustainable environmental strategies and techniques.
12	AfDB	• Recommend additional measures for strengthening management framework and implementation performance. • Implementation support missions and ensuring that the SAPZ and its subprojects comply with the E & S conditions of the loan agreement with the AfDB
13	General Public	• Identify issues that could derail the project and support project impacts and mitigation measures, Awareness campaigns.

ES 16 Institutional Capacity Strengthening Plan

Capacity Building Activity	Proposed Topics	Objectives	Target Audience	Duration	Cost (Naira)
Module 1: AfDB's ISS and Nigeria Extant Laws on Environmental Protection	• Introduction to E&S policies and laws in Nigeria • AfDB's ISS & OS • Operational Safeguards triggered by project activities. • The roles and responsibilities of regulators and the AfDB during project implementation	To enhance awareness of AfDB's OS and applicable national regulatory requirements for project activities	• Zamfara State Min of Env & Nat Res., • Zamfara State Min of Agric • Contractors, • FMEnv, • Zamfara State Min of Works, • Representatives of the LGAs	1-day	1,000,000

Module 2: Training on Environmental and Social Management Plan (ESMP) Implementation	• Overview of ESMP • Potential Impacts of Project • Pollution & Control Measures • Environmental Management • Labour influx, GBV, Code of Conduct, vulnerable people inclusion • Environmental Performance Monitoring • Environmental Issues Reporting	To enhance competence in environmental sustainability and regulatory practice	• Zamfara State Min of Env & Nat Res., • Zamfara State Min of Agric, • Contractors, • FMEnv, • Zamfara State Min of Works, • Representatives of the LGAs	1-day	1,000,000
Module 3: Climate Smart Agriculture	• Introduction to climate change • Climate-smart strategies for crop production • Climate-smart livestock production systems • Creation of an enabling environment for climate-smart crop and livestock production	To mainstream climate change adaptation strategies to enhance project sustainability.	• Zamfara State Min of Env. & Nat Res., • Zamfara State Min of Agric, • Contractors, • FMEnv, • Zamfara State Min of Works, • Representatives of the LGAs	1-day	1,000,000
Module 4: Agricultural Waste Management	• Agricultural waste management • Agricultural waste recycling strategies • Composting • Biogas Production • Vermi composting	To develop & implement eco-friendly and modern methods of livestock waste recycling to prevent environmental degradation and enhance profitability	• Zamfara State Min of Env. & Nat Res., • Zamfara State Min of Agric, • Contractors, • FMEnv, • Zamfara State Min of Works, • Representatives of the LGAs	1-day	1,000,000

Module 5: Training on Construction HSE	• Introduction to Construction HSE • Overview of Health and Safety Hazards in Construction • Incidents: Causation, Investigation & Reporting • Excavation Safety • First Aid, Defensive Driving etc. • Project/Site Specific OHS • Construction Site Inspection • Personal Protective Equipment	To ensure completion of project with zero fatalities, zero Lost Time Injuries (LTI) or occupational illness by promoting safe & healthy working conditions for workers and monitoring officers	• Zamfara State Min of Env. & Nat Res. • Zamfara State Min of Agric, • Contractors, • FMEnv, • Zamfara State Min of Works, • Representatives of the LGAs	1-day	1,000,000
Total				5 days	5,000,000

ES 17 MONITORING AND REPORTING

Monitoring	Action	Responsibility	When	Deliverables
Internal Monitoring	Regular site visits to ensure that the mitigation measures and actions specified in the monitoring plan and as bound by the contract is satisfactorily implemented.	Environmental Safeguard Specialist from Zamfara State Implementing Unit. National Safeguards Unit	During Preconstruction, Construction and Operation Phases	Monitoring Reports and documentation
	Site visit for monitoring and inspection to ensure contractor adhere strictly to the engineering designs and specifications for the project	Supervision Consultants	During Construction Phase	Observations and Monitoring Reports to be compiled and presented to the Zamfara State Implementing Unit.
External Monitoring	Regular site visit to ensure project is implemented in an environmentally & socially sustainable manner using the monitoring indicators	FMEnv, LGAs, Representatives of affected communities, and other relevant MDAs.	During Preconstruction, Construction and Operation Phases	Inspect monitoring reports from Safeguard units and provide feedback on observations. Enforce corrective actions where

	specified in the monitoring plan and other national and international environmental & social requirements			necessary.

The Zamfara State Implementing Unit shall implement a system of continuous reporting between all parties involved in the ESMMP implementation in order to ensure the receipt of timely feedback and to take rapid corrective actions if there are issues of non-conformance.

ES 18 Record Keeping and Control

The Contractor is required to keep records providing evidence of ongoing mitigation activities. Such records may include site monitoring plan, HSE Policy, Site Specific HSE Plan, Waste Management Plan, Traffic Control Plan, Emergency response and preparedness procedures, site instructions, training records, complaints records, incident report, Inspection, maintenance and equipment calibration records. These documents should be made available to the Safeguard Unit upon request.

The Safeguard Unit is also required to keep records to provide evidence of monitoring activities and effectiveness of the monitoring plan. The site monitoring Plan identifying problems/corrective actions and monitoring reports are to be kept by the Safeguard Unit and are to be made available to relevant regulators upon request. In addition, all significant communications with the FMEnv, ***Nigerian*** Society of Mining Engineers (NSME) and other relevant authorities should be documented and kept. These documents are required to track performance in order to achieve and demonstrate compliance with the monitoring plan and applicable regulatory requirements

ES 19 Grievance Redress Mechanism (GRM)

The existing grievance redress mechanism in the project environment which empowers the Community Head and leadership to arbitrate over grievances will be enhanced using the AfDB approach.

At the project level, the design of the GRM may be done with the assistance of a specialized independent consulting team as part of the ESMMP implementation. The GRM shall be designed based on the following principles:

1. Involvement of individuals of mixed levels and functions from the entity (e.g., operations, environmental affairs, community relations, legal affairs, contractors). Staffing the design team from just one function such as community relations or human resources is unwise;
2. The inclusion of a balanced group of representatives from the community, representing the range of constituencies and demographics that will be using the grievance redress mechanism, while keeping the team small enough to be responsive;
3. GRM relying upon clear terms of reference and a work plan that outlines team goals, roles, and responsibilities, level of decision-making authority, reporting lines, tasks, time frame, and products;

4. Making the use of multiple channels (e.g., face to face, phone conversation, mail, text or e-mail, message on a dedicated website), sensitive to cultural customs and traditional methods that may influence or impede the expression of grievances;
5. The existence of a central point of contact that will receive complaints and log them into a central register;
6. Existence and operation of designated complaint resolution staff;
7. Processes for acknowledging the receipt of a grievance and informing the complainant about the time frame in which a response can be expected.

Specifically, for the SAPZ implementation, the GRC at the project level shall constitute from among the members:

1. Director, Agric Department (Zamfara State Ministry of Agric);
2. Representatives from the 14 LGA (1 each);
3. Village Heads;
4. A Representative of Farmers Group;
5. A Representative of Community Women;
6. Youth Leader;
7. a member from a recognized Non-Government Organization;
8. SAPZ Liaison Officer from Zamfara State Ministry of Agric (Secretary).

The GRC shall have the right to request the project technical staff, and officers from relevant State or non-State institutions to attend the meetings and provide information. A complainant has the right to appear in person, to be accompanied by a community member, and/or to request to be represented by a community elder. GRCs shall be established at the project level to assure accessibility for Project Affected Persons.

ES 20 Contractual Measures

Action	Remarks
The measures as described in this ESMMP shall be included in the tender documents with appropriate flexibility to adjust these measures to site circumstances, and that the potential contractor will have to prepare their proposals taking into account these measures.	The non-inclusion of these measures in the proposal will lead to a disqualification of the proponent; The contract with the successful bidder should contain these environmental and social management measures as firm conditions to be complied with.
Specifically, the measures should be translated into a suite of environmental specification that are written in the same language style and format as the rest of the contract document	This approach will ensure that the environmental and social controls integrate seamlessly into the tender document and are presented in a familiar form to the Contractor
Cost of mitigation measures be added to the cost of the contractual document	The contactor must take into account and put the cost for the environmental and social requirements specified in the ESMMP.

ES 21 ESIA Disclosures

After a review and clearance by the FMEnv./AfDB, the ESIA will be disclosed at the FMEnv., SME and the host LGA offices as well as at the AfDB website.

Action	Remarks
Disclosure on 2 national newspapers	The project proponent will disclose the ESIA as required by the Nigeria EIA public notice and review procedures. This entails advert in 2 newspapers: one national and one local (State) newspaper
Disclosure at the Zamfara **Ministry of Environment**	The project proponent will display the ESIA as required by the Nigeria EIA public notice and review procedures
Disclosure at the Zamfara **Ministry of Agriculture**	The project proponent will display the ESIA as required by the Nigeria EIA public notice and review procedures
Disclosure at the respective LGA offices	The purpose will be to inform stakeholders about the project activities; environmental and social impacts anticipated and proposed environmental and social mitigation measures.

ES 22 Implementation Schedule

An implementation schedule gives a clear-cut direction on the timeline for the implementation of stipulated mitigation measures. It is anticipated that each of the Stated measures should be time-based for suitable implementation and appropriate monitoring. Table below documents the implementation schedule for the mitigation measures with respective time lapse.

S/N	Activity	Timeline (Monthly)											
		1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	11th	12th
1	Clearance and Formal Disclosure of ESIA												
2	Inclusion of Environmental & Social Requirements in Bid Docs												
3	Allocating Budget for ESIA												
4	Appointing Support Staff for ESIA												
5	Review& Approval of Contractor's ESIA, Waste & HSE Plan												
6	Finalization of Designs, studies and other preliminary												
7	Environmental and Social Training												
8	Mobilization to site												
9	Site Clearing and preparation												
10	Implementation of Mitigation												
11	Monitoring & Reporting on ESIA Implementation												

12	Environmental and Social Auditing												

ES 23 ESIA Costing and Cost Analysis

The cost analysis illustrated here is structured to ensure that each of the identified mitigation measures is successfully and expertly implemented. It is also designed exclusively for each of the activities identified and value chains in the Zamfara SAPZ program. Hence, it covers the productivity, Agro-Processing and Small infrastructure activities mitigation measures. In addition, the cost is designed for a global spread across the stated measures. The ESIA costing Table below illustrates the synoptic details of the ESIA costing for the Zamfara SAPZ program.

S/N	ESIA Activities (Monitoring)	Cost Estimate (~~₦~~)
1	**Impact Mitigation Monitoring**	13,308,375
2	***Institutional Capacity Reinforcement Programme***	5,000,000
Total for Mitigation Monitoring		18,308,375
10% Contingency		1,830,837.5
Grand Total		**20,139,212.5**

ES 24 Consultations: Stakeholders, Expectations of the Project

The expectations of the communities during construction and operation phases are noted as follows:

i. Timely implementation of the program to keep the enthusiasm

ii. Full engagement of qualified and skilled youths from the communities to ensure inclusiveness and local ownership of the program;

iii. Respect for the cultural and religious values;

iv. Ensuring the safety of road users to avoid accidents that might directly or indirectly be related to the construction and operation works;

v. Damage to any existing social and physical infrastructures of the communities should not only be replaced but restored to optimum functioning level.

ABBREVIATIONS & ACRONYMS

AfDB	African Development Bank
ACHPR	African Charter on Human and Peoples' Rights
ACRWC	African Charter on the Rights and Welfare of the Child
ATCs	Agricultural Transformation Centres
AoI	Area of influence
BAT	Best Available Technology
BCS	Broad Community Support
BPT	Best Practical Technology
BOD	???
BOI	???
BOQ	Bill of Quantities
CAT	Convention against Torture
CBOs	Community Based Organisations
CCAC	Climate and Clean Air Coalition
Cfu	???
CoC	Code of Conduct
CEDAW	Convention on the Elimination of All Forms of Discrimination against Women
CEMPs	Construction Environmental Management Plans
C-ESMP	Contractors Environmental and Social Management Plan
CO	Carbon monoxide
COD	???
CITES	Convention on International Trade and Traffic in Endangered Species
CRC	Convention on the Rights of the Child
CRPD	Convention on the Rights of Persons with Disabilities
CPGs	Consumer Packaged Goods
CSOs	Civil Society Organisations
dB	Noise-decibel
DFIs	Development Financial Institutions
EA	Environmental Assessment

EIA	Environmental Impact Assessment
ESAP	Environmental and Social Action Plan
ESEU	Environmental Sanitation and Enforcement Unit
ESF	Environmental and Social Framework
ESIA	Environmental and Social Impact Assessment
ESS	Environmental and Social Standards
E&S	Environmental and Social
ESMP	Environmental and Social Management Plan
ESMMP	Environmental and Social Management and Monitoring Plan
FAO	Food and Agriculture Organisation
FEPA	Federal Environmental Protection Agency
FGD	Focus Group Discussions
FGN	Federal Government of Nigeria
FMAFS	Federal Ministry of Agriculture and Food Security
FMEnv.	Federal Ministry of Environment
FMWASD	Federal Ministry of Women Affairs and Social Development
GBV	Gender Based Violence
GCF	Green Climate Fund
GFSI	Global Food Safety Initiatives
GHGs	Green House Gases
GON	Government of Nigeria
GPS	Global Positioning System
GRM	Grievance Redress Mechanism
GRC	Grievance Redress Committee
Ha	Hectare
HIV/AIDS	Human Immune Deficiency/ Acquired Immune Deficiency Syndrome
HHQ	Household questionnaires
H_2S	Hydrogen sulphide
HND	???
HSE	Health Safety and Environment

IEE	Initial Environmental Evaluation
IESIA	Integrated Environmental and Social Impact Assessment
IFAD	International Fund for Agricultural Development
ISS	Integrated Safeguards System
ICESCR	International Covenant on Economic, Social and Cultural Rights
ICCPR	International Covenant on Civil and Political Rights
IsDB	Islamic Development Bank
IUCN	International Union of Conservation of Nature
IPF	Investment Project Financing
ISO	International Organization for Standardization
IRM	Independent Review Mechanism
KII	Key informant interviews
LEL	Lower Explosive Limit
LFN	Laws of the Federation of Nigeria
LGA	Local Government Area
MDAs	Ministries, Departments and Agencies
MoU	Memorandum of Understanding
NAP	National Action Plan
NESREA	National Environmental Standards and Regulations Enforcement Agency
NGOs	Non-Governmental Organizations
NIMET	Nigerian Meteorological Agency
NO_2	Nitrogen dioxide
NIRSAL	???
NSDWQ	???
NTU	????
O/G	???
OS	Operational Safeguards
OHSP	Occupational Health and Safety Plan
OND	???
PM	Particulate matter

PAP	Project Affected Persons
PACs	Project Affected Communities
PPE	Personal Protective Equipment
RAM	Risk Assessment Matrix
RAP	???
RH	Relative Humidity
SAPZ	Special Agro-Processing Zones
SEA	Sexual Exploitation and Abuse
SEP	Stakeholder Engagement Plan
SH	Sexual Harassment
SME	Small and Medium Scale Enterprise
STDs/STIs	Sexually Transmitted Diseases/Sexually Transmitted Infections
SO_2	Sulphur dioxide
SPM	Suspended Particulate Matter
TDS	Total Dissolved Solids
TOR	Terms of Reference
UNFCCC	United Nations Framework Convention on Climate Change
UN SDG	United Nations Sustainable Development Goal
USEPA	United State Environmental Protection Agency
µS/cm	???
VOCs	Volatile Organic Compounds
ZSMANR	Zamfara State Ministry of Agriculture & Natural Resources
ZSPIU	Zamfara State Project Implementation Unit
ZSG	Zamfara State Government
ZSME	Zamfara State Ministry of Environment & Nat. Res.
ZMoH	Zamfara State Ministry of Health

CHAPTER ONE

INTRODUCTION

1.1 Background

The Special Agro-industrial Processing Zones (SAPZ) programme is a major investment of the Federal Government of Nigeria (FGN), 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. This clustering approach is to help address investment challenges in developing agro-processing enclaves across Nigeria, including poor access to quality infrastructure, inadequate feedstock supplies, and other challenges confronting the agro-processing environment.

SAPZs, therefore, will be developed with the requisite infrastructure for an agro-processing environment, which will help reduce cost absorptions and engender competitiveness in agro-industrial production, which is critical to further unlocking the potential of Nigeria's agriculture to create ready markets and wealth for farming communities and reduce rural poverty. It is a strategic move to rapidly develop modern agro-processing capacity to serve the vast and growing local market, create a sustainable market for farmers, reduce post-harvest losses of local agricultural produce, and thereby create wealth for farmers, promote import substitution, and create sustainable agriculture-related jobs for women and youth.

The SAPZ programme is aligned with national policies and priorities. It seeks to sustainably contribute to poverty alleviation, hunger, and inequality reduction 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 smallholder farmers, women, and youth.

The SAPZ Programme's 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, while the development objective is to support inclusive and sustainable agro-industrial development. Moreover, the programme interventions will seek to improve the competitiveness of the selected value chains.

The SAPZ will be made up of two building blocks, which include the Agricultural Transformation Centre (ATC), which is a community-based rural institution within the host community supported by the provision of quality production drivers for the production of feedstock, the Aggregation Centre (AC) for primary storage, and the Agro-Industrial Hub (AIH), equipped with desirable infrastructure to create a modern agro-processing environment where secondary value addition will take place. The Agro-Industrial Processing Hub (AIH) will draw its processing feedstock from the ATC, where production clusters and Aggregation Centres' activities are coordinated.

The Programme has four (4) broad mutually reinforcing components, namely:

5. Support the development of enabling climate-adapted infrastructure for Agro-Industrial Hubs (AIHs);
6. Improve agricultural productivity and enterprise development to enhance agricultural value chains and job creation in the SAPZ Catchment Areas;
7. Support Agro-Industrial Zone Policy and Institutional Development and
8. Programme Coordination and Management.

The key design features of the program are the following:

- Support economic and social development programmes of the Federal Government of Nigeria (FGN) and Zamfara State;
- Contribute to rural infrastructure development;
- Improve access to agricultural markets;
- Increase agricultural production and productivity;
- Stimulate the adoption of agricultural technology;
- Facilitate climate-smart agricultural production and processing practices;
- Increase value addition and agro-processing; and
- Increase skills acquisition and job creation for all actors along the value chain, including the smallholder farmers, women and youth.

The expected outcomes of the phase I of the SAPZ Programme are:

- Development of infrastructure, including Agro-Industrial Processing Hubs (AIHs),
- Development of Agricultural Transformation Centers (ATCs),
- Development of irrigated lands and farm-to-market access roads;
- Supply of certified agricultural inputs and extension services;
- Skills development for farmers and Micro, Small and Medium Scale Enterprises (MSMEs); and
- Updated agro-industrial zone policy and establishment of regulatory institution/special regulatory regime.

The first phase of the Special Agro-Industrial Processing Zone (SAPZ) Programme is being implemented in seven (7) states, namely Cross River, Imo, Kaduna, Kano, Kwara, Ogun, and Oyo, and the Federal Capital Territory (FCT). The SAPZ phase one is valued at USD538.05 million (net taxes), funded by AfDB, IsDB, IFAD, GCF, and Federal and State Governments.

The second phase of the SAPZ programme has been receiving relevant attention at appropriate quarters. Expressions of interest (EOIs) from about twenty-seven (21) states, to participate in the second phase have been submitted to the Federal Ministry of Agriculture and Food

Security, Abuja. It will commence immediately with the enlistment of interested states based on their readiness levels.

Zamfara State desires to be enlisted in Phase 2 of the SAPZ Programme. Four (4) major specified criteria must be met to qualify for enlistment. To meet this set of criteria, Zamfara State has engaged the services of an agribusiness and environment consultant to conduct a feasibility study suitable to fulfil the eligibility criteria for the state's qualification in the SAPZ programme.

Specifically, the eligibility criteria will include but not be limited to:

- Completed/ Draft Feasibility Studies;
- Comprehensive Environmental and Social Impact Assessment (ESIA) Studies;
- Determination of Value Chain where Zamfara State has comparative advantage;
- Determination of Sites for one AIH and two or more ATCs.

1.2 Rationale for the Participation of Zamfara State in the SAPZ Programme

Zamfara State has an agriculturally viable environment since it has high soil fertility, vast farmlands and economically viable rivers sheltered by the delicate tropical climate. Due to these factors, agriculture has remained the primary source of revenue and the backbone of the state's economy. Major crops in the area are millet, guinea - corn, maize, rice, groundnut, cotton, tobacco and beans. Agro-industrial concerns in the state include Gusau Oil Mill, the first vegetable mill in Nigeria to extract oil from cotton seeds, Zamfara Textile Industries Limited, Gusau and the Gusau Sweets Factory and the Cotton Gingery at Gusau. The inhabitants of Zamfara State also weave and sell locally dyed and designed textiles and other types of woven handicrafts. Favourable environmental characteristics that attract the greatest concentration of cattle and other animals have also made the state a primary raw material source for dairy products, hide, and skin.

Zamfara State thus has the potential to be a net producer of food crops, minerals, and industrial items and a net exporter of cash crops such as cotton, groundnuts, rice, and cassava. Its human resources, vast arable land, and substantial irrigation facilities make the state economically vibrant.

Despite its economic potential, Zamfara State has the highest poverty rate in Nigeria. According to the National Bureau of Statistics, the poverty level in Zamfara State was 74 percent above the national average of 40.1 percent in 2019. In the same light, the multidimensional poverty index released in November 2022 stated that 78 percent of Zamfara people are poor, meaning poverty worsened from 74 to 78 percent.

The SAPZ programme has therefore presented a massive opportunity for the Zamfara State Government to focus on agricultural areas with a comparative advantage to revitalize its economy, reduce poverty, improve youth employment, and reduce the crime rate (banditry and terrorism).

1.3 Rationale for the ESIA

The SAPZ Programme has been classified as Category 1 in accordance with the African Development Bank Integrated Safeguards System (ISS) and national legislation. This validated category is based on the large-scale, multisectoral, and sensitive nature of the programme. In line with national legislation and the AfDB's ISS, Zamfara State is required to prepare an Environmental and Social Impact Assessments for all concerned investments, including Resettlement Action Plans and/or Livelihood Restoration Plans where applicable. Additionally, all associated facilities and investments will require the applicable Environmental and Social Assessments (ESIAs, RAPs LRPs, Audits etc.), to be prepared for disclosure by Zamfara State and the Bank.

1.4 Objective and Scope of the ESIA

The ESIA aims to identify and address possible direct, indirect, and cumulatively significant adverse environmental and social impacts that are likely to arise from the proposed programme for acceptability and sustainability. The primary objective of the ESIA is, therefore, to facilitate effective decision-making and to ensure that the implementation processes during the execution of the proposed programme are sustainable. Some activities to be carried out during the ESIA preparation include:

- ensuring that the programme activities are environmentally sound,
- encouraging community consultation and participation, and
- enhancing social well-being.

Specifically, the ESIA seeks to provide a transparent process that integrates environmental and social considerations into the proposed SAPZ programme, including action plans. The ESIA is site-specific and consists of a well-documented set of mitigation, monitoring, and institutional actions to be taken before and during implementation to eliminate adverse environmental and social impacts, offset them, or reduce them to acceptable levels. The ESIA also includes the measures required to implement these actions, addressing the adequacy of the monitoring and institutional arrangements within the state.

The objectives of the ESIA are to:

i. Initial scoping activities in order to understand the project's field of influence, activities and impacts that will have to be outlined in the Framework.

ii. Reviewing the Operational Safeguards of the AfDB especially OS1, IFAD and IsDB, as well as those of the Federal Government (especially Federal Ministry of Environment) and the State regulations.

iii. Describing the proposed project by providing a description of the project relevant components and presenting plans, maps schematic diagrams, figures and tables;

iv. Provide maps to illustrate the general setting of the project-related development sites, as well as SAPZ adjoining areas, which can be potentially affected.

v. Identify and describe all potential significant changes that may occur as a result of the project. These would encompass environmental and social impacts, both positive and negative, as a result of project interventions- such as involuntary resettlement, social

conflicts and disturbance, or environmental risks such as threats to land and natural resources, biodiversity, and natural habitats.

vi. Specific types of projects and associated environmental and social impacts that might require separate assessments in relation to location, project size, and other site specific factors need to be identified.

vii. Analysis of alternative approaches against current project plans from an environmental, socioeconomic and cultural standpoint. Alternatives should be compared in terms of their potential impacts; capital and operating costs, suitability under local conditions, including skill requirements, public and political acceptability, level of technology as well as their institutional, training and monitoring exigencies.

viii. Analysis of existing environmental policies and legislation, including directives for environmental impact assessment and assess needs for strengthening these policies in the context of this project.

ix. Analysis of the sub-sector specific policies, laws and regulations that have environmental implications. The sectoral investment planning process in terms of objectives, methodology and procedures for review and approval of plans and projects, should be carefully reviewed.

x. Describing and analysing the physical, biological and social environment conditions in the study area before project implementation. This analysis shall include the interrelations between environmental and social components and the importance that the society and local populations attach to these components, in order to identify the environmental and social components of high value or presenting a particular interest; Description of the project environment shall be obtained from a combination of literature review, field sampling, in-situ measurements and laboratory analyses of samples;

xi. Analysis of biophysical issues as related to Climate and meteorology, Air and Noise, Geology, Topography and hydrogeology, Surface Water Quality, drainage pattern and aquifer characteristics, Soil, biological aspects: flora and fauna, endemic and endangered species including sources of data.

xii. Sampling of relevant biophysical parameters within the project area of influence including air, noise, water and soil using *in-situ* and laboratory analysis as appropriate.

xiii. Discuss the results and its implications for the proposed project. Analyses of samples should be done in an accredited Federal Ministry of Environment Laboratory.

xiv. Collate data on the size and social structure of the local population, and assessment of the groups/people expected to be impacted directly or indirectly by the project: their needs, their demands, their ability to deal with change, physical and economic displacements likely to occur, impact on road users (school children, business owners, etc.), health assessments, waste management practices, the existing human capital in the form of education and skills and the potential for improving that, gender issues, and vulnerable groups, and the need for measures of mitigation;

xv. Preparation of an implementation plan. The plan should include measures for integrative/participatory environmental and social monitoring, and institutional and training requirements to implement them. Such a plan should recommend feasible and cost-effective measures to prevent or reduce significant impacts to acceptable levels and estimate the impacts and costs of those measures.

xvi. Presentation of a summary of the impacted communities for the project: location, access, population (number, demographic and social characteristics); economy (employment rate, income distribution); services (types, capacity, and adequacy) and housing. Concern is the ability to provide work force, service new development and absorb and adjust to growth (worker/family). The report should identify and assess the social impacts identified during the public consultation process and those that, based on consultant's experience, are also likely to occur. In some instances, the affected communities may not be aware of or be in a position to identify all the social impacts that may occur. However, this does not mean that they will not occur. In such cases the consultant should use his experience to identify additional social impacts that have not been raised by the public.

xvii. Submission of an ESIA report in a concise format containing all studies, processes, analyses, tests and recommendations for the proposed intervention. The report shall focus on the findings, conclusions and any recommended actions, supported by summaries of the data collected and citations for any references used in interpreting those data. It should provide a description of the specialist studies undertaken and the report should include a bibliography, maps, photographs, diagrams and any other diagrammatic representation needed to facilitate understanding of the main text, detailed data should be presented in annexes or a separate volume. Unpublished documents used in the assessment should also be included or referenced in an appendix and the location of the originals of such documents indicated.

1.5 Approach/ Methodology for the ESIA Study

The approach and methodology for the ESIA involved the following:

- desktop study; review of design reports and literature;
- reconnaissance visits and site inspections;
- spections;
- public/stakeholder consultations and involvement;
- data collation, analysis and reporting;
- identification and assessment of environmental and social impacts;
- development of mitigation measures;
- development of monitoring and management plan.

1.5.1 Review of Available Literature

Information from relevant documents from the programme proponents, and other documents on agricultural development will be of immense help to the ESIA study. Key documents reviewed for this study include:

- SAPZ Environmental and Social Management Framework (ESMF);
- SAPZ Project Appraisal Report (PAR);
- SAPZ Project Implementation Manual (PIM);
- Zamfara State Agriculture Profile
- All information collected in the past for the preparation of ESIA for SAPZ or related programme in the State;
- African Development Bank Integrated Safeguards Policy Statement and Environmental and Social Assessment Procedures (ESAP).

1.5.2 Field surveys and site inspection

Field surveys for the proposed intervention were carried out from 17th to 20th March 2024. The visits included inspections of the proposed intervention areas in order to confirm the environmental and social issues and conditions to be affected or are likely to develop from the implementation of the programme. This enabled the consultant to appraise the programme area of influence, the nature of the biophysical environment to be affected (especially current land and water uses), the relevant baseline data were also obtained. The socio-economic characteristics of the environment to be potentially impacted by the programme including the neighbouring rural communities, current infrastructural status in the programme area were captured.

1.5.3 Public/Stakeholder Identification and Consultations

The programme proponents and beneficiaries have been engaged to understand the programme scope, design and implementation and to obtain relevant programme documents. Key stakeholders have also been consulted so as to obtain their comments and concerns on the proposed programme with respect to the potential environmental and socio-economic issues. Details of consultations are provided in Chapter 8.

1.6 Structure of the ESIA Report

This ESIA report was presented in a concise format containing all studies, processes, analyses, tests and recommendations for the SAPZ intervention. The report focused on the findings, conclusions and recommended actions, supported by a summary of the data collected and citations for references used. Below is the indicative Table of Contents and description of the content embedded for the ESIA final report:

Cover Page

Table of Contents

List of Acronyms and their Definitions

Executive Summary

The executive summary provides an overview of the programme objectives and a brief programme component description in addition to a brief non-technical description of the significant findings and recommendations for environmental management that will be adopted by the investor. This is to eliminate or minimize the adverse impacts to acceptable levels as defined by the appropriate authorities and standards. This section will serve as the main consultation document.

- Chapter 1: Introduction
- Chapter 2: Legal and Institutional Framework for Environmental Management
- Chapter 3: Project description and alternative:
- Chapter 4: Biophysical Environment Conditions and Socio-Economic Characteristics
- Chapter 5: Assessment of Potential Environmental and Social Impacts Identification and Evaluation
- Chapter 6: Mitigation Measures
- Chapter 7: Environmental and Social Management and Monitoring Plan (ESMMP)
- Chapter 8: Public Consultation

References

Annexure

- Summary of African Development Bank Integrated Safeguards Policy
- General Environmental and Social Management Conditions for Construction Contracts/Civil Works
- List of Persons Met
- Photos.

CHAPTER TWO

LEGAL AND INSTITUTIONAL FRAMEWORK

2.0 Introduction

This section presents Nigeria's government's national policy and legal, regulatory, and administrative frameworks that guide the country's environmental sustainability of developmental activities. It also provides a detailed discussion of Zamfara State policies, legislation, regulations and guidelines on environmental issues that apply to the proposed Zamfara State Special Agro-Industrial Processing Zone (SAPZ) Programme.

In addition, the African Development Bank Integrated Safeguards Policies were identified, and those triggered by the proposed Zamfara State Special Agro-Industrial Processing Zone (SAPZ) Programme are also discussed. Several national and local environmental guidelines applicable to the operations of the Programme in Zamfara State were also explicitly addressed in the chapter.

2.1 Federal and State Policy, Legal, Regulatory and Administrative Frameworks

Several national and State environmental guidelines and international conventions which Nigeria ratified and which apply to the SAPZ programme's operations. A brief discussion of these is presented in Table 2.1.

Table 2.1: Relevant Federal/Zamfara State Policies, Legislation, Regulations and Guidelines

Federal Policies				
S/N	**Policy Instrument**	**Year**	**Provision**	**Applicability to the proposed Zamfara State SAPZ programme**
1	National Policy on the Environment	1989 revised 1991, 1999	This describes both the conceptual and theoretical frameworks and strategies for achieving sustainable development in Nigeria. The policy identifies key sectors that require the integration of environmental concerns and sustainability with development. The goal of the policy is to achieve sustainable development; it seeks in particular to: i. Enhance the quality of the environment; ii. Promote the sustainable use of natural resources; iii. Restore and maintain the ecosystem and ecological processes and preserve biodiversity; iv. Raise public awareness and promote understanding of linkages between environment and development; and v. Cooperate with government bodies and other countries and international organizations on environmental matters	This policy provides a framework for all developmental projects in Nigeria including the proposed Zamfara State SAPZ programme.
2	National Agricultural Technology and Innovation Policy (NATIP).	2022-2027.	NATIP is a 6-year national agricultural policy, incorporating the intervention instruments and implementation strategy, aimed at sustainable development of national technological and innovative capacity to fast-track increased productivity, import substitution, with particular emphasis on the reduction of rice, dairy, meat and fish imports, increased resilience through digital and climate-smart agriculture, towards promoting agricultural value chains and investments. The Policy aims at generating agricultural employment and services, promoting the production and supply of raw materials to agro industries, providing markets for the products of the industrial sector, generating foreign exchange and promoting rural socio-economic development, organizing and managing the agriculture sector and facilitating agribusiness, and therefore increasing Nigeria's agriculture sector and transforming the country into a leading global food market. 1. The Policy identifies the following interventions as specific and targeted to address the challenge of Nigerian agricultural sector: a. strengthening agricultural research and training systems; b. rapid mechanization of the sector and automation of livestock, fisheries, poultry and swine production processes; c. establishment of agricultural development fund; d. livestock development, improving animal genetic resources, creating a functional model of ranches, grazing reserves, promoting the domestic animal production, strengthening the animal and aquatic diseases surveillance system; e. strengthening the value-chains for priority crops: rice and cereals, pulses, vegetables, palm oil, sugar cane;	The NATIP is highly applicable to the proposed SAPZ programme especially as it relates to the agricultural employment of women and youth and strengthening the value chain for priority crops

			f. marine and inland fisheries and aquaculture development, in order to encourage massive fish production and reduce fish importation; g. enhancing security of agricultural land and investments and developing rural infrastructure and water resources, with efficient utilization of reservoirs, dams and waterways to support irrigation, aquaculture, improve water supply and generation of hydro-electric power and reduce land clearing and degradation; h. encouraging the role of women and youth in agriculture.	
3	Agricultural Promotion Policy-The Green Alternative	(APP-2016-2020)	The policy develops the framework for facilitating business alliances, promotion of greater farmers-agri-business linkages, and support for critical infrastructure in the value chain development. The policy thrust promotes climate smart agriculture through the following strategies: • Increasing public awareness on climate smart agriculture; • Improving management of land, water, soil and other natural resources; • Strengthening of Institutional linkages and partnerships for ensuring climate smart agricultural governance, policies, legislations and financial mechanisms; • Conducting Environmental impact assessment on major agricultural programmes; • Promoting the use of renewable energy with the involvement of private sector; • Facilitating the production and use of soil map to improve land use and management practices by the government; and • Promoting the increased adoption of global best practices in handling climate change, including the aspects of adaptation, mitigation and carbon credit by the government.	The proposed Zamfara State SAPZ aligns with the APP as it intends to facilitate business alliances and promote greater farmers-agribusiness-linkages
4	National Gender Policy	*2006*	The goal of the National Gender Policy is to build a just society devoid of discrimination, harness the full potentials of all social groups regardless of sex or circumstance, promote the enjoyment of fundamental human rights and protect the health, social, economic and political well-being of all citizens in order to achieve an equitable rapid economic growth; evolve an evidence based planning and governance system where human, social, financial and technological resources are efficiently and effectively deployed for sustainable development.	The proposed Zamfara State SAPZ aligns with the National Gender Policy as it intends to empower women and youth to participate effectively in agriculture
5	National Policy on Climate Change	*2012*	The strategic goal of the Climate Change policy is to foster low-carbon, high growth economic development and build a climate resilient society through the attainment of the following objectives: • Implementing mitigation measures that will promote low carbon as well as sustainable and high economic growth; • Enhancing national capacity to adapt to climate change; • Raising climate change related science, technology, research, and development to a new level that enables the country to better participate	The proposed Zamfara state SAPZ is aligned with the National Policy on climate change as the programme intends to facilitate climate smart agricultural production and processing practices

			in international scientific and technological cooperation on climate change; • Significantly increasing public awareness and involve private sector participation in addressing the challenges of climate change; and • Strengthening national institutions and mechanisms (policy, legislative and economic) to establish a suitable and functional framework for climate change governance. The policy elaborates on adaptation and mitigation programmes and actions in key sectors including energy, agriculture, water, transport and human settlement.	
Federal Legal/Regulatory Instrument				
1	Environmental Impact Assessment Act, Cap E12,	LFN 2014	This Act sets out the general principles, procedures and methods to enable the prior consideration of environmental impact assessment on certain public or private programmes. It further provides that before a decision is taken to undertake or authorize the undertaking of any activity, those matters that may likely or to a significant extent affect the environment or have an environmental effect on those activities shall first be taken into account. There are nineteen thematic areas of mandatory study activities. The drivers of deforestation and forest degradation for which mandatory study is required include: agriculture, infrastructure, logging and conversion of forest to other land use, mining and housing. Environmental sensitivity and the area coverage of a programme are some of the criteria for an EIA	The EIA act is applicable to the proposed Zamfara State SAPZ programme
2	The National Guidelines and Standards for Environmental Pollution Control in Nigeria	1991	These represent the basic instrument for monitoring and controlling pollution in Nigeria	The National Guidelines and Standards for Environmental Pollution Control is applicable to the proposed Zamfara State SAPZ programme
3	National Guidelines on Environmental Management Systems	*(1999)*	This establishes the requirements for an Environmental Management System (EMS) in all organizations/facilities in Nigeria.	The National Guidelines on Environmental Management Systems is applicable to the proposed Zamfara State SAPZ programme
4	National Air Quality Standard Decree No. 59	*1991*	This defines the levels of air pollutants that should not be exceeded in order to protect public health.	The National Air Quality Standard Decree No. 59 is applicable to the proposed Zamfara State SAPZ programme
5	The National Environmental Standards and Regulations Enforcement Agency Act	*2007*	This makes provision for solid waste management and its administration and prescribes sanctions for offences or acts, which run contrary to proper and adequate waste disposal procedures and practices.	The NESREA Act is applicable to the proposed Zamfara State SAPZ programme

	(NESREA Act)			
6	Child Rights Act	*2003*	This Act serves as the legal documentation and protection of Children rights and responsibilities in Nigeria. It also serves as the legislation against Human trafficking since it forbids children from being "separated from parents against their will, except where it is in the best interests of the child.	The Child Rights Acts is applicable to the proposed Zamfara State SAPZ programme
7	Employee's Compensation Act	*2010*	This Act make provisions for compensations for any death, injury, disease or disability that could arise out of or in the course of employment; and for related matters.	The Employee's compensation act is applicable to the proposed Zamfara State SAPZ programme
8	Land Use Act	*1978 Modified 1990*	This is the primary legal means to acquire land in the country. The Act vests all land in the territory of each State in the federation in the Governor of the State and requires that such land shall be held in trust and administered for the use and common benefit of all Nigerians in accordance with the provisions of this Act	The Land Use Act is applicable to the proposed Zamfara State SAPZ programme
9	Criminal Code		The Nigerian Criminal Code makes it an offence punishable with up to 6 months imprisonment for any person who: • violates the atmosphere in any place so as to make it noxious to the health of persons in general dwelling or carry-on business in the neighbourhood, or passing along a public way: or • engages in any act which is, and which he knows or has reason to believe to be likely to spread the infection of any disease dangerous to life, whether human or animal.	The criminal code is applicable to the proposed Zamfara State SAPZ programme
10	Endangered Species Act	1985	This provides for conservation and management of wild life in Nigeria and the protection of some of her endangered species from extinction as a result of over exploitation.	The endangered species act is applicable to the proposed Zamfara State SAPZ programme
11	FEPA/ FMEnv. EIA Procedural guidelines	1995	These indicate the steps to be followed in the EIA process throughout programme life cycle.	The EIA guidelines is applicable to the proposed Zamfara State SAPZ programme
12	S115 National Environmental Protection (Management of Solid and Hazardous Wastes Regulations)	1991	Regulates the collection, treatment, and disposal of solid and hazardous waste for municipal and industrial sources and give the comprehensive list of chemicals and chemical waste by toxicity categories	The Management of Solid and Hazardous Wastes Regulations is applicable to the proposed Zamfara State SAPZ programme
13	S19 National Environmental Protection (Pollution Abatement in Industries and Facilities	1991	These are the imposed restrictions on the release of toxic substances and requirements of Stipulated Monitoring of pollution to ensure that permissible limits are not exceeded during and after the programme.	The Pollution Abatement in Industries and Facilities Generating Waste) Regulations is applicable to the proposed Zamfara State SAPZ programme

	Generating Waste) Regulations)			
14	S18 National Environmental Protection (National Effluents Limitations Regulation)	1991	This makes it mandatory for industrial facilities to install anti-pollution equipment. It also makes provision for further effluent treatment, prescribe maximum limit of effluent parameters allowed for discharge, and spells out penalties for contravention.	The National Effluents Limitations Regulation is applicable to the proposed Zamfara State SAPZ programme
15	Workmen Component Act	1987 Revised 2010	This provides for occupational health and safety.	The workmen component act is applicable to the proposed Zamfara State SAPZ programme
16	Violence Against Persons (Prohibition) Act	2015	The Act becomes necessary as a result of agitations for protection of persons against different forms of violence. The Act strengthens advocacy against rape, female genital mutilation, partner battery, stalking, harmful widowhood practices while prohibiting all forms of violence, including physical, sexual, psychological, domestic, harmful traditional practices and discrimination against persons. It also provides maximum protection and effective remedies for victims and punishment of offenders. The Act is a key instrument for addressing GBV in Nigeria.	The violence against persons act is applicable to the proposed Zamfara State SAPZ programme
Federal Institutional Framework				
1	The Federal Ministry of Environment (FMEnv)		The FMEnv is the government agency charged with the responsibility to administrate and enforce environmental laws in Nigeria. The FMEnv prohibits public and private sectors from embarking on major developmental programmes or activities without due consideration, at early stages, for environmental and social impacts. In addition to the EIA Act, the Ministry has produced sectorial including sectorial guidelines on infrastructure development which will be duly considered in the implementation of this programme	The FMEnv is responsible for overseeing all development projects in Nigeria including the proposed Zamfara state SAPZ to ensure their sustainability
2	Federal Ministry of Agriculture and Food Security		The Federal Ministry for Agriculture and Food Security has the responsibility of optimizing agriculture and transformation of the Nigerian economy, with a view to attaining food security and positioning Nigeria as a net food exporter for socio-economic development.	The FMAFS has the sole responsibility of mainstreaming the proposed Zamfara state SAPZ
Zamfara State Legislations				
1	Zamfara Environmental Sanitation Agency (ZESA) Law	No. 22, 2010	The law authorizes the agency to: i. Collect and dispose of both wet and dry refuse (solid and liquid) including human waste. ii. Control of industrial waste (liquid emission) and air pollution. iii. In consultation with FEPA ensure implementation and enforcement of FEPA's regulations in the state where applicable.	The law is applicable to the implementation of the proposed SAPZ in Zamfara state

		iv. Collaborate with the FEPA in conducting public investigation of measure environmental pollution. v. Cooperate with federal and state ministries, local government council's statutory bodies, research and educational institutions on matters related to environmental protection. vi. In collaboration with FEPA, conduct public investigation and pollution.	
Zamfara State Institutional Framework			
1	Zamfara State Ministry of Agriculture	• The Ministry is responsible for formulating and implementing policies, projects and programmes of the government for the development of the agricultural sector and to monitor the implementation of the following policy objectives: o Attainment of self-sufficiency in the essential food products for enhanced food security. o Increase production of Agricultural raw material to meet the growing demand in the agro-allied industries. o Increase in production of exportable products to attract foreign exchange earnings for the State. o Modernization of agricultural production, processing, storage and distribution through the infusion of improved technological packages and management so that agriculture can be more expensive to the demands of other sectors of the economy. o Create more agricultural and rural employment opportunities and improve the living standards of farmers and rural dwellers through enhanced income. o Protection and improvement of Agricultural Land resources and safety of the environment through appropriate farming systems. o Establish formal support institutions and operation of administrative organs to facilitate the integrated development and realization of the State's agricultural potentials. o Train and retrain and enlightened human resource stock to make agriculture a business and not a hobby.	Zamfara state SAPZ will be domiciled within the Zamfara State Ministry of Agriculture and Natural Resources and thus be implemented by the ministry
2	Zamfara State Ministry of Environment and Natural Resources	• Zamfara State Ministry of Environment and Natural Resources was created with the statutory responsibility to attend to issues of water supply, ecological and environmental challenges. The Ministry manages both human and industrial waste, protects and conserve the environment, and enforces laws on the environment in the State. • The Ministry undertakes the following core functions: o Public Health and Sanitation does monthly sanitation exercise early Flood warning system monitoring. o Urban Renewal executes the following installation of directional signs.	The Zamfara State Ministry of Environment is responsible for overseeing all development projects in Zamfara state including the proposed Zamfara state SAPZ to ensure its sustainability

		o Environmental impact assessment (EIA). o Beautification and greening of major streets. o Waste Management Waste management and recycling plant. o Collaboration with private service providers, PSPs for effective waste management. o Direct Town cleaning (DTC).	
3	Zamfara Environmental Sanitation Agency (ZESA)	• Zamfara Environmental Sanitation Agency is an agency charged with the responsibility of waste collection, pollution control, Inspection and enforcement of environmental laws, streets and drainage evacuation	ZESA is the implementation arm of the ministry of environment and directly involved in the SAPZ programme to ensure its sustainability

Source: Desk review, March 2024

2.2 Development Financial Institutions (DFIs) Environmental and Social Requirements

The commitments of DFIs to Environmental and Social Governance in programme financing are embedded in the developed standards known as the safeguards policy. These standards include the ISS of the African Development Bank and the World Bank ESS, among others.

2.2.1 Integrated Safeguards System (ISS) of the African Development Bank (AfDB) Triggered by SAPZ Programme in Zamfara State

The Environmental and Social safeguards of the AfDB are the cornerstone of the Bank's support for inclusive economic growth and environmental sustainability in Africa. The AfDB will apply the Integrated Safeguards System for the proposed Zamfara SAPZ programme. The Bank ISS is designed to promote the sustainability of programme outcomes by protecting the environment and people from the potentially adverse impacts of programmes. This requires that all the activities under the programme will comply with the safeguard requirements of the ISS during programme preparation and implementation. The safeguards aim to:

1. Avoid adverse impacts of programmes on the environment and affected people while maximizing potential development benefits to the extent possible;
2. Minimize, mitigate, and/ or compensate for adverse impacts on the environment and affected people when avoidance is not possible;
3. Help borrowers/clients strengthen their safeguard systems and develop the capacity to manage E&S risks.

The ISS consists of four inter-related components, which include:

1. Integrated Safeguards Policy Statement
2. Operational Safeguards
3. ESAP revised procedures
4. Guidance

The Operational Safeguards (OSs), which are a set of five safeguard requirements that the Bank's clients are expected to meet when addressing social and environmental impacts and risks, are of particular interest. The Bank's staff use due diligence, review, and supervision to ensure clients comply with these requirements during programme preparation and implementation. As necessary, the Bank may adopt additional safeguard requirements or update existing requirements to enhance effectiveness, respond to changing needs, and reflect evolving best practices.

The five OSs were designed to:

1. better integrate considerations of E&S impacts into Bank operations to promote sustainability and long-term development in Africa;
2. prevent programmes from adversely affecting the environment and local communities or, where prevention is not possible, minimize, mitigate and/or compensate for adverse effects and maximize development benefits;
3. systematically consider the impact of climate change on the sustainability of investment programmes and the contribution of programmes to global greenhouse gas emissions;

4. delineate the roles and responsibilities of the Bank and its borrowers or clients in implementing programmes, achieving sustainable outcomes, and promoting local participation;
5. assist regional member countries and borrowers/clients in strengthening their safeguards systems and their capacity to manage E&S risks.

Table 2.2 provides the AfDB Operational Safeguard Policies triggered by the SAPZ and those applicable to the Zamfara State Special Agro-Industrial Processing Zone (SAPZ) Programme sites.

Table 2.2: AfDB Operational Safeguard Policies Applicable to Zamfara State-SAPZ Programme

Operational Safeguards	Description	Applicability to the proposed Zamfara State SAPZ programme	
		Yes	No
OS 1: Environmental and social assessment	This overarching safeguard governs the process of determining a programme's environmental and social category and the resulting environmental and social assessment requirements	[x]	[]
OS2: Involuntary Resettlement: Land Acquisition, Population Displacement and Compensation	This safeguard consolidates the policy commitments and requirements set out in the Bank's policy on involuntary resettlement and incorporates a few refinements designed to improve the operational effectiveness of those requirements	[x]	[]
OS 3: Biodiversity and Ecosystem Services	This safeguard aims to conserve biological diversity and promote the sustainable use of natural resources. It also translates the commitments in the Bank's policy on integrated water resources management into operational requirements.	[x]	[]
OS 4: Pollution Prevention and Control, Greenhouse Gases, Hazardous Materials and Resource Efficiency	This safeguard covers the range of key impacts of pollution, waste, and hazardous materials for which there are agreed international conventions, as well as comprehensive industry specific and regional standards, including greenhouse gas accounting, that other multilateral development banks follow	[x]	[]
OS 5: Labour Conditions, Health and Safety	This safeguard establishes the Bank's requirements for its borrowers or clients concerning workers' conditions, rights and protection from abuse or exploitation. It also ensures greater harmonization with most other multilateral development banks	[x]	[]

Source: Desk review, March 2024

2.2.2 World Bank Operational Safeguard Policies Triggered by SAPZ Programme in Zamfara State

The World Bank Environmental and Social Standards are the cornerstones of the Bank's support for sustainable poverty reduction. The main objective of these policies is to prevent and mitigate undue harms to people and their respective environment during or as a result of the developmental processes. These policies also provide the guidelines for the Bank and the borrower staff in the identification, preparation and implementation of programmes.

Table 2.3 provides the World Bank Operational Policies triggered by SAPZ and those applicable to Zamfara State Special Agro-Industrial Processing Zone (SAPZ) Programme sites.

Table 2.3: World Bank Environmental and Social Standards Applicable to Zamfara State-SAPZ Programme

Environmental and Social Standards (ESS)	Description	Applicability to the proposed Zamfara State SAPZ programme	
		Yes	No
ESS1: Assessment and Management of Environmental and Social Risks and Impacts	This overarching standard sets out the Borrower's responsibilities for assessing, managing and monitoring E&S risks and impacts associated with each stage of a programme supported by the Bank through Investment Project Financing, in order to achieve E&S outcomes consistent with Bank's ESS.	[x]	[]
ESS 2: Labour and Working Conditions	ESS 2 recognizes the importance of employment creation and income generation in the pursuit of poverty reduction and inclusive economic growth. Borrowers can promote sound worker-management relationships and enhance the development benefits of a programme by treating workers in the programme fairly and providing safe and healthy working conditions	[x]	[]
ESS 3: Resource Efficiency and Pollution Prevention and Management	ESS 3 recognizes that economic activity and urbanization often generate pollution to air, water, and land, and consume finite resources that may threaten people, ecosystem services and the environment at the local, regional, and global levels	[x]	[]
ESS 4: Community Health and Safety	ESS 4 stipulates that programme activities, equipment, and infrastructure can increase community exposure to risks and impacts. In addition, communities that are already subjected to impacts from climate change may also experience an acceleration or intensification of impacts due to programme activities.	[x]	[]
ESS 5: Land Acquisition, Restrictions on Land Use and Involuntary Resettlement	ESS 5 stipulates that programme-related land acquisition and restrictions on land use can have adverse impacts on communities and persons. This may cause physical or economic displacement.	[x]	[]
ESS 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources	ESS 6 recognizes that protecting and conserving biodiversity and sustainably managing living natural resources are fundamental to sustainable development.	[x]	[]
ESS 7: Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities	This ESS applies to a distinct social and cultural group identified as "Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities, indigenous ethnic Minorities etc."	[]	[x]

ESS 8: Cultural Heritage	ESS8 sets out measures designed to protect cultural heritage throughout the programme life cycle.	[x]	[]
ESS 9: Financial Intermediaries	This ESS applies to Financial Intermediaries (FIs) that receive financial support from the Bank	[]	[x]
ESS 10: Stakeholder Engagement and Information Disclosure	This ESS recognizes the importance of open and transparent engagement between the Borrower and programme stakeholders as an essential element of good international practice.	[]	[x]

Source: Desk review, March 2024

2.2.4 International Conventions and Agreements

Several international regulations, protocols, treaties and conventions have been signed by countries of the World. The conventions are aimed at halting environmental degradation and protecting human health against possible adverse effects. As should be expected, Nigeria subscribes to a number of these International Regulations and Conventions that are related to Environmental Protection. Table 2.4 shows some of the international conventions, agreements and protocols to which Nigeria is signatory and which are applicable to the Zamfara State Special Agro-Industrial Processing Zone (SAPZ) Programme sites.

Table 2.4: International Conventions, Agreements and Protocols to which Nigeria is Signatory and Applicable to the proposed Zamfara State Special Agro-Industrial Processing Zone (SAPZ) programme

International conventions, agreements and protocols	Applicable to SAPZ		Reasons for their Applicability to SAPZ programme
	Yes	No	
Both the Vienna convention for the protection of the Ozone Layer and the Montreal protocol for Control of Substances that deplete the ozone layer.	[x]	[]	Agricultural works may extend to the forest area. There will be a reduction in tree taxonomy and biomass leading to reduction in carbon sink and release of ODS gasses. Some of the crops may also be emitting or when burnt transmit ODS substances
Basel convention on the prevention of trans-boundary movement of hazardous wastes and their disposal.	[x]	[ ]	Hazardous chemical might be used as pesticides
Convention on the prevention of the international trade in endangered species (CITES).	[]	[x]	No endangered species(s) of any kind was identified in the programme area.
Convention on Biodiversity.	[x]	[]	Agricultural activities may extend to forest area. This will disturb biodiversity in the area.
Convention on climate change.	[x]	[]	Proposed activities will result in both systemic and cumulative environmental change; thereby contributing to a sustained increase in temperature.
Convention on Desertification.	[x]	[]	Proposed activities may result in deforestation.
Convention on Persistent Organic Pollutants.	[x]	[ ]	Organic pollutant may be used for agricultural activities.

World Health Organization (WHO) Health and Safety Component of EIA, 1987.	[x]	[]	Proposed activities may be injurious to man and the environment

Source: Desk review, March 2024

2.3 Institutional Framework

The proposed Zamfara State SAPZ Programme will involve many federal and State ministries, departments and agencies (MDAs), local governments, communities, and civil society. This is because a practical implementation of programmes requires inter-ministerial coordination, collaboration, and information sharing at all levels of government. Thus, each component, sub-component and activity will be implemented through the relevant federal and State MDAs. The various MDAs include those responsible for agriculture, planning, economy and finance, works, environment and water resources. Although the investments for the Zamfara State Special Agro-Industrial Processing Zone (SAPZ) Programme are made through the Zamfara State Implementing Unit (YSPIU), the Zamfara State government is primarily responsible for land management and land allocation for agricultural purposes.

The Federal Ministry of Agriculture and Food Security (FMAFS) is the lead implementing agency for the SAPZ Programme. The National Coordinating Office, headed by a National Coordinator and hosted by the FMAFS, is responsible for the overall coordination of the programme. The Zamfara State Programme Implementing Unit (YSPIU), headed by the State Programme Coordinator and hosted by the Zamfara State Ministry of Agriculture, will coordinate Zamfara State. Thus, the Zamfara State-PIU is directly responsible for coordinating the activities of the Zamfara State Special Agro-Industrial Processing Zone (YSAPZ) Programme, including implementing this ESIA. The federal and State level coordinating units have environmental officers who take responsibility for mainstreaming environmental issues into the SAPZ sub-programmes.

CHAPTER THREE

PROJECT DESCRIPTION AND ALTERNATIVES

This chapter provides a detailed description of the existing conditions under the proposed Zamfara state SAPZ programme.

3.1 Location of the Proposed SAPZ Programme

Zamfara is one of the seven states that form the North-West geopolitical zone of Nigeria. With an area of 38,418 square kilometres, it is bordered in the North by Niger republic, to the South by Kaduna State. In the east it is bordered by Katsina State and to the West by Sokoto and Niger States. It has a population of 3,278,873 according to the 2006 census and a projected population of 5,833,500 for 2022 (NBS, 2012) and contains fourteen local government areas. It lies within latitude 10º 50`N and 13º 38`N and longitudes 4º 16`E and 7 º 18`E (Fig. 3.1). Gusau is the state capital.

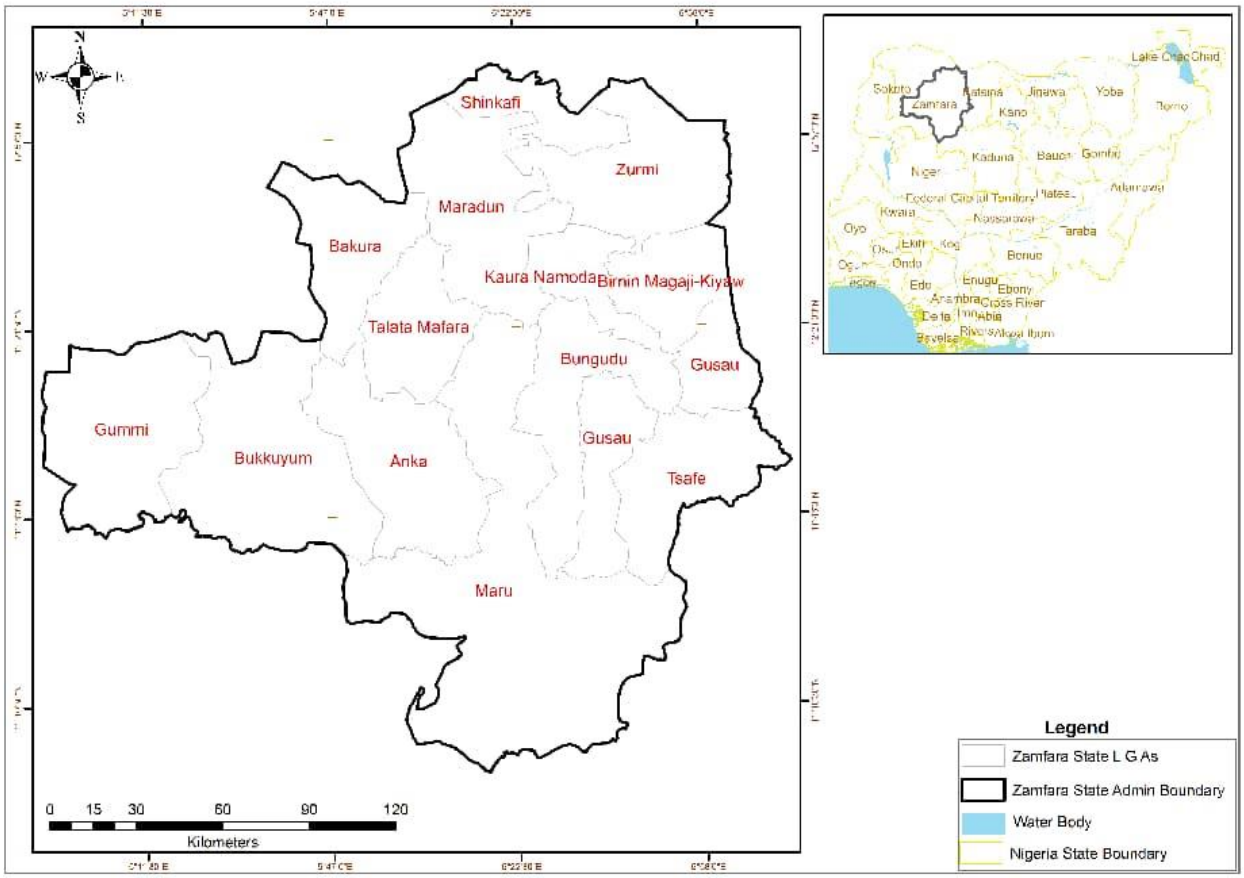


Fig. 3.1: Nigeria depicting Zamfara State

As shown in Fig. 3.2, administratively, the State is sub-divided into fourteen (14) local government areas (LGAs).

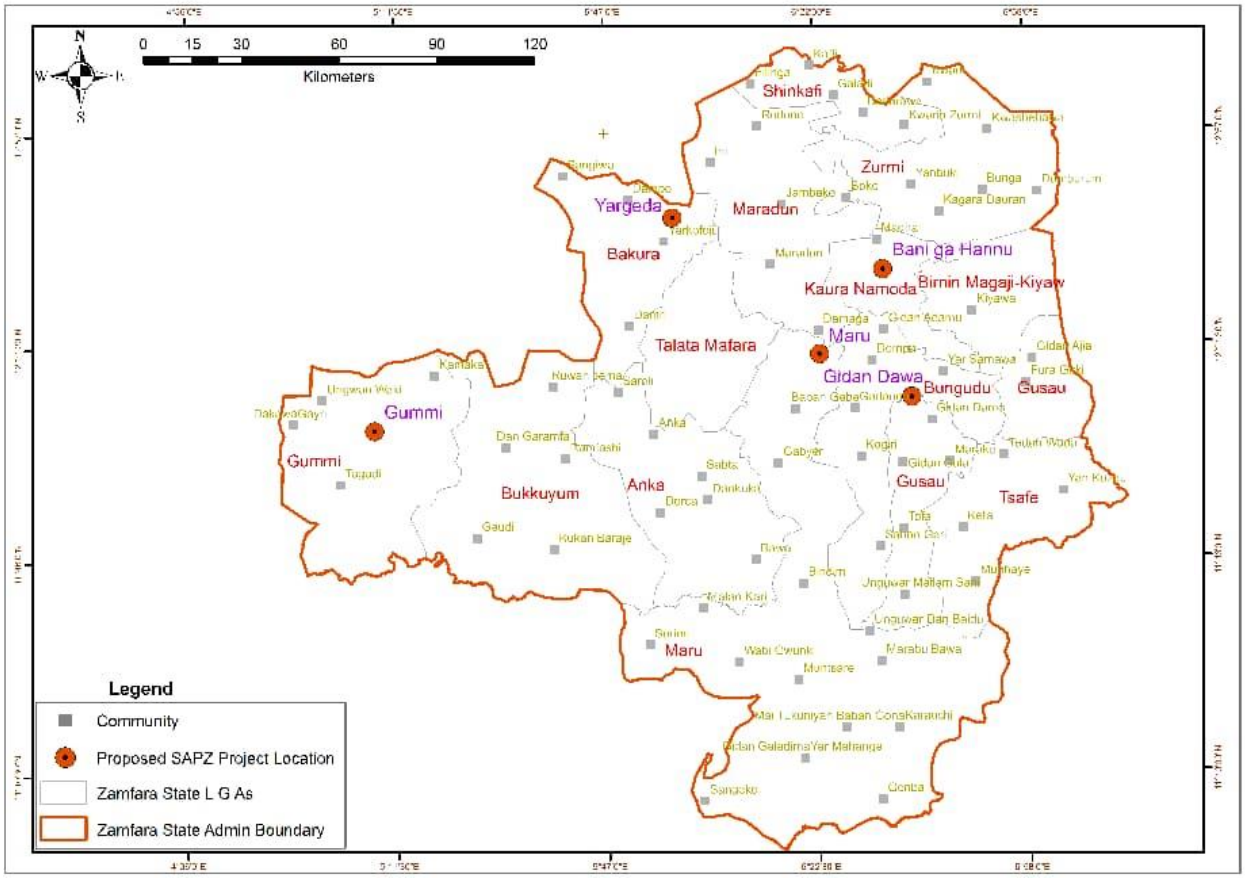


Fig. 3.2: Zamfara State with the LGAs

Zamfara state was created in 1996. Until 1996 the area was part of Sokoto State. Zamfara is peopled by Hausa and Fulani's. Major groups of people include the Zamfarawa mainly Anka, Gummi,Bukkuyum and Talata Mafara Local Governments areas. Gobirawa peopled Shinkafi Local Government. Gobirawa actually migrated from the Gobir Kingdom. Burmawa are found in Bakura and Fulani peopled Bungudu, Maradun, Gusau and are scattered all over the State. In Tsafe, Bungudu and Maru Local Governments are mainly Katsinawa, Garewawa and Hadejawa. While Alibawa peopled Kaura Namoda and Zurmi.

The area today called Zamfara state was one of the old Hausa city-states like Kano, Katsina, Gobir, Kabi and Zazzau. It extends up to the bend of River Rima to the North West and River Ka in the south west. Zamfara Kingdom was established in the 11th century and flourished up to 16th century as a city-state. Its capital has shifted with the fortunes of the kingdom from place to place like Dutsi and Birnin Zamfara. In the first half of the 18th century, its then capital Birnin Zamfara, was destroyed by the Gobir Kingdom and a new capital was established in Anka by the second half of the 19th century. Zamfara had many centers of commerce and scholarship that attracted many scholars like the Yandoto city. It became part of the Sokoto Caliphate after the 1804 jihad by Usman dan Fodio. In fact, Usman Danfodiyo settled in Sabon Gari where Sarkin Zamfara Abarshi had already established a garrison headquarters during the early days of his Jihad as a base from where fought Gobir and Kabi.

At the wake of British colonialism, the emerging town of Gusau became an important commercial and administrative center with road and rail networks passing through it. With the creation of States during the Gowon Administration, Zamfara Kingdom became part of the then North West State and later Sokoto State.

3.2 Proposed Value Chains and Sites

Over 90% of Zamfara State's population is engaged in agriculture; hence, "Farming is our pride" is the state's official slogan. The state produces agricultural commodities such as Millet, Sorghum, Rice, Maize, Cotton, Wheat, Groundnuts, Cowpeas, Soybeans, Sweet Potatoes, Cassava, Yam, Cocoyam, Vegetables, and Hide and skin.

The technical session with representatives of the Zamfara State Ministry of Agriculture, Ministry of Environment and Natural Resources, International Fund for Agricultural Development, Agricultural Development Project and farmers from across the state revealed that the following agricultural practices are carried out in Zamfara state (Table 3.1).

Table 3.1 Agricultural practices in Zamfara State

S/No.	Proposed Site CSF	Value Chain	LGA	Community	Latitude	Longitude
1.	Gusau	Rice, Sorghum,	Gusau	Gidan Dawa	12º21'N	6º64'E
2.	Bungudu	Rice, Sorghum,	Bungudu	Bungudu – Area development office	12º28'N	6º58'E
3.	Bungudu	Rice, Sorghum,	Bungudu	Bungudu – Farm service center	12º27'N	6º56'E
4.	Maru	Rice,	Maru	Maru – Farm service center	12º26'N	6º56'E
5.	Gusau/Damba	Rice,	Gusau	Damba – Farm center	12º15'N	6º75'E
6.	Gusau	Cotton,	Gusau	Gusau – Industrial layout	12º15'N	6º68'E
7.	Bakura	Rice, wheat, maize, cassava, sweet potato, onions	Bakura	Birnin Tudu – Warehouse	12º65'N	6º05'E
8.	Bakura	Rice, wheat, maize, cassava	Bakura	Yargeda – Talata Marafa	12º58'N	6º00'E
9.	Gumil	Rice, maize, sorghum, soybean, sweet potato, onions, cassava, cowpea, calabash, water melon	Gumil	Gumil	12º13'N	5º13'E
10	Kaura-Namoda	Maize Sorghum, Cowpea, Groundnut	Kaura Namoda	Banigahannu	12º 34'N	6 º 34'E
11	Magazu	Maize Sorghum, Cowpea, Wheat Groundnut	Tsafe	Magazu	11 º 54'N	6 º 57' E

Source: Field survey, March 2024

Based on the resolution of the technical session, the following value chains were selected due to Zamfara state's comparative advantage in their cultivation and processing:

1. Cotton

2. Rice

3. Wheat

4. Soyabeans

5, Maize

The Zamfara state government thus resolved through the Ministry of Agriculture and other relevant stakeholders that these value chains should be prioritized. The following proposed sites were selected for the different value chains and building blocks for the Zamfara State SAPZ programme (Table 3.2). The Hub and Agricultural Transformation Centers (ATCs) were selected based on their geographical locations, comparative advantage, and ownership.

Table 3.2: Proposed Sites for the location of the AIH and ATCs

SN	LOCATION	STATUS	LGA	AGGREGATION CENTERS (to feed the ATCs)
1	Gidan Dawa	HUB	Gusau	Damba
				Bungudu
				Maru
				Magami
2	Yargeda	ATC	Bakura	Birnin Tudu
				Maradun
				Jangebe
3	Gummi	ATC	Gummi	Anka
				Nasarawa Burkullu
4	Bani ga hannu	ATC	Kaura Namoda	Shinkafi
				Kyambarawa
				Moriki
5	Maru	ATC	Maru	Bungudu
				Kanoma
				Nahuce

Source: Field survey, March 2024
Agro-Industrial Hub (AIH); Agricultural Transformation Centres (ATCs)

3.3 Description of Proposed Sites

3.3.1 Gidan Dawa - Agro-Industrial Hub (AIH)

Gidan Dawa is the choice for AIH. This choice was made due to the existing facilities at the proposed centre. This choice was also facilitated by facilities around site that could enhance the smooth operation of activities in and around the hub (Figs. 3.3 & 3.4).

As inspected, the current owner of the proposed facilities is the Zamfara state Government, which is willing to rescind the structures from any current use or users and concede them to SAPZ to ensure the successful implementation of the program in the state.

The inspection revealed warehouses. Five strips of large warehouses have a capacity of 6000 tons, culminating in a collective capacity of 30,000 tons of agricultural produce that can be aggregated at these centres. However, some of these structures have worn-out roofs that leak rain, dilapidated walls, and slightly rusty roller shutter doors, which could all be fixed back to shape when operation commences.

The facility is within Gusau town. It has surrounding roads, which are major trunk roads and other service roads, making transportation and commuting of goods and personnel easy. It also has a site for the proposed inland dry port, which would be an additional advantage for transporting commodities in and out of the state. These roads are all in good condition, well-tarred and not more than 200m for the facility. There was also a rail line that was about 300m away from the facility. It is the rail line that connects Zamfara to Kano to Nguru. When functional again, it can be an easy alternative to haul agricultural produce to other states.

There is an electricity supply to the facility, though service cables were not physically seen during the inspection. An 11kVA power line from the national grid was seen to power buildings around the facility through step-down transformers. It was reported that an independent power source is currently used by a fertilizer blending plant close to the inspected facility. These can be consolidated when the hub is operational.

The primary utility considered in this case was water. It was reported that there are water-yielding aquifers in and around the facility, which was confirmed by some boreholes seen within the facility. Though such boreholes were manually powered, the facility can be improved by making it a solar-powered one when operation is about to commence.

The facility's security was reported to be very good, as it is located inside Gusau town. Security guards employed by the Zamfara State Government watch over the facility, and their efforts are complemented by those of private vigilantes hired by the community. This is an indication that goods and personnel are secured when SAPZ becomes operational in this facility.

There is a skill acquisition centre about 150m away from the facility. The centre entirely operates and engages youths and women in different skills. Also, a fertilizer blending plant is about 1km from the facility. It is also operational and produces fertilizers for the state's agrarian community. The collection of these extra facilities is an expedient advantage for the choice of this AIH and is expected to facilitate the hub's activities and complement those around it. Moreover, schools and healthcare facilities were reported to be within 500 m of the facility.

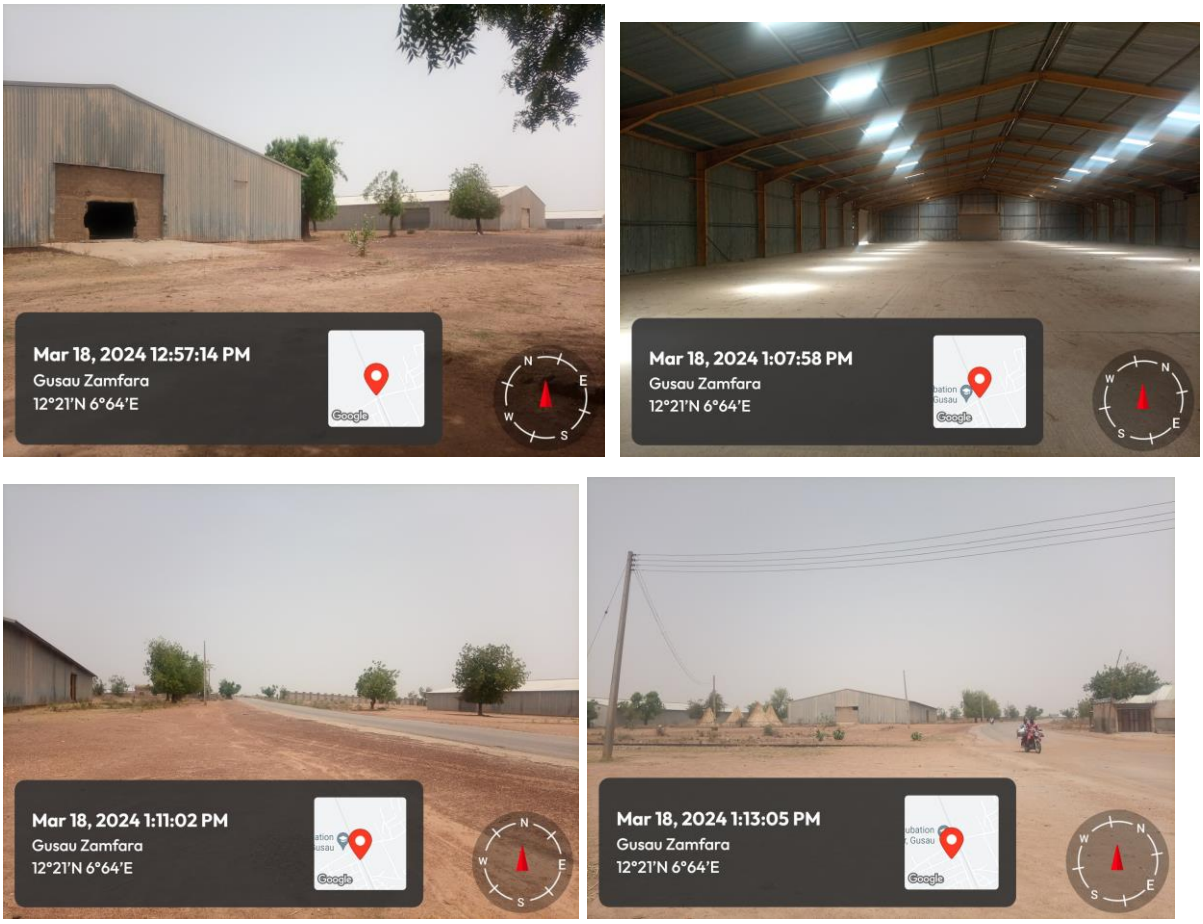


Figure 3.3: Pictures of the available facilities at the proposed AIH at Gidan Dawa

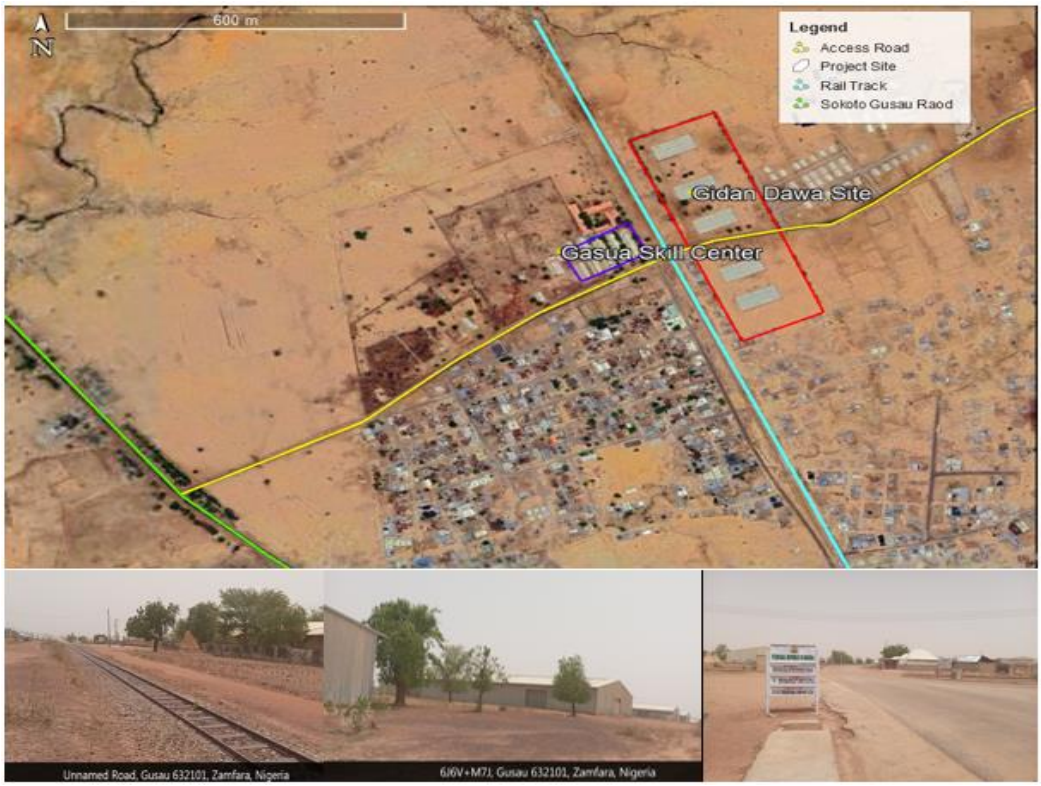


Figure 3.4: Satellite imagery depicting Gidan Dawa AIH and existing facilities

3.3.2 Yargeda – Talata Mafara (ATC)

Yargeda is a town in Talata Mafara. It was selected as an ATC due to its advantage as a significant agrarian community. The proposed facility's current owner is the Zamfara State Government.

The facility's structures include four warehouses and training centres attached to offices. The warehouses have a combined capacity of 3600 tons. These facilities were seen to be dilapidated, especially the training centre and the adjoining offices. However, slight renovation of the warehouses, training centres, and offices will bring them into shape and make them ready for use before the project commences (Figs. 3.5 & 3.6).

The facility is accessible, with major and service roads that ease commuting in and out. The major road is an express (Trunk A) road that is well-tarred and in good condition, while the service roads are in good condition, though not tarred.

The national grid, supplied by Kaduna Electricity Company (KADCO), provides power for the facility and its surrounding communities. An 11kVA power line traverses the area, indicating the power source that serves the facility and its communities.

There is a dam about 500m away from the facility, with irrigation channels about 150m away. Also, boreholes were seen around the facility, which provides drinking water to the community.

The facility was reported to be secure due to some security men engaged to watch over it. However, the security around the community was reported to be poor. There are arrangements

for vigilante men and communal security of lives and property during some regular night watch.

It was reported that schools and healthcare facilities were within 350 m of the facility.

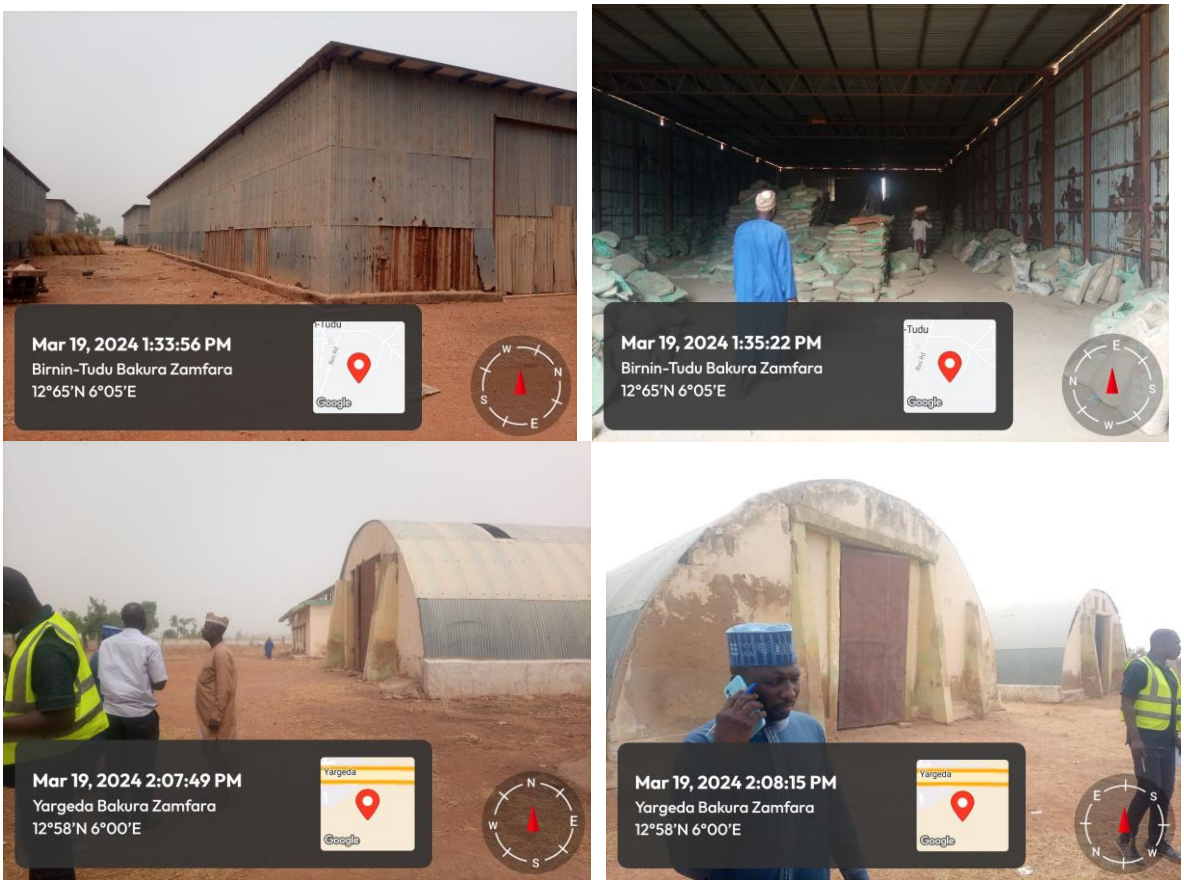


Figure 3.5: Pictures of the available facilities at the proposed ATC at Yargeda – Talata Mafara

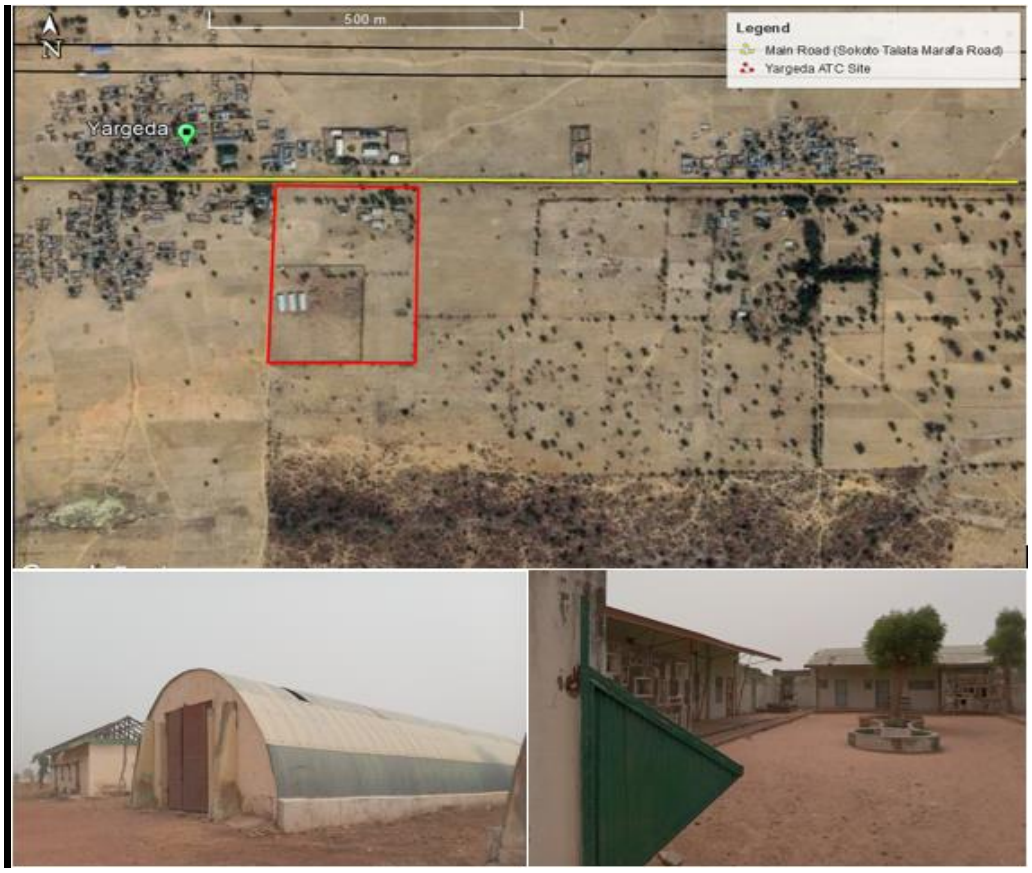


Figure 3.6: Satellite imagery depicting Yargeda ATC Site and existing facilities

3.3.3 Gumil (ATC)

Gumil is a town away from the capital city (Gusau). It is an enriched agrarian community that thrives in crops like tomatoes, sugarcane, pepper, and watermelon, to mention a few. Its choice of ATC was guided by its location advantage and some prominent infrastructures available in and within the facilities.

The proposed facility is owned by the Zamfara State Government, which has expressed its willingness to release these structures for a smooth take-off of the SAPZ in the state.

During the visit, the primary on-site structures were warehouses/stores, training centres, offices and staff quarters. The warehouses are 3 with an individual capacity of 1500 tons, totalling 4500 tons. This implies that 4,000 tons of agricultural produce can be stored in these warehouses over time. The offices can coordinate the activities around the centre, and the staff quarters can accommodate some staff, truck drivers and other personnel working there (Figs. 3.7 & 3.8).

The major (Trunk A21) road leading into the community passes in front of the facility (not more than 70m) away. The road is in good condition and well-tarred with coal tar. The service road leads into the facility. It is not tarred but in good condition, easing vehicular movement.

It was observed that there were 33kVA and 11kVA power lines of the national grid within the community. The availability of a 33kVA power line within the facility indicates that power

utilization can be greatly expanded for all sorts of agricultural machines and equipment with just a 33kVA stepdown transformer.

There were reported cases of boreholes in the facility, indicating sufficient groundwater. However, there is a river source about 1.5km away from the facility where farmers around the facility and the community use it for irrigation purposes. Surface irrigation, that is, pumping the water using a pumping machine, is a common trend for effectively utilizing the river.

The facility's security is placed in the hands of the security men employed to watch over the facility, making the facilities secure. The security around the facility and Gumil town were reported to be fair. The security situation is expected to improve when the ATC become operational.

Schools and healthcare facilities were reported to be within 200 m of the facility.

Figure 3.7: Pictures of the available facilities at the proposed ATC at Gumil

Figure 3.8: Satellite imagery depicting ZADP Gummi ATC Site and existing facilities

3.3.4 Banni ga Hannu – Kaura Namoda (ATC)

The proposed facility is currently owned by the Zamfara State Government. Warehouses with offices and staff quarters are available at the facility (Figs. 3.9). Although they were seen to be dilapidated, they can be renovated to standard before the kick-off of the SAPZ activities.

There are trunk A and service roads, which make accessibility and movement within and around the facility easy. Both roads are in good condition and allow for the commuting of goods and services.

A national grid of 33 and 11 kVA from KADECO was seen around the facility. It supplies the community, and relatively stable electricity is also reported.

Groundwater supplies water through the borehole facility around the facility. The boreholes seen were manually powered but can be upgraded to solar-powered before or during the commencement of the state SAPZ.

The security situation was reported to be good in the facility and the community, ensuring the safety of lives and property when the project commences.

The expanse of land where other facilities are reported to be available and at an advantage of the ATC when it is fully operational. Schools and healthcare facilities were also reported to be within 250 m of the facility.

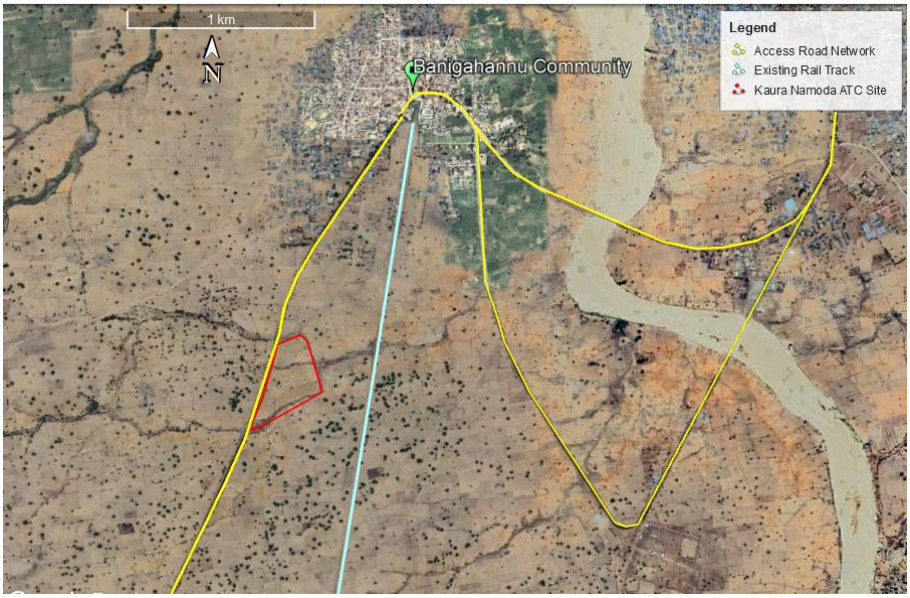


Figure 3.9: Satellite imagery depicting proposed Banigahannu ATC Site and existing facilities

3.3.5 Maru (ATC)

Maru is a community close to the state capital (Gusau). It is central and relatively developed, with fantastic accessibility, power, and security. The current ownership of the proposed facility is Zamfara State Government. There are warehouses/stores and silos found on the facility when inspected. The silos found were three (3) in number with an average capacity of

5,000 tons each which amounts to 15,000 tons (Figs. 3.10 & 3.11). The warehouses/stores are dilapidated but can be restored to functional use when SAPZ is ready to commence.

All roads leading to the proposed site are well-tarred and in good condition. However, it is surrounded by buildings, which might make it slightly difficult for trucks to manoeuvre. A national grid of 11kVA from KADECO was seen to supply power to the facility and its environs. Power availability will undoubtedly enhance the activities at the facility when SAPZ eventually commences. Around the facility, boreholes, both manually and solar-powered, are visible. The availability of such boreholes indicates a water source in an underground aquifer.

The security in and around the proposed facility is good. Individuals, communities, and governments collectively work to secure the lives and property of the community.

There is an adjoining facility about 800m from the main facility. These facilities are inside the market square and include drying slabs, a weighing house, and an aggregation centre. These facilities are an added advantage for the ATC. Moreover, schools and healthcare facilities were reported to be within 150 m of the facility.

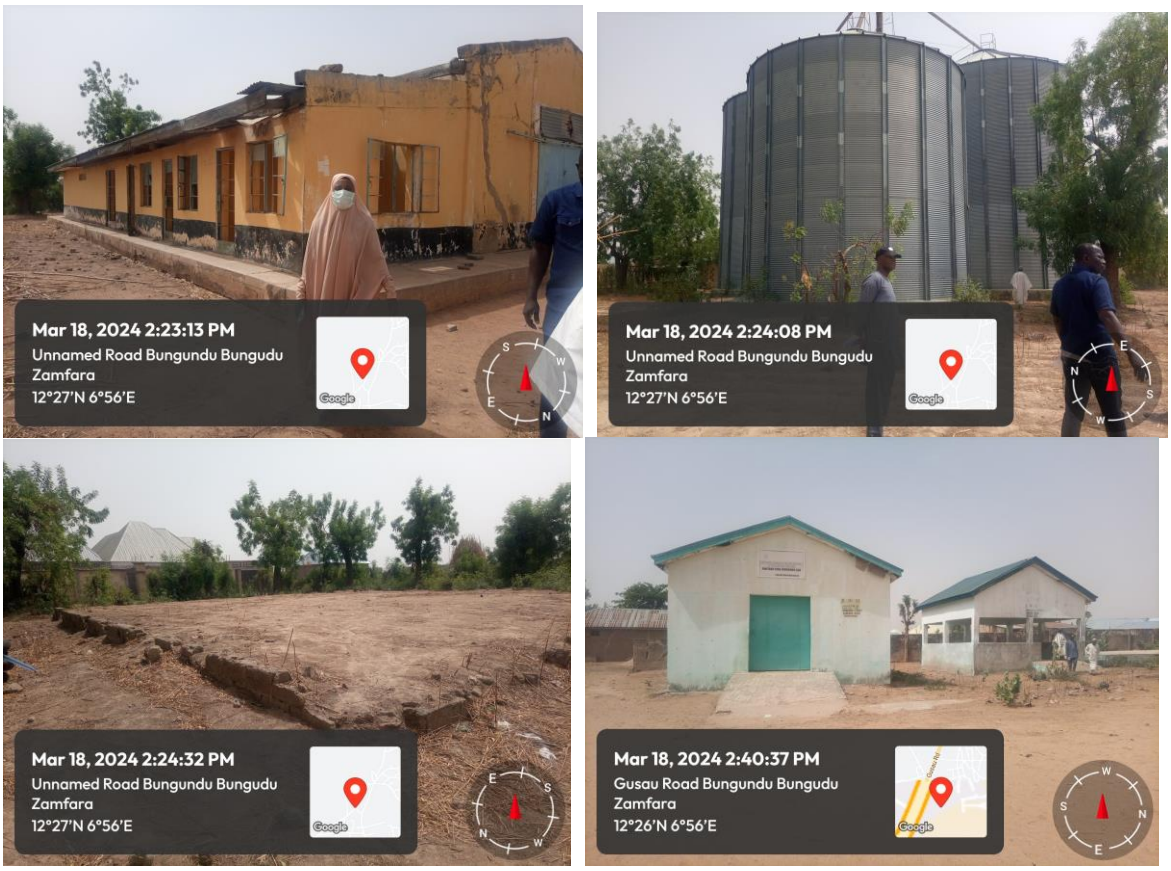


Figure 3.10: Pictures of the available facilities at the proposed ATC at Maru

Figure 3.11: Satellite imagery depicting the facility in Maru

3.4 Project Alternative

Alternative actions considered for the programme area include the following:

- The "No Action" alternative assumes that there will be no alteration to the existing areas. This alternative would imply that the proposed SAPZ programme intervention area/location would not be implemented, and the agriculture in the State would be left in its present condition with a real potential for it to worsen. Specifically, if the sites are left unimproved, environmental degradation as a result of the ongoing agricultural practices by the locals would continue and, in turn, will continue to lead to ever-increasing destruction of the habitat without proper or sustainable management that would further lead to soil erosion, deforestation, etc. In other words, damage and loss rates may increase as there will not be proper and systematic management, monitoring and guidance from the appropriate authorities. This has been the characteristic of the agricultural sector over the years. Furthermore, the poverty level amongst the local population will remain high, and the objective of the NATIP and APP of the Federal Government for the country will suffer a setback. A *no-action or no programme* alternative is certainly not recommended.
- A "Go Ahead Project Alternative," though more expensive in terms of cost in every respect at the start, is believed to be the most feasible and profitable than the "do nothing alternative". The go-ahead alternative is expected to reduce the operational costs for crops in the value chain processors by up to 30%, create thousands of new jobs, and contribute significantly to Zamfara State GSP and Nigeria's economy and, consequently, poverty reduction. The development of the SAPZ programme in Zamfara State will strengthen the State's food security, improve regional economic growth and generally improve livelihoods in the rural farming communities in the programme area through increased household incomes that would arise from opportunities for secured markets, improved productivity, reduced post-harvest losses and increased employment of the locals. In addition, the negative impacts on the environmental resources due to the unsustainable manner in which the local farmers devastate the forest resources to eke out a living in the area will be reduced if not eliminated. In its place, there will be enhanced knowledge of how these environmental resources could be better mined or used through the knowledge gained from the program. This alternative, in turn, will reduce the overall level of poverty prevalent in Zamfara State.

The two scenarios considered herewith are summarized in Table 3.3. The inference from this consideration is that even though the go-ahead option is extensive, it is the preferred or most environmentally sensible, financially feasible, and benign alternative for achieving programme objectives and ensuring economic growth and sustainable development both at the micro and macro scales. Thus, the advantages of the "go ahead" alternative make it a better option than the "No Action" alternative.

Table 3.3: Analysis of the Alternative

S/N	Criteria	No Project Alternative	Go Ahead Project Alternative
1	Overall Protection of the environment and social well being	The field visits revealed the level of poverty in the communities, the unsustainable manner in which environmental resources are being devastated to the extent that taking a "no action "alternative will not benefit members of the study areas or their environment and even the national economy as the government gradually diversifies from petroleum to non-petroleum focused economy	Intervention would lead to the strengthening of agriculture in a more professionalized and highly organized manner. This will provide room for best practice soil conservation and sustainable management of natural resources. It will further generate income, which in turn increases the living standard of the locals and overall improvement of the national economy even in the absence of petroleum product
2	Long-term Effectiveness and Permanence	No action alternative does not meet the long-term effectiveness and permanence criteria of the national and local economy including the agenda to improve the overall management of environmental resources for sustainable development	The go-ahead option will further improve the local and national economy with sustainable development agenda in mind through a careful planning that will be based on informed decision making by all parties including the locals of the programme environment

CHAPTER FOUR

ENVIRONMENTAL AND SOCIAL BASELINE CHARACTERISTICS

4.1 Background

Baseline data, particularly accurate and reliable information, are germane for appraisal to ensure that a particular project is implemented in a sustainable way. The initiative of the proposed SAPZ program in Zamfara State is laudable with the potential to transform agricultural industry within the State as a paradigm shift compared to the present condition. The proposed project, when it is fully implemented and operational, will increase the State revenue from agriculture in particular and the country's GDP in general with ultimate socio-economic development and overall prosperity.

However, there is a need to establish the existing environmental and social conditions of the selected project sites, in spite of the stated envisioned benefits. Establishing baseline conditions, a place are crucial for the future appraisal of the SAPZ program and to provide a unique opportunity for the identification of potential impacts and feasible options for negative impact mitigation measures. Therefore, the baseline environmental and social conditions of the proposed project are presented and discussed thematically as outlined below:

- Physical environment (this includes assessment of climate, air quality, noise, water quality, topography, geology, etc);
- Biological environment (vegetation and wildlife); and
- Socioeconomic and health environment.

The description of the baseline conditions of the project area was based on a one-season field data gathering conducted from the 18th to the 21st of March, 2024, and complimented with secondary data obtained from relevant literature. Based on the hydrological regime, the field sampling period falls within the dry season, which indicates that the samples collected on the biophysical environment represent the dry season. However, representative data of the wet season scenarios were obtained from relevant literature including environmental studies carried out within the project State's environs. The desktop review of relevant literature (secondary data) was carried out to augment the field *(in-situ* data) and laboratory results. Laboratory analyses of the field samples (soils and water) were conducted at Environmental Accord Laboratory- an accredited laboratory by the Federal Ministry of Environment (FMEnv.) and other regulatory bodies in charge of environmental management and regulation in Nigeria. The field sample collection and analyses were carried out in line with the appropriate quality assurance and quality control measures recommended by the relevant local and international guidelines.

4.2 Existing Physical Environmental Conditions

The prevailing environmental condition of an area where a developmental program would be implemented require a well detailed assessment. A detailed assessment of physical environment of project area is one of the cardinal aims of any well-planned intervention programs such as the proposed SAPZ program. The baseline physical environment data description and documentation typically serve two main purposes; first, it provides a

benchmark against which future assessments can be compared to determine changes in environmental characteristics over time. Secondly, the process of environmental impacts (positive and negative) prediction, identification, and quantification is facilitated by the superimposition of the technical details of the proposed program on the baseline (existing) environmental conditions. In addition, this understanding will foster and aid the process of developing and proffering cost-effective measures that will mitigate any negative impacts that will be identified and enhance the beneficial impacts. The components of the physical and biological environment assessed are outlined as follows:

- Climate and Meteorology;
- Geology and Hydrogeology;
- Drainage and surface water resources (hydrology);
- Ambient Air Quality and Noise;
- Soil Quality;
- Groundwater Quality;
- Vegetation (flora); and
- Wildlife (fauna).

4.2.1 Climate and Meteorology

The climate of Zamfara State is tropical savannah as postulated by Koppen's system of climate classification which is the most recognised system of climate classification. This climate type is characterized by conventional rainfall and the amount of precipitation received in the region is relatively high and it is expressed as the contrast between a dry season and a wet season. These two seasons are very dependent on the two prevailing air masses blowing over the country at different times of the year; the dry north-easterly air mass of Saharan origin, and the humid maritime air mass blowing from over the Atlantic.

These air masses result in the Inter-Tropical Convergence Zone (ITCZ) which is commonly referred to as Inter-Tropical Discontinuity (ITD) or the Inter-Tropical Front (ITF). The Front is associated with the northward and southward movement of wind. The movement of the ITCZ is the warm humid maritime Tropical (mT) air masses with north-easterly winds. As noted by Ojo, 1972, these air masses are the major controlling factors of the region's atmospheric characteristics which causes the marked variations in the wet and dry seasons in the area.

4.2.1.1 Climatic Data Type/Source, Characteristics, and Analysis

Several weather elements of a place over a long period determine the climate of such region. In other words, the climate of an area is not created by a single weather element, but by the distinctive combination and interrelation of several elements; therefore, five (5) weather/meteorological parameters were analysed for this study. These weather elements are Rainfall, Temperature, Wind Speed, Wind Direction, and Relative Humidity. Analysis of weather elements given as mean value over a long period shows the overall trends of increase and/or decrease. Micro-climatic elements in terms of duration or intensity, changes, fluctuations, and variations have considerable influence on human activities particularly for farming/agricultural practices such as the proposed SAPZ project.

The Nigeria Meteorological Agency (NiMet) is the custodian and authority in charge of weather data in Nigeria. Therefore, the climatic data for this study was acquired from archival records available at the Data Management Unit (DMU) of the NiMet (and supported by relevant literature). The analysed weather data for this study was acquired from the Potiskum weather station and covered a period of 27 years (1995-2021). This period was considered to be adequate to show the pattern of the study area weather characteristics that can perhaps guide the proposed project design, implementation strategy, and schedule of activities, among others. Results of the analysis are presented in charts, tables, and figures, and formed the basis for the description of the climatic setting of the project area.

4.2.1.2 Rainfall Characteristics

4.2.1.2.1 Annual Rainfall Pattern

Generally, in tropical region, rainfall is the principal element controlling climate including in Zamfara State. Computed annual rainfall pattern in the study area from 1995 to 2021 is presented in Fig. 4.1. As shown, annual rainfall values in the State range from 615.9 mm to 1442.2 mm. This indicate that an annual rainfall in the area could be as low as 615.9 mm and could be high as 1,442.2 mm. Of the twenty-seven (27) years records analysed, it was only in six (6) years that annual rainfall amount was over 1,000 mm. Therefore, typical or mean annual rainfall amount in the study area is about 858.42 mm. Given the average rainfall value in the State and the nature of crops commonly cultivated in Zamfara State, farming activities have been sustainable and there is potential for significant increase in farm produce when the planned SAPZ program is mainstreamed.

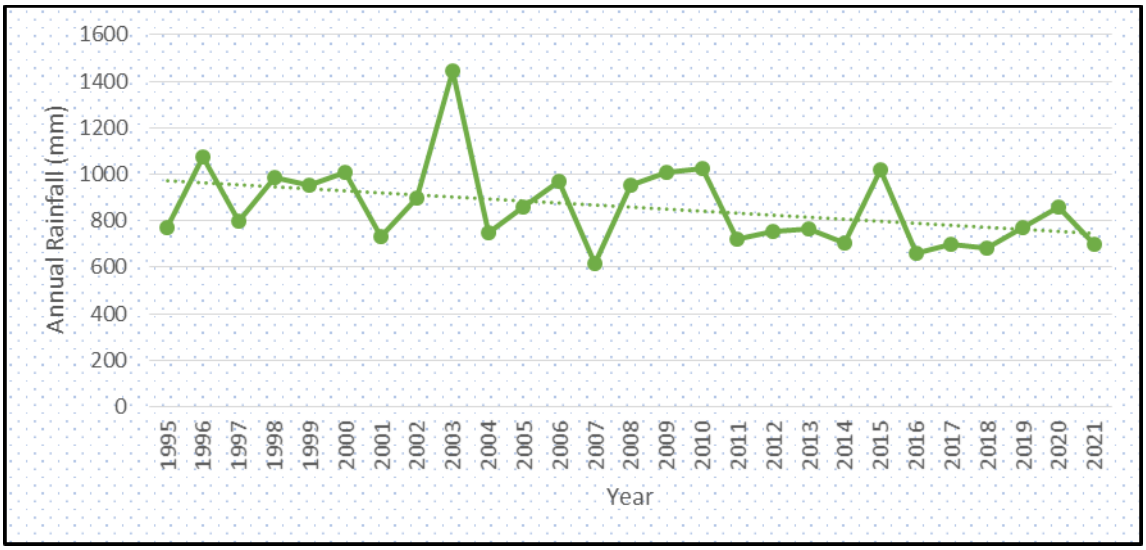


Figure 4.1: Long-term annual rainfall pattern in Zamfara State

4.2.1.3 Monthly Rainfall Characteristics

The mean monthly rainfall characteristics in the study area is shown in Fig. 4.2. It was observed that rainfall regime in Zamfara State is between May and October. It rains in about six months of the year. Significant amount of this rainfall is received between July and September. Specifically, about 53% of the total annual rainfall in the study area is received in the months of July and August. Meanwhile, the mean monthly rainfall ranges from 16.15 mm

to 264.88 mm with an average of 72.57 mm. As shown in Fig. 4.2, it can be observed that onset of rainy season in the project State is May while its cessation is October. Based on these monthly rainfall characteristics and nature of crops mostly planted, two (2) cycle of cultivation is possible. In other words, certain crops (particularly grains) with three months gestation period can be planted and harvested twice in a year without irrigation (manual plant wetting). The two planting cycles will ensure sustainable produce of raw materials for the proposed value chain enhancement and Agro-Industrial processing activities.

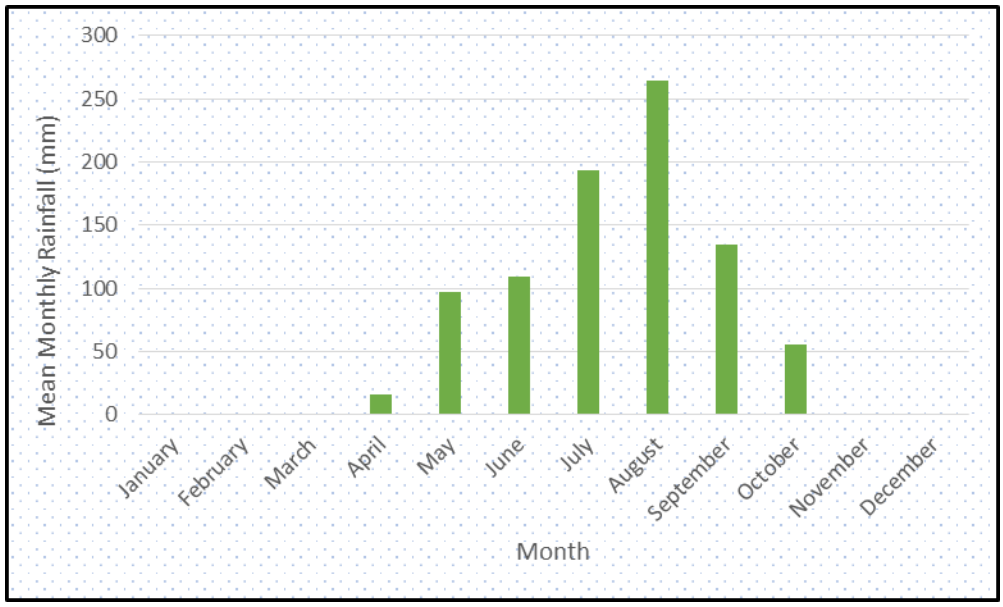


Figure 4.2: Mean monthly rainfall characteristics in the study area

4.2.1.4 Annual Number of Rain days

The distribution of the number of precipitation days (readable water droplet) from the atmosphere is shown in Fig. 4.3. Records show that there is no significant variations in the annual number of rain days in the study area. The highest number of rain days was recorded in 2002 when rainfall was observed in 80 of the 365 days of the year, this represents 21.92%. Records of rainfall days in the area therefore range from 50 to 80 with a mean of 65 days. This signifies that rain falls in Zamfara State for at least 65 days in a single calendar year. Meanwhile it was computed that amount of a single rainfall event could as be low as 0.1 mm and as high as 182.9 mm. This information is also germane for various purposes including during the proposed project implementation work schedule. Meanwhile, it should be noted that the highest number of annual rain days does not necessarily translate to the year with the highest annual rainfall amount and vice versa.

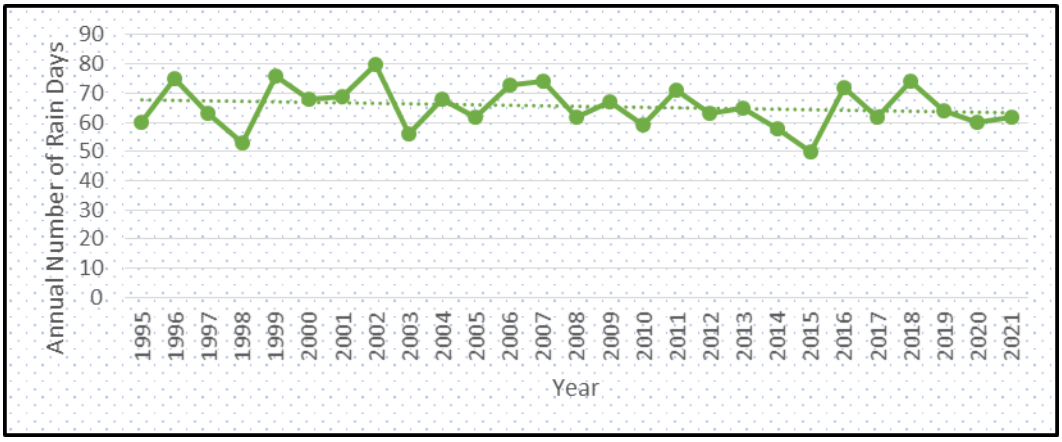


Figure 4.3: Annual number of rain days in Zamfara State

4.2.1.5 Temperature Characteristic

Temperature of Zamfara mirrors that of tropical area which is high and relatively stable throughout the year although with indications of seasonal fluctuations. The monthly temperature trend drops insignificantly between July and September (Fig. 4.4) which coincides with the peak of the rainfall months. The long-term mean minimum and maximum temperature in the study area is shown in Table 4.1. As shown, the mean minimum temperature usually ranges from 16.93º C to 27.08 º C while the mean maximum temperature 31.26 º C to 40.82 º C. It can therefore be noted that the coolest months around the study area are January and August, the month of January coincides with the harmattan season while reason for the low temperature in August is due to the peak of the rainfall months in the area. In other words, as expected, temperature is usually higher during the dry season and lower during the wet season.

Table 4.1: Mean Monthly Temperature Pattern in Zamfara State

Month	Maximum Temperature (^{0}C)	Minimum Temperature (^{0}C)	Avg. Monthly Mean (^{o}C)
January	32.18	16.94	24.56
February	35.56	19.67	27.62
March	38.76	23.46	31.11
April	40.82	26.56	33.69
May	39.26	27.08	33.17
June	36.19	25.35	30.77
July	32.78	23.58	28.18
August	31.26	22.87	27.06
September	32.97	22.99	27.98
October	36.25	23.07	29.66
November	36.08	20.12	28.1
December	33.06	17.46	25.26

Source: Computed from NiMET Data (1995-2021)

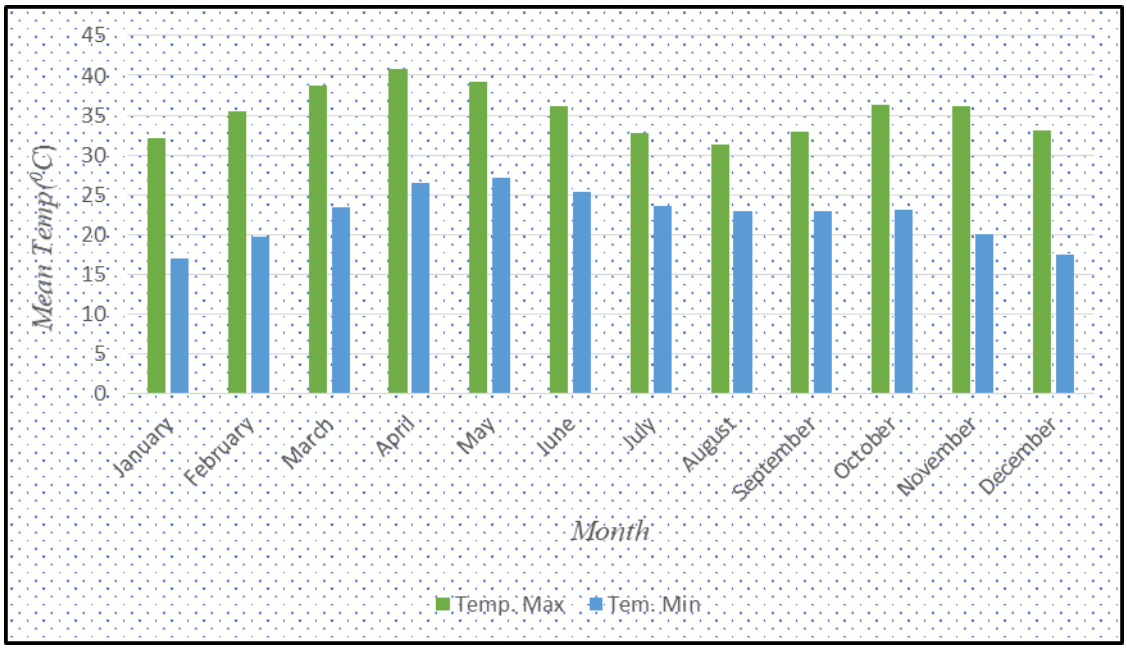


Fig. 4.4: Long-term Mean Maximum and Maximum Temperature in Study Area (Sokoto State)

4.2.1.6 Solar Radiation

Solar Radiation - the amount of solar energy incidence on the earth surface is dependents on the intensity and duration of sun rays as well as the angle at which the sun rays' strike the earth. Northern Nigeria states/regions generally received high amount of incident solar radiation throughout the year. Specifically, mean solar radiation characteristic of the study area ranges between 17.52 – 25.52 kW/m^2. Mean incident solar radiations in the State follow closely the reverse pattern of rainfall, however, unlike the rainfall; the pattern of solar radiation is bi-modal. As shown in the Fig. 4.5, the amount of radiation reaching the surface peaks at March and drops drastically from May – August due to cloud cover (water blanket) and then peak again at November. Also, between December and January (harmattan period), a slight drop in the amount of solar energy was recorded perhaps due to suspended particles in the upper atmosphere. However, the difference in the amount of solar radiation received in Zamfara throughout the year (wet and dry season) is somewhat insignificant.

The 27 years daily weather data analyzed shows that daily average insolation in the study area is about 22.2 kW/m^2; there are days with over 34.5 kW/m^2 of solar radiation in the State while the least daily solar radiation recorded was about 9.9 kW/m^2. The sun resource could harness to generate energy for some of the proposed SAPZ project activities during operation phase. At least the energy could be harness to provide security light at night around the AIH and ATCs.

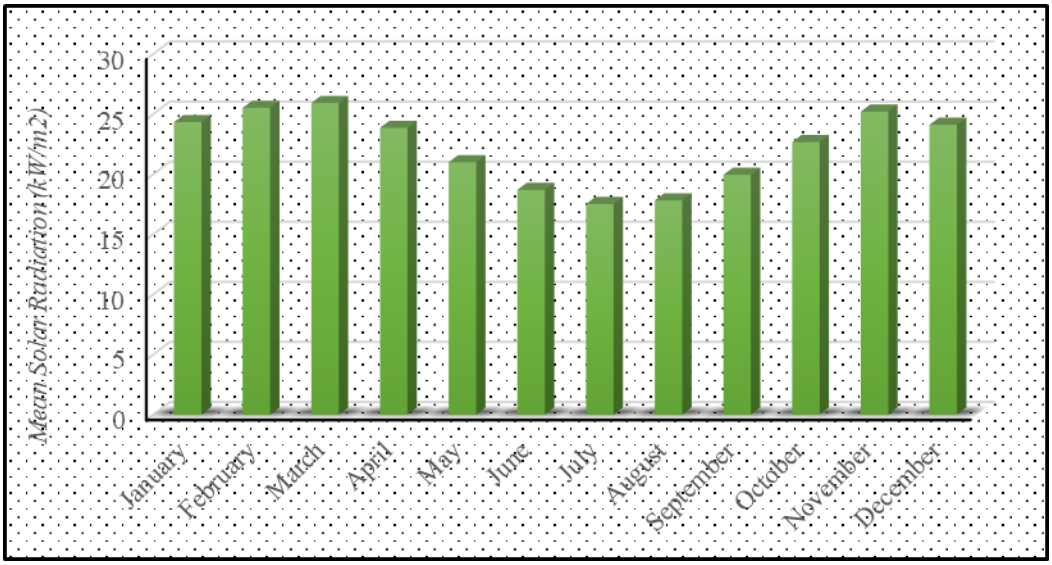


Fig. 4.5: Mean Solar Radiation around the Project Environment

4.2.17 Relative Humidity

In Zamfara State, relative humidity (RH) is generally at its maximum around dawn between 05.00 and 07.00 hours and generally at its lowest in the afternoon between 15.00 and 16.00 hours. As shown in Fig.4.6 and Table 4.2, the RH rises continuously from April with a mean of 30% and peaked at August with a mean of 78%. The great variation between the lowest and the highest RH signifies the peak of the dry and wet seasons, respectively.

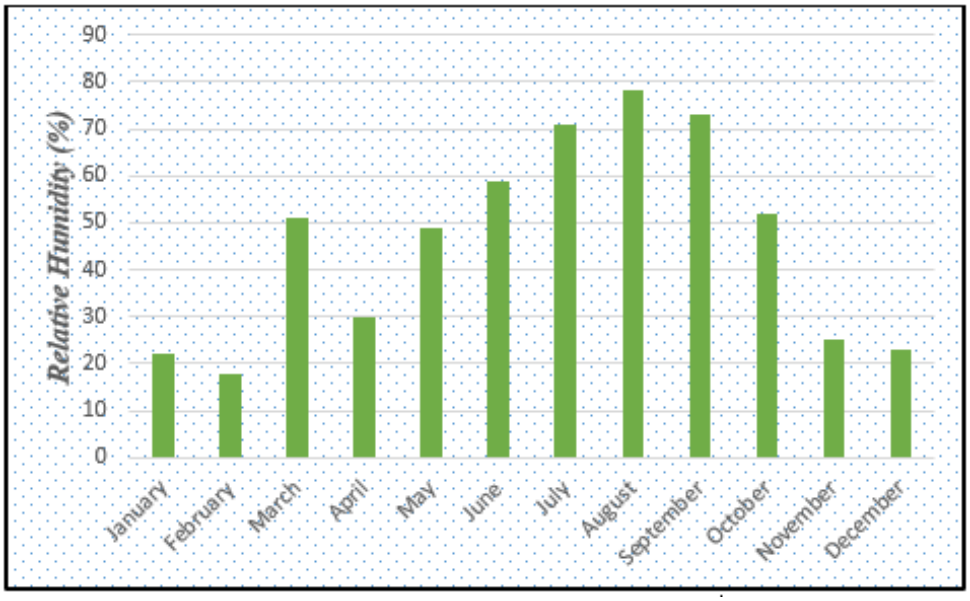


Fig. 4.6: Mean Relative Humidity Pattern of Zamfara

Table 4.2: Relative Humidity in Zamfara State

Month	Mean Monthly Relative Humidity (%)
January	23.20
February	23.41
March	25.80
April	50.60
May	69.90
June	75.15
July	79.55
August	81.60
September	76.45
October	71.40
November	37.45
December	26.85

Source: Computed from NIMET Historical Data (1995-2021)

4.2.1.8 Wind Speed and Direction

4.2.1.8.1 *Wind Speed*

Wind speeds are greatly influenced by the creation of cyclonic and anti-cyclonic vortices that has logical connection with the various seasons. Analysis shows that the wind speed is relatively high throughout the year (Fig.4.7). On the average, wind velocity exceeds 28 km/h while lesser winds decline month-on-month. Most days of the month, wind usually exceeds 19 km/h and rarely exceeds 28 km/h. by implication wind erosion becomes a normalcy all-year-round but intensifies during the rainy season. During the rainy season where the intertropical zone of discontinuity moves northwards permitting the mesocale processes to interact with the tropical maritime, wind velocity becomes very high leading to erosional activities. This annual phenomenon starts from the last week of December where it gathers momentum and peaks in June where it at 9 days in the month and the rest of the month is characterized by winds exceeding 12 km/h. one key factor that drives this occurrence is the absence of high canopy and broadleaved dense trees which could act as wind breakers.

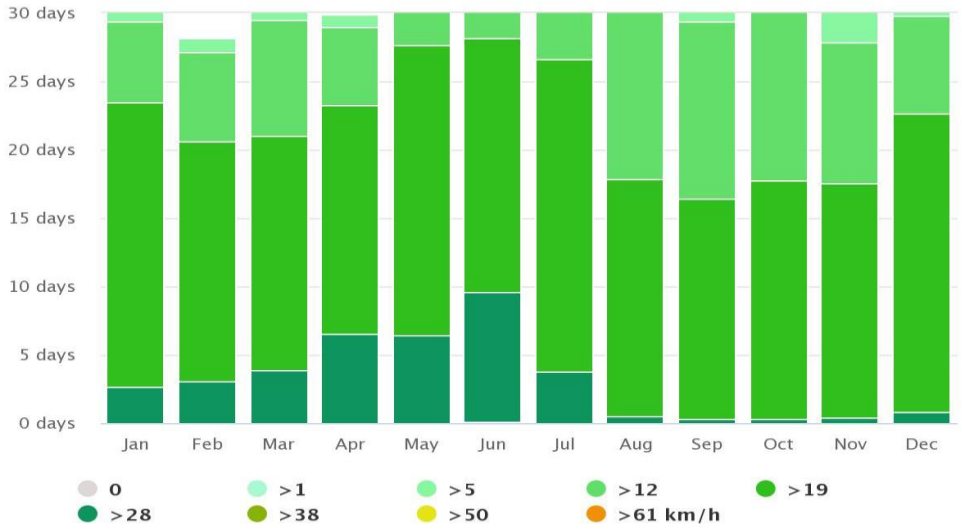


Fig. 4.7: Wind velocity frequency per number of days in a month in Zamfara State

4.3.5.1 *Wind Direction*

The prevailing wind direction over the region is south westerly. Highest wind direction for the month and the year is South-West (SW), meanwhile, the wind pattern during dry season of November to March is usually north easterly (Fig. 4.8). Therefore, the wind pattern is greatly influenced by the prevailing season. The north easterly winds periodically raised dust particles into the atmosphere over the region, following the occasional strengthening of the surface high pressure.

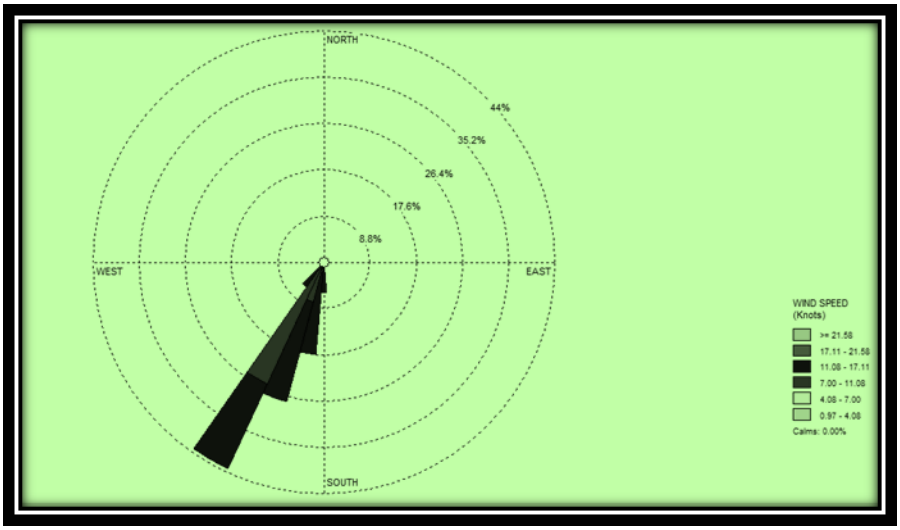


Fig. 4.8: Mean wind speed and direction in the Project State

4.2.2 Geology and Hydrogeology

4.2.2.1 Geology

Zamfara State geological distribution showing the distribution of the proposed/selected project sites is shown in Fig. 4.9. As shown, the State boundary cuts across three different

rock type of Igneous and sedimentary rocks of quaternary and tertiary. Specifically, these geological units where the proposed project sites are located are Precambrian Basement Complex (Gidan Dawa, Maru, and Bani ga Hannu), undifferentiated sedimentary rocks, and undifferentiated sands gravels and clay. The dominant geological cover is the Precambrian Basement Complex and it covers about 90% of the entire state boundary. Undifferentiated sedimentary rocks characterized the northwest section while the strand undifferentiated sands gravels and clays are underlain a small section in northernmost region of the State.

The Basement complex (the oldest exposed rock in Nigeria) comprises the remnants of an ancient sedimentary series of the meta-sediments which have been transformed into anatectic Migmatites and Granites. The meta-sediments include quartzofelspathic, biotite, hornblende, gneisses, schists, quartzites, marbles, and Calc-Silicate rocks (National Atlas, 1997). In addition to the economic mineral deposit, the rocks of the Basement complex generally provide rich quality stone for building and engineering construction.

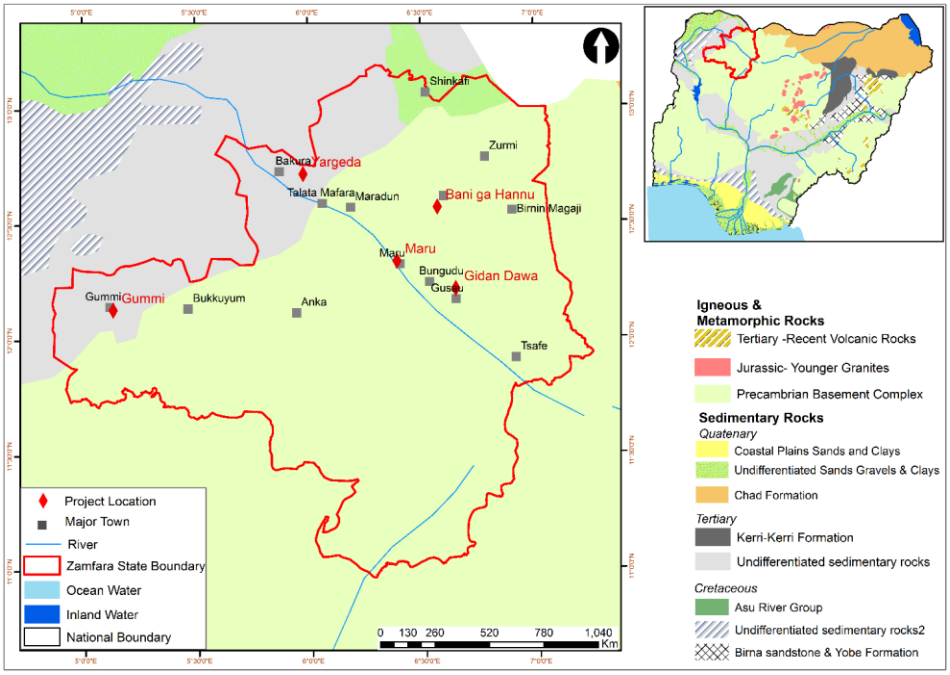


Figure 4.9: Geology Distribution of Zamfara State depicting project sites, Nigeria Geology Inset

4.2.2.2 Hydrogeology

Groundwater is one of the important natural resources and this would be required at all the selected project sites for the SAPZ program for various uses ranging from domestic to processing. Based on hydrological provinces of Nigeria, Zamfara State geographical space is within the crystalline zone of Basement Complex in the Sokoto basin. Groundwater availability in the Basement Complex is very unpredictable and crystalline rocks by their nature are impervious but fracturing, fissuring, jointing, and weathering may impose secondary aquifer characteristics on these rocks, thus making them favourable to groundwater storage.

As noted in the Nigeria National Atlas of 1978, borehole yields vary widely in the study area and the average safe yield (maximum yield) of 4,000 g.p.h is often available at about 53.5 feet (16.3 meters). During the field data gathering exercise, domestic well waters were observed across different communities in the State which signifies abundance of groundwater resources availability. However, there is a need to conduct a detailed hydro-geological investigation to determine the locations of best/optimal yield before a borehole is dug, this will prevent borehole failure as well wastage of valuable resources and manpower concerning the proposed SAPZ project.

4.2.3 Terrain and Drainage Characteristics

4.2.3.1 Terrain Characteristics

Zamfara State's elevation characteristics range from 321 meters to 849 meters elevation (Fig.49). Meanwhile most vast land in the state has relatively flat topography ranging from 322 to 453 meters above the mean seas level. The relatively flat topography of the state favours large scale and contagious land cultivation. Also, as opposed to present practice of using manual means, the nature of the study area favours mechanization farming as tractors would be used without much hindrances. In other words, mechanization activities will be prompted when the proposed SAPZ project is mainstreamed or implemented in Zamfara State.

4.2.3.2 Drainage Pattern

As shown in Fig.4.10, several streams (surface water resources) characterize the project State. Most of these streams are seasonal in nature and drain mostly towards the North West direction into the Sokoto basin. Generally, five (5) different catchments drain the State and most of the rivers are of Order 1 & 2 which are highly dependent on rainfall, in order words, most of the surface water (stream) resources dry up in the dry season period of the year. The two major rivers draining the State however are Zamfara and Sokoto Rivers and they drain the State's from the east to west and from the east to northern areas, respectively. The Sokoto River is dam at Gusau for municipal water supply, irrigation farming, and fishing activities (Plate 1). The popular Gusau Water Barrage is located on the Sokoto River.

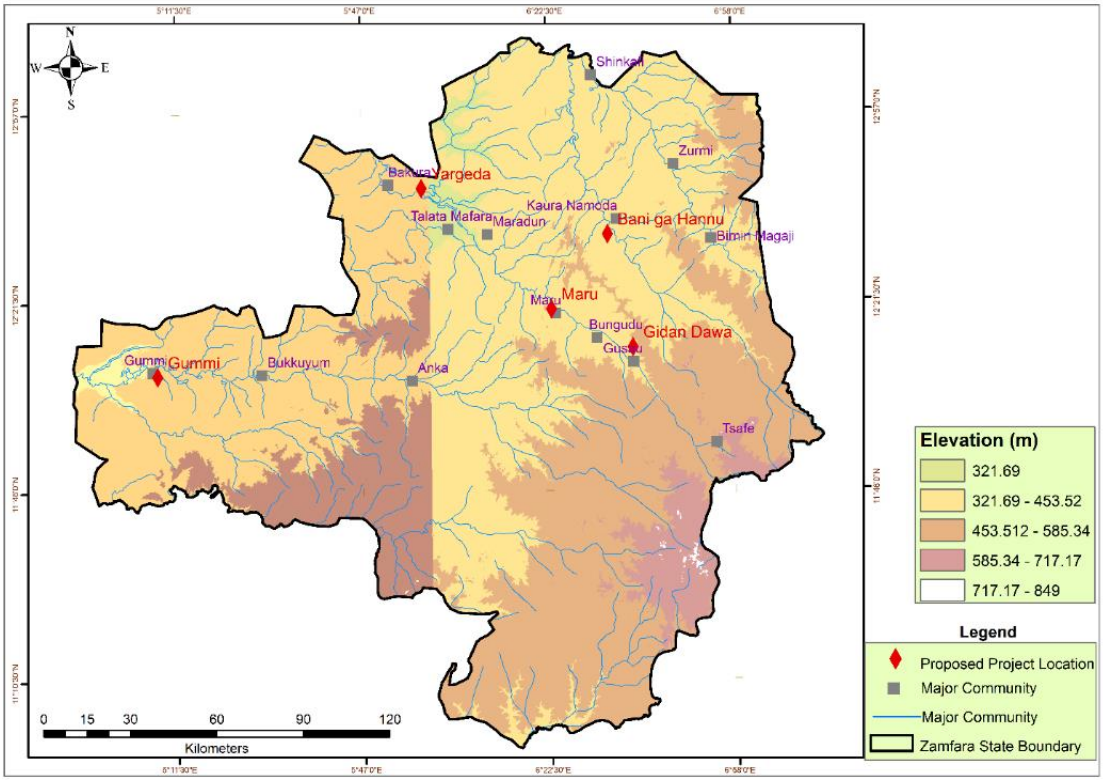


Figure 4.10: Zamfara State topography and River Network Characteristics

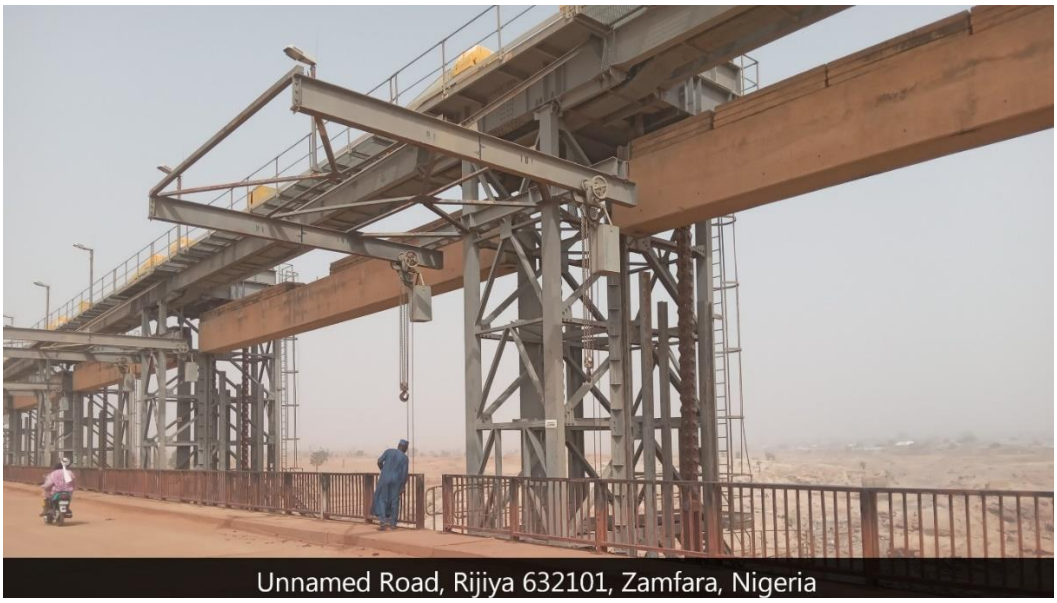


Plate 4.1: Gusau Water Barrage on Sokoto River

Source: ESIA Fieldwork for the Proposed SAPZ Project in Zamfara State, March 2023

4.2.4 Ambient Air Quality Assessment

4.2.4.1 Sampling Locations and Distribution

As part of the environmental baseline study, ambient air quality across the proposed project sites was assessed. As shown in Fig. 4.11, air quality and noise level were assessed at all the selected sites for the proposed project. In all, five (5) locations were selected for the development and they were assessed accordingly.

As shown, the local government areas where the selected project sites fall within the State administrative boundaries are Gusau, Maru, Gummi, Bakura, and Kaura Namoda. The air quality sampling code, location coordinates, and description of the sampling station environment are presented in Table 4.1 while the spatial distribution of the sampling locations is shown in Fig. 4.11. Similarly, equipment and photographs of the air quality field sampling activities are shown in Plates 4.2. Specifically, the measured air quality parameters are Nitrogen oxide (NO), Nitrogen dioxide (NO_2), Sulphur dioxide (SO_2), Hydrogen Chloride (HCl), Volatile Organic Carbon (VOC), Carbon dioxide (CO_2), Carbon monoxide (CO), ambient temperature and humidity. The air quality was measured in-situ using a pre-calibrated Graywolf Advance Sense TM air quality meter. In addition, Particulate matter (PM) was measured at the same locations where ambient air quality was taken using Greywolf Particle Mass/Particle Counter. The five particulate matter sizes measured are PM0.5, PM1.0, PM2.5, PM5.0 and PM10. Furthermore, at each location of the air quality measurement, ambient noise level was measured. The average noise level at each monitored site was taken with a hand-held digital battery-powered Sound Pressure Level (SPL) meter (Extech 407730 Sound Meter).

Table 4.3: Air Quality Sampling Locations and Description

Sample Code	Location and Value Chain	Long. (^{0}E)	Lat. (^{0} N)	Description of environment
SAPZ/ZMS/ESIA/AQ&N 1	Gida Dawa (Cotton)	6.64403	12.21310	Frontage of the existing warehouse
SAPZ/ZMS/ESIA/AQ&N 2	Maru (Rice)	6.40052	12.32876	By existing ADP facility
SAPZ/ZMS/ESIA/AQ&N 3	Yargeda (Wheat.)	6.00085	12.57633	Premises of Yargeda moribund warehouse
SAPZ/ZMS/ESIA/AQ&N 4	Gummi (Soya beans)	5.00033	12.57621	Premises of ZADP in Gummi
SAPZ/ZMS/ESIA/AQ&N 5	Bani ga hannu (Maize)	6.56667	12.56667	Premises of proposed site

Source: Field survey, March 2024

Note: **SAPZ**-Special Agro-Industrial Processing Zone; **ZMS**-Zamfara State; **ESIA**-Environmental and Social Impact Assessment**; AQN**- Air Quality and Noise

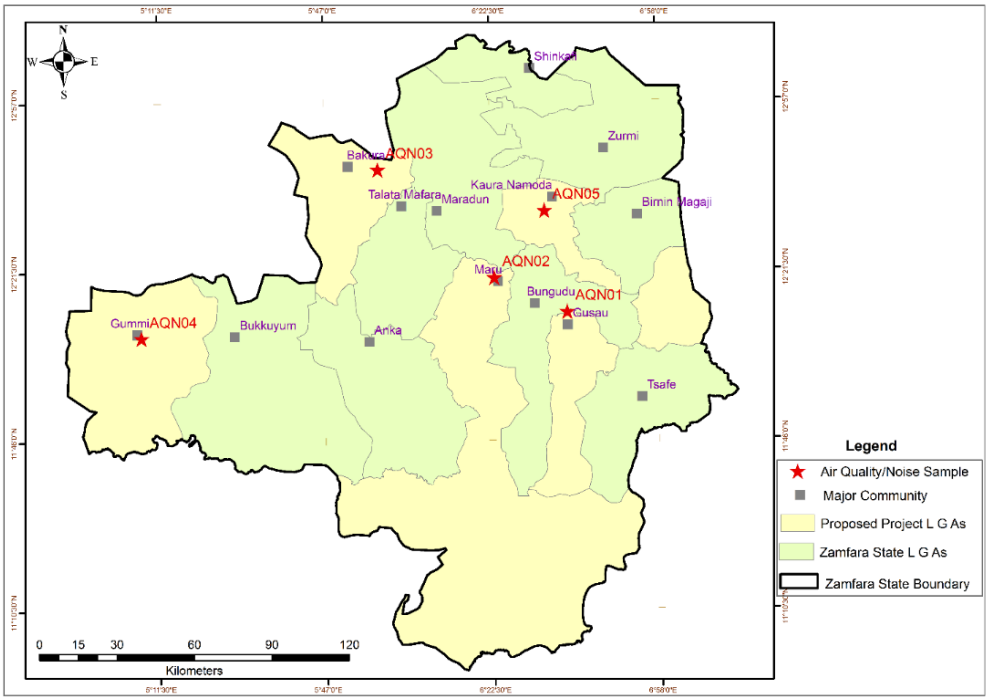


Figure 4.11: Air quality/Noise sampling locations and distribution

Plate 4.2: *In situ* air quality field sampling activities

Source: ESIA Fieldwork for the Proposed SAPZ Project in Zamfara State, March 2024

4.2.4.2 Air Quality Results

Field ambient air quality assessment carried out at each of the project sites are presented in Table 4.2. The assessment became necessary to detect if there is any pollutant source within and around the proposed project locations. As shown in the Table, the measured gases are Carbon monoxide (CO), Carbon dioxide (CO_2), Volatile Organic Compound (VOC), Sulphur dioxide (SO_2), Oxides of Nitrogen, and Hydrogen Chloride (HCl).

The measured CO ranged from 0.06 ppm to 2.17 ppm with an overall mean of 0.97 ppm, the highest CO value of 2.17 ppm was observed at AQ1 (Gidan Dawa-Gusau) while the lowest of 0.06 ppm was measured at Gummi location. The high CO value observed at Gidan Dawa is not unconnected to the commercial activities of the Gusau town particularly the proximity of the project site to the main road. Nevertheless, the measured CO values at all the project sites are within the FMEnv. recommended limit of 10 ppm.

The SO_2 was only observed at three locations and it ranges from 0.01 to 0.02 ppm with an overall mean of 0.01 ppm. Similarly, NO_2 was measured at three sites with no significant variation in their values, the NO_2 mean therefore was 0.01 ppm while NO average was also 0.01 ppm. The HCl concentration at the project sites range from 0.01 to 0.06 ppm and the average across sites was 0.02 ppm. TVOC was not observed in any of the sample locations, in other words, its concentration in the project sites atmosphere was below the equipment resolution limit of 0.01 ppm. As expected, the RH and ambient air temperature averages are 23.8% and 30.0^0 C, respectively. It should be noted that the very low RH in the State is due to the prevailing dry season weather condition when the sample was conducted. Generally, RH and temperature are usually time and season dependent. Relatively humidity is relatively high in the morning and evening hours of the day, compared to noon.

In all, none of the measure air pollutants it regulatory limits where stated. Therefore, as a baseline information, the air environment of the proposed project sites is not polluted and activities that could escalated the condition during the proposed project development and operations would be guided against as much as possible.

Table 4.4: Measured Gaseous Concentrations at the Proposed Sites

Sample Code	CO (ppm)	CO_2 (%)	TVOC (ppm)	SO_2 (ppm)	NO_2 (ppm)	NO (ppm)	HCl (ppm)	RH (%)	Air Temp. (°C)
AQ1	2.17	0. 41	0.00	0.01	0.01	0.01	0.01	27.5	29.5
AQ2	1.03	0.23	0.00	0.00	0.00	0.00	0.03	23.7	31.6
AQ3	1.11	0.12	0.00	0.02	0.00	0.01	0.05	26.8	30.5
AQ4	0.06	0.11	0.00	0.00	0.01	0.00	0.00	21.4	30.1
AQ5	0.50	0.06	0.00	0.01	0.01	0.01	0.01	19.6	28.3
Min.	0.06	0.06	0.00	0.01	0.01	0.01	0.01	19.6	28.3
Max.	2.17	0.23	0.00	0.02	0.01	0.01	0.05	27.5	31.6
Avg.	0.97	0.13	0.00	0.01	0.01	0.01	0.02	23.8	30.0
FMEnv	10.0	NA	1.6	0.10	0.06	NS	2-5*		

Source: Field Observation, March 2024

4.2.4.3 Ambient Air Particulate Matter (PM) Concentration

Results of the measured PM concentration at the proposed project locations are presented in Table 4.3. The observed $PM_{0.5}$ range from 0.10 to 2.21 µg/m3 with an average of 1.16 µg/m3 while $PM_{1.0}$ and $PM_{2.5}$ are 1.65 µg/m^3 and 4.88 µg/m^3, respectively. Also, $PM_{5.0}$ and PM_{10} averages are 6.33 µg/m^3 and 12.72 µg/m^3, respectively. The TPM values range from 81.0 at Maru (AQ2) to 113 µg/m^3 at Kaura Namoda location (AQ5) and the overall TPM mean value was 99.2 µg/m^3.

In the study area, air particles observed are mainly from dust re-suspension by wind action (majorly), vehicular emissions, and domestic/commercial activities. Dust particle re-suspension result majorly scattered or limited vegetal cover that could prevent continuous wind actions momentum. Generally, none of the measure particle sizes exceeded their WHO, FMEnv., and World Bank limits where stated. It should be however not noted that the stated limits are 24 hours averaging, whereas the field assessment was less than the 24 hours monitoring period.

Table 4.5: Observed Particulate Matter (PM) Concentrations at the Project Sites

Sampling Location Code	Concentration (µg/m3)					
	PM0.5	PM1.0	PM2.5	PM5	PM10	TPM
SAPZ/ZMS/ESIA/AQ&N 1	1.27	1.52	6.80	6.42	16.20	100
SAPZ/ZMS/ESIA/AQ&N 2	0.13	0.19	4.64	5.11	14.39	81
SAPZ/ZMS/ESIA/AQ&N 3	0.10	0.27	7. 53	8.16	9.46	110
SAPZ/ZMS/ESIA/AQ&N 4	2.21	3.82	4.19	5.72	10.51	92
SAPZ/ZMS/ESIA/AQ&N 5	2.07	2.43	3.88	6.23	13.02	113
Min	0.10	0.19	3.88	5.11	9.46	81.0
Max	2.21	3.82	7.53	8.16	16.20	113
Mean	1.16	1.65	4.88	6.33	12.72	99.2
Limit	-	-	25*	-	80**	250*

Source: Field Observation, March 2024
**WHO 24hr Limit, ** World Bank 24hr Limit,*
Note: SAPZ-Special Agro-Industrial Processing Zone; ZMS-Zamfara State; ESIA-Environmental and Social Impact Assessment; AQN- Air Quality and Noise

4.2.4.4 Ambient Noise Level

Observed ambient noise levels at all the proposed project locations are presented in Table 4.4. The measured background noise levels range from 49.6 dB (A) to 76.5 dB(A) and the overall average noise level was 62.82 dB(A). The highest background noise levels of 76.5 dB(A) and 70.9 dB(A) were measured at Maru (AQ2) and Gidan Dawa (AQ1) project sites, respectively. The high noise level at the two locations were caused by automobile movement particularly articulated vehicles as a result of their proximity to major roads. Aside the frequent automobile movement (principal noise source), other sources of noise across the selected sites are wind action and human voices. Meanwhile recommended limit of FMEnv. for eight (8) hours exposes was not exceeded at any of the sites while the WHO for the same exposure hours were exceeded at AQ2 and AQ1, although, the observation period was less than the exposure time.

It can therefore be assumed that, at the moment, there is no escalated source of noise however, the existing noise level across the project locations may increase significantly at different phases of the proposed project activities due to the envisaged increase in human activities as well as the frequency of vehicular movement. Hence, activities that may contribute to the existing noise levels to pollution level from the proposed SAPZ program at all phases of the project activities should be put in check, and monitoring of ambient noise level should be routinely carried out.

Table 4.6: Ambient Noise Levels

Sample Location Code	Noise Level, dB(A)		
	Min.	Max.	Background
SAPZ/ZMS/ESIA/NL1	61.4	78.2	70.9
SAPZ/ ZMS/ESIA/ NL2	73.1	81.6	76.5
SAPZ/ ZMS/ESIA/NL3	55.8	64.7	59.4
SAPZ/ ZMS/ESIA/NL4	41.8	57.7	49.5
SAPZ/ ZMS/ESIA/NL5	52.4	69.0	58.3
Minimum	41.8	57.7	49.5
Maximum	71.1	81.6	76.5
Mean	56.9	70.24	62.92
FMEnv/WHO Limit	-	-	90*, 70**

Source: Field Observation, March 2024
NL- Noise Level; SAPZ- Special Agro-Industrial Processing Zone; ZMS-Zamfara State; ESIA- Environmental and Social Impact Assessment
**FMEnv limit, ** WHO limit*

4.2.5 Groundwater Quality

The existing groundwater resources within and around the proposed project area of influence were sampled as part of the baseline data gathering. As shown in Table 4.5 and Fig. 4.12, a total of six (6) groundwater samples were sampled. The water samples were collected in a 2-litre polyethylene bottle for general physio-chemical examination while samples for oil and grease analysis were taken in a 1-litre plastic bottle and preserved with concentrated sulphuric acid. Heavy metal samples were preserved with nitric acid. A calibrated Extech Digital DO700 meter was used for in-situ measurement of pH, Electrical Conductivity, Total

Dissolved Solids (TDS), Temperature and Dissolved Oxygen (DO) at each location, immediately after sample collection.

The laboratory analyses of the groundwater samples were carried out at Environmental Accord Laboratory, an FMEnv-accredited laboratory. The distribution of the groundwater samples is depicted in Fig. 4.9 while the sampling location coordinates are presented in Table 4.5. Pictorial views of field sampling and *in-situ* water testing activities are shown in Plate 4.3.

4.2.5.1 Water Sample Quality Control

The water sample collection was carried out with appropriate quality assurance and quality control (QA/QC) measures consistent with relevant local and international guidelines and standards. The QA/QC measures among others include,

- *In situ* measurement of parameters with short holding time immediately after sample collection;
- Calibration of all portable meters used for the *in-situ* measurement;
- Collection of separate samples for parameters requiring different treatment/preservation before analysis;
- Adequate preservation and labelling of samples;
- Use of disposable rubber hand gloves during sampling to avoid cross-contamination of samples.
- Use of only recommended sample containers to store sample media;
- Use of ice chest and ice cubes to ensure that the samples were maintained at the recommended temperature of 4^{o}C in-transit;
- Adequate labelling of chemical reagents used for sample preservation to avoid mix-up;
- Proper documentation of *in-situ* readings in log sheets and field notebooks.

Table 4.7: Groundwater sampling location coordinates and description

Sample Code	Project Location	Long. (^{0}E)	Lat. (^{0}N)	Remarks/Description
SAPZ/ZMS/ESIA/GW01	Gidan Dawa	6.64403	12.21310	A borehole water within Gasau skills acquisition centre opposite the project site
SAPZ/ ZMS/ESIA/GW02	Maru	6.40052	12.32876	A hand pump well water in Maru town
SAPZ/ ZMS/ESIA/GW03	Yargeda	6.00085	12.57633	A hand pump well water in Maru town
SAPZ/ZMS/ESIA/GW04	Gummi	5.00033	12.57621	Open/artisanal well within the ZADP premises
SAPZ/ZMS/ESIA/GW05	Bani ga hannu	6.56667	12.56667	A hand pump well water in Maru town

SAPZ- Special Agro-Industrial Processing Zone; ZMS -Zamfara State; ESIA- Environmental and Social Impact Assessment; GW- Groundwater

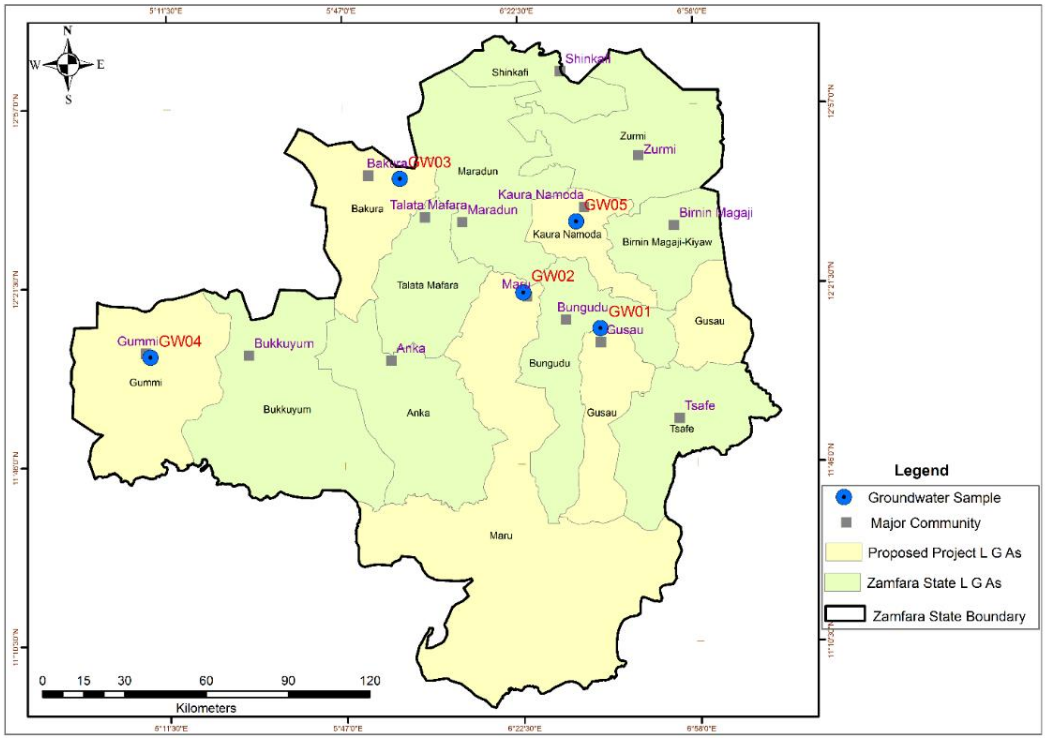


Figure 4.12: Groundwater sampling locations and distribution

Plate 4.3: Groundwater sampling and *in-situ* measurement activities
Source: Fieldwork, March 2024

4.2.5.2 *In-Situ* Analysis

Results of the sampled groundwater in-situ observation are shown Table 4.6. As shown, the pH values ranged from 5.40 to 8.30; the lowest and highest pH value was measured at GW04 (Bani ga hannu) while highest value of 8.30 was measured at GW01 (Gidan Dawa). It was noticed that pH at GW04 is acidic and falls below the recommended limit of 6.50 for drinking based on NSDWQ standard. On the average, the pH values across the sample were 7.26. The sample temperature was the same across sample and it is expected on groundwater to have a 25.0^0C, however, the temperature values do not contravene the recommended limit $<40^0$C.

Also, the electric conductivity (EC) ranged from 14.25 to 60.6 µS/cm with an average of 40.49 µS/cm. The individual values of each sample as well as their overall mean are within the NSDWQ limit of 250 µS/cm. Other in-situ parameters and their mean values are TDS (25.40 mg/l), Salinity (0.02 ppt), Dissolved Oxygen (2.45 mg/l), and resistivity (39.16 kΩ). Expect at GW04 (hand dug well in Gummi) where the pH value falls short of the range, all other *in-situ* parameters across samples are within their respective limits where they are specifically stated.

4.1.5.2.2 Physicochemical and microbial properties

Laboratory results on the groundwater physicochemical and microbial properties are shown in Table 4.6. The total hardness concentrations ranged from 24.2 to 68.5 mg/l with an overall average of 43.42 mg/l, the measured values are well below the limit of 500 mg/l set by NSDWQ, this indicate that they are within the set limit. Hardness in groundwater is primarily caused by dissolved mineral compounds of calcium and magnesium. Also, the Chloride (Cl^-) concentrations do not vary considerably across the samples as it ranged from 21.72 mg/l to 33.28 mg/l with a mean of 28.16mg/l. No regulatory limit was set for the Cl^- to compare whether it constitutes pollution or otherwise. In addition, chemical oxygen demand (COD) values in the samples ranged from 2.19 mg/L to 4.02 mg/l with a mean value of 3.58 mg/l. Turbidity values were only observed in two of the five samples, the measure value at Gw01 was 0.10 NTU while the value in GW04 was 0.80 NTU. The high turbidity value in GW04, as observed, it was due to shallowness of the well and the low water level. Total suspended solid (TSS) was only observed at GW04 and the value was 1.60 mg/l. Oil and grease (O&G) was not observed in any of the samples as their values were below the equipment resolution limit of <0.001 mg/l. hence, the samples groundwater is not polluted with hydrocarbon materials. On microbes, the measured properties are THB, THF, THUB, THUF, and E. coli and they do not show indication of polluted water as their values are generally low.

4.1.5.2.3 Anions and Nutrients (Exchangeable Cations)

The three anions' properties analysed in the samples are Sulphate (SO_4^{2-}), Nitrate (NO3-), and Phosphate (PO_4^{3-}) and respective mean concentration are 10.3 mg/L, 0.23 mg/L, and 0.27 mg/L. The anions concentration in the samples are extremely low when compared to their FMEnv. limits as shown in Table 4.7. Generally, there was no significant difference in the values of these microelements' concentration across the samples; also, they do not exceed both the FMEnv. and WHO regulatory limits where stated.

Likewise, the groundwater macro nutrients (exchangeable cations) analysed are Sodium (Na), Calcium (Ca), Magnesium (Mg), and Potassium (K) and their averages across samples are 50.81 mg/l, 68.74 mg/l, 42.22 mg/l, and 3.90 mg/l, respectively. These elements are abundant

in the earth's crust aquatic environment and are very important elements required for optimal primary and secondary productivity. Nonetheless, their concentration maybe affected and could be disproportionate and constitute water quality concern. No elevated cation concentrations were recorded in the water samples when compared to the regulatory permissible limits.

4.1.5.2.4 Trace Metals Concentration

As shown in Table 4.7, eleven (11) metals were analysed/tested in the sampled groundwater to detect their pollution level or otherwise. Of these metals elements, it was only Iron (Fe) and Zinc (Zn) that were observed. The Fe concentration range from 0.10 to 1.22 mg/l and the overall mean was 0.53 mg/l. High Fe concentration were observed in Gummi well water (GW04) and Bani ga hannu community mechanical well water. The Fe concentration at these two location samples exceeded both the FMEnv. and WHO limits of 0.03 mg/l and 1.00 mg/l, respectively.

Similarly, the Zinc concentration range from 0.01 at GW 03 & GW04 to 0.03 (GW02); the overall Zn concentration however was 0.02 mg/l. Unlike the Fe, Zn concentration in the samples is moderate across samples and does not constitute pollution. In other words, the Zn concentration does not breach its regulatory limits of both FMEnv and the WHO. Metals such as Nickel (Ni), Arsenic (As), Vanadium (V), Copper (Cu), Lead (Pb), Mercury (Hg), Chromium (Cr), Manganese (Mn) and Cadmium (Cd) were not observed in any of the sample as their concentration were below their respective equipment resolution limits which range from <0.001 (for Cd, Cu, Ni, As, and V) to <0.004 (for Cr and Pb respectively). At the time of the study, it can therefore be noted that the project area ground waters are not polluted with heavy metals and activities that can pollute the study area groundwater from the proposed SAPZ program are not envisaged at any phase of the project development.

Table 4.8: Trace Metals, Anions and Nutrients in the Groundwater Samples

Sample Code	Metals(mg/L)											Anions and Nutrients(mg/L)						
	Fe	Zn	Cr	Pb	Cu	Cd	Ni	Mn	Hg	V	As	SO4 2-	NO3 -	PO3-	Na+	Ca2+	Mg2+	K+
GW01	1.12	0.02	<0.04	<0.04	<0.001	<0.001	<0.001	<0.03	<0.001	<0.01	<0.001	13.9	0.35	0.22	57.00	62.12	42.13	3.89
GW02	0.10	0.03	<0.04	<0.04	<0.001	<0.001	<0.001	<0.03	<0.001	<0.01	<0.001	7.1	0.23	0.28	42.12	63.47	43.09	3.15
GW03	0.12	0.01	<0.04	<0.04	<0.001	<0.001	<0.001	<0.03	<0.001	<0.01	<0.001	6.9	0.11	0.11	47.62	71.52	40.94	4.55
GW04	0.11	0.01	<0.04	<0.04	<0.001	<0.001	<0.001	<0.03	<0.001	<0.01	<0.001	9.2	0.24	0.23	52.32	69.562	45.84	3.75
GW05	1.22	0.02	<0.04	<0.04	<0.001	<0.001	<0.001	<0.03	<0.001	<0.01	<0.001	14.4	0.21	0.33	54.99	77.02	39.09	4.17
Mean	0.53	0.02	<0.04	<0.04	<0.001	<0.001	<0.001	<0.03	<0.001	<0.01	<0.001	10.3	0.23	0.27	50.81	68.74	42.22	3.90
FMEnv. Limit	0.03	5.0	0.1	0.05	1	NS	NS	NS	NS	NS	NS	500	10	5	200	200	NS	NS
WHO Limit	1.00	5.00	0.10	0.05	1.50	1.00	NS	NS	NS	NS	NS	400	50	NS	NS	75	30	NS

Source: Laboratory Results, March 2024

Table 4.9: Groundwater Sample Properties (In-Situ and Laboratory Results)

S/N	Sample Code	In-Situ Parameters									Physico-Chemical Properties				Microbial				
		pH	Temp. (^{0}C)	E.C (µS)	TDS (mg/L)	Sal. (ppt)	Res. (kΩ)	DO (mg/L)	TSS (mg/L)	Turb. (NTU)	Hard-ness	COD	Cl^-	O&G	THB	THF	THUB	THUF	E.coli(MPN/ 100mL)
											(mg/L)				(cfu/mL)				
1	GW01	8.30	25.0	27.0	17.1	0.01	37.4	2.2	0.00	0.10	34.2	3.44	32.55	<0.001	$1.13x10^3$	$3.3x10^2$	Nil	Nil	Nil
2	GW02	7.30	25.00	41.8	27.3	0.02	23.7	3.4	0.00	0.00	29.8	3.16	25.03	<0.001	$1.8x10^3$	$1.9x10^2$	$1.5x10^1$	$1.0x10^1$	$2.0x10^2$
3	GW03	7.70	25.00	60.6	39.4	0.03	16.6	2.42	0.00	0.00	24.2	4.02	33.28	<0.001	$1.9x10^3$	$1.7x10^2$	Nil	Nil	Nil
4	GW04	5.40	25.00	14.25	8.39	0.00	71.7	2.15	0.00	0.20	68.5	2.19	28.18	<0.001	$1.5x10^3$	$1.9x10^2$	Nil	Nil	$1.0x10^2$
5	GW05	7.60	25.00	58.8	34.80	0.04	46.4	2.10	1.60	0.80	59.0	5.11	21.72	<0.001	$1.1x10^3$	$3.8x10^2$	Nil	Nil	Nil
	Mean	7.26	25.0	40.49	25.40	0.02	39.16	2.45	0.32	0.22	43.42	3.58	28.15	<0.001	$1.6x10^3$	$2.4x10^2$	$0.7x10^1$	$0.5x10^1$	$0.8\ x10^2$
	FMEnv./ NSDWQ Limits	**6.5-9.2**	<40	250**	**500*** **	**NS**	**NS**	**7.5**	**NS**	**1.0**	**500**	**8.5***	**NS**	**NS**	**NA**	**NA**	**NA**	**NA**	**NA**

Source: Laboratory result, March 2024

*WHO-World Health Organization; FMEnv-Federal Ministry of Environment, NSDWQ- National Standard for Drinking Water Quality; NA- Not Available, NS- Not Stated, BH- Borehole; *** WHO Limit, **NSDWQ Limits; *FMEnv. Limit*

4.2.6 Soil Quality

Soil properties that are often studied include its mechanics, erodibility, and chemical compositions. As an agricultural project, the soil investigation for the planned project deliberately focused on its physio-chemical and nutrients properties for the baseline study. The quality (chemical composition) of soil is particularly essential for agriculture/crop cultivation. The physio-chemical characteristics of soil reflect the nature, properties, as well as the degree of interaction with other environmental components. It also reflects the potential and vulnerability of soil to extraneous factors. Generally, soil plays significant roles in man's quest for continuous agriculture/crop cultivation and sustainable development in the changing global climate reality. Land availability and soil fertility are crucial to the proposed SAPZ project, hence, the need to assess the existing soil environment of the project locations.

4.2.6.1 Soil Sampling Design and Field Activities

Soil samples were collected at each of the selected/proposed project sites at two depths (top and bottom). The topsoil was taken from the soil surface down to 15 cm while the subsoil was taken from 15 cm to 30 cm using a calibrated (marked) stainless steel soil auger. The soil sampling code, location coordinates and description of the condition of the sample station environment are presented in Table 4.8. Soil sampling spatial distribution is shown in Fig. 4.13 while field sampling activities are presented in Plate 4.4.

Also, appropriate quality assurance and quality control (QA/QC) measures were implemented during the sampling activities. The QA/QC measures included: regular cleaning of the soil auger after each sampling event to avoid cross-contamination, wrapping of soil sample in foil paper and separation of samples meant for microbiology. In addition, soil samples were properly labelled with a unique code to avoid a possible mix-up while in-transit particularly during the transportation of samples to the laboratory. Analysis of the soil samples was conducted at Environmental Accord Laboratory.

Table 4.10: Soil Sampling Locations and Description

Sample Code	Location	Long. (0 E)	Lat. (0 N)	Description of environment
SAPZ/ZMS/ESIA/SS1	Gidan Dawa	6.64403	12.21310	On a fallow land between the rail track and Gidan Dawa store
SAPZ/ ZMS/ESIA/ SS2	Maru	6.40052	12.32876	On grassland within the project site
SAPZ/ ZMS/ESIA/SS3	Yargeda	6.00085	12.57633	On fallow land within Yargeda warehouse premises
SAPZ/ ZMS/ESIA/SS4	Gummi	5.00033	12.57621	On fallow land opposite the training center in Gummi ZADP premises
SAPZ/ ZMS/ESIA/SS5	Bani ga hannu	6.56667	12.56667	On a fallow land adjacent to the project site

Source: Field Observation, March 2024

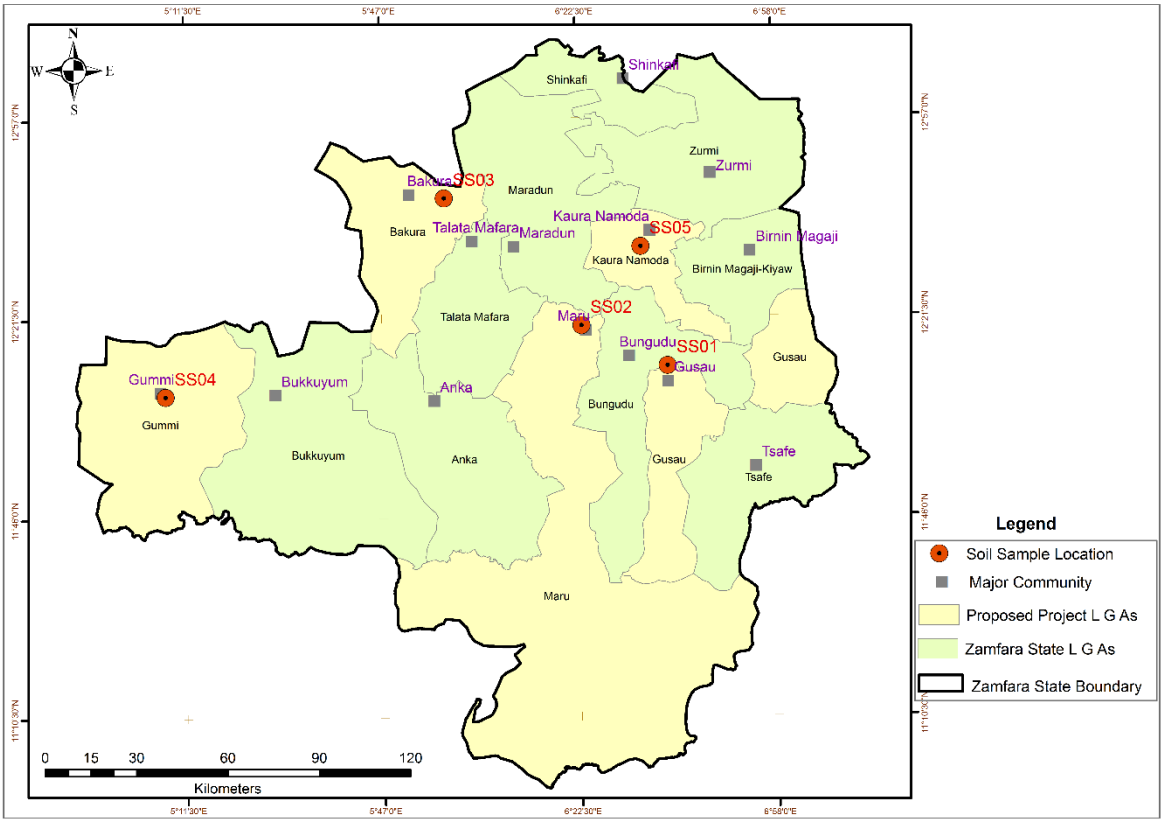


Figure 4.13: Soil sampling locations and distribution

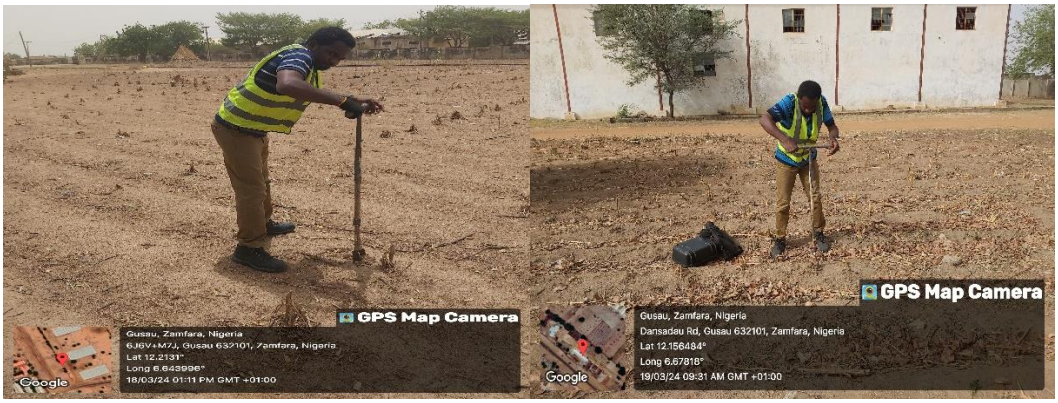


Plate 4.4: Soil Sampling Activities Field
Source: Fieldwork, March 2024

4.2.6.2 Soil Results and Discussion

4.2.6.2.1 Physicochemical Properties

Summary of the sampled soils laboratory analysis are shown in Table 4.11. As shown, the soil Hydrogen Ion (pH) Concentration ranged from 4.82 to 5.64 with an average of 5.13. Generally, the study area soils pH vary from very acidic to distinctly acidic based on soil pH classification as shown in Table 4.9. However, the observed pH values across the sites are

all within the limits (4.5 to 9.0) that support plant growth and crop yield in natural soil as stipulated by Alloway, 1991.

The observed electrical conductivity (EC) values in the samples ranged from 167.99 to 189.00 µS/cm with a mean of 180.99 µS/cm. The measured EC in the samples can said to be low when compared to maximum limit of 2000µS/cm stipulated by the FAO, 1974. In other words, the samples EC values do not contravene the recommended limit. Likewise, the total organic carbon (TOC) overall mean was 1.31%. It was only at SS4 & SS5 where the TOC values were within the medium range, other three location TOC concentration are low based on Udo 1986 soil organic matter classification (Table 4.10). Nonetheless, the TOC values are within the critical limit of 0.8% specified by Snapp (1998) for optimum yield in most arable crops. Organic matter plays a significant role in the dynamics of soils as it stores water, provides a living environment for organisms, and promotes structural stability, supplies, and stores nutrients. Invariably, the soils of the study possess the TOC need to support plant growth. This is evident as most of the soil samples were collected in fallow lands.

4.2.6.2.2 Soil Anions and Exchangeable Cations

The observed micro-nutrients (Anions) in the soil samples are Sulphate (SO_4^{2-}), Phosphate (PO_4^{3-}), Nitrate (NO_3^-), and Chloride (Cl^-) and their respective mean across the samples are 25.03 mgkg-1, 3.80 mgkg-1, 0.96 mgkg-1, and 49.8 mgkg-1. As shown in Table 4.11, none of this anion concentration exceeds the limits for non-polluted soil.

Mean concentrations of exchangeable cations of Na^+, Ca^{2+}, Mg^{2+}, and K^+ on the other hand are 73.11 $mgkg^{-1}$, 4.93 $mgkg^{-1}$, 1.99 $mgkg^{-1}$, and 22.66 $mgkg^{-1}$, respectively. These soil macro elements are highly needed in soil for productive crop yields. Largely, both the micro and macro nutrients concentration in the samples are within their specified limits. The availability or deficiency of exchangeable cation affects the vibrancy of soil flora. Consequently, the selected sites soils are fertile and possess necessary nutrients for plant growth and crop production, however, fertilizer application maybe required for optimal and maximum crop yields.

4.2.6.2.3 Heavy Metals Concentration

The presence of certain metals in soil indicates pollution that could affect plant's growth and human health, hence, the need to assess their presence or concentration as part of the baseline information. As shown in Table 4.11, eight (8) metals were analysed in the soil samples and they are Iron (Fe), Lead (Pb), Copper (Cu), Zinc (Zn), Manganese (Mn), Cadmium (Cd), Chromium (Cr), and Nickel (Ni).

As observed (lab analysis), it was only Fe, Cu, and Mn that were measured in the samples and their respective mean concentration are 8.25 $mgkg^{-1}$, 0.63 $mgkg^{-1}$, and 1.21 $mgkg^{-1}$. The concentration of the observed metals did not show any pollution on the project location soils. Hence, no intervention is required for normalization or restoration. Metals such as Pb, Cd, Cr, Ni, and Zn, analysed in the soil samples were below their respective equipment detection limits which ranged from <0.01 to <0.05 mgkg-1(Table 11).

As observed during the field data gathering exercises, almost all the proposed project sites are fallow land which indicates that they are productive and are used for farming activities.

In other words, the selected lands are productive for large scale farming/cultivation of crops particularly crops. Details of flora observed within and around the proposed project locations are discussed under the biological environment (vegetation and wildlife) section.

4.2.6.2.4 Soil Microbial

The observed soil microbial properties are Total Heterotrophic Bacteria (THB), Total heterotrophic fungi (THF), Hydrocarbon Utilizing Bacteria (HUB), and Hydrocarbon Utilizing Fungi (HUF) and their mean values are $5.7x10^4$ cfu/g, $5.4\ x10^3$ cfu/g, $4.2\ x10^2$ cfu/g, and $8.6\ x10^1$ cfu/g, respectively. Microbes are generally found in soil. The population of hydrocarbon degraders observed in the soil samples are relatively low, indicating non-hydrocarbon polluted environment.

Several parameters as outlined and discussed above are needed in appropriate proportion to determined soil quality and its capability to support plant growth. In variably, the study area soil conditions and their suitability for crop cultivation is not in doubt in Zamfara State, which makes it a suitable State for the SAPZ programme.

Table 4.11: Soil pH Range and Class

pH Range	Class
4.5-5.5	Very Acidic
5.5-6.0	Distinctly Acidic
6.0-7.0	Acidic
7.0	Neutral
7.0-7.5	Faintly Alkaline
7.5-8.0	Alkaline
8.0-8.5	Strongly Alkaline
8.5-9.0	Extremely Alkaline

Source: Udo (1986)

Table 4.12Organic Matter Classification

Organic (%)	Class
< 1.50	Low
1.50-2.50	Medium
>2.50	High

Source: Alloway (1991)

Table 4.13: Project Locations Soil Physio-chemical and Microbial Properties

Parameter		SS1	SS2	SS3	SS4	SS5	Mean	Limits
	pH	5.64	4.99	5.02	5.19	4.82	5.13	4.5 –9.0*
	E.C (µScm-1)	189.00	172.00	183.01	192.96	167.99	180.99	2000***
	Redox potential	13.6	12.4	13.2	13.0	12.9	13.02	NS
	TOC (%)	1.08	1.04	1.11	1.52	1.81	1.31	NS
Anions and Nutrients (mg/kg)	Ca^{2+}	4.83	3.89	4.11	5.82	6.02	4.93	NS
	Mg^{2+}	1.08	2.11	3.02	2.82	0.93	1.99	NA
	K^{+}	1.44	1.87	107	2.05	0.93	22.66	725***
	Na^{+}	71.28	84.11	70.06	69.57	70.54	73.11	NA
	SO_4^{2-}	23.29	31.81	22.89	24.05	23.11	25.03	300
	PO_4^{3-}	3.27	5.89	2.67	3.11	4.05	3.80	150
	NO^{3-}	0.49	1.22	0.75	0.33	2.02	0.96	NA
	Cl^{-}	49.97	52.67	48.78	46.56	51.02	49.8	250**
Metals	Fe	8.57	7.32	9.02	8.04	8.32	8.25	NS

(mg/kg)	Cu	0.11	0.32	0.78	0..91	1.31	0.63	500*
	Mn	1.29	2.07	0.54	1.10	1.07	1.21	NS
	Pb	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	20*
	Cd	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.3*
	Cr	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	NS
	Zn	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	50*
	Ni	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	50*
Microbial (cfu/g)	THB	$6.1x10^4$	$5.5x10^4$	$4.5x10^4$	$6.3x10^4$	$5.9x10^4$	$5.7x10^4$	NS
	THF	$5.3 x10^3$	$6.4 x10^3$	$4.7x10^3$	$5.1x10^3$	$5.5 x10^3$	$5.4 x10^3$	NS
	THUB	$4.2 x10^2$	$4.0x10^2$	$3.6x10^2$	$5.4x10^2$	$3.7 x10^2$	$4.2 x10^2$	NS
	THUF	$9.2x10^1$	$7.6x10^1$	$8.8x10^1$	$7.2x10^1$	$10.4x10^1$	$8.64x10^1$	NS

*NA- Not Available, NS- Not specified; *Alloway (1991); **Brady, (2002); ***FAO, 1974, ****FMEnv.*

Source: Laboratory Analysis, March 2024

4.2.7 Biological Environment

4.2.7.1 Vegetation Component

The study presents the comparative features of the vegetation cover of the selected sites for the proposed SAPZ in Zamfara State. Information on biological environment was gathered from five (5) different locations that were proposed/selected for the ATC and AIH. Primarily, the study focussed on capturing the floristic composition, species identity, profile of the vegetation types, vegetation forms and species distribution. All these were carried out with a view to fulfil one of the criteria for the donor agencies which among other include Islamic Bank, Africa Development Bank clearance and certification by National environmental regulatory body in Nigeria (FMEnv.).

The field study was complemented with a comprehensive review of literature, particularly Monographs, Floras and Textbooks, and examination of herbarium materials. During field work, site-specific samples of plants were collected for both *in-situ* and *ex-situ* determinations. In addition, some useful information on the plants and previous agronomic practices carried out on the sites before now were obtained through engagement with people that have adequate local knowledge and history of the study sites for physical determination. For clarity, brevity, readability and ease of reference, only highlights of results and highly essential items are included in the report.

4.2.7.2 Sampling Strategy

The sampling methods adopted for vegetation are in accordance with the acceptable international standards. Specifically, quadrats of different dimensions: 10m x 10m for grasses, 20m x 20m for herbs, 50m x 50m for shrubs and 100m x 100m for trees were adopted for the intensive and detailed study of the vegetation around the proposed project locations. Within the quadrats, various vegetation and flora characteristics were assessed and documented.

4.2.7.2.1 Data Acquisition and Analysis

Results presented in this study are drawn from five (5) sources; these sources of information/data are literature review, field investigations, laboratory analysis, herbarium visitations and verbal questioning. The field work was primarily for *in-situ* determinations and the collection of plant samples for laboratory analyses. The grid coordinates of each sampling location were determined with the aid of a hand-held Global Positioning system (GPS) equipment. All plant species in each quadrat were identified to generic and species levels.

The standard methods adopted are as provided by National and International Regulatory bodies. Adequate quality control and quality assurance measures were taken at every stage of the study. Strategic collection of plant samples was conducted while in-situ and ex-situ identification of these specimens were carried out in the field and herbarium using appropriate Floras, Manuals and Monographs. Basically, flora assessment of the area was conducted with a view to providing unambiguous information on the following:

- Floristic composition
- Species identity
- Plant forms
- Presence or absence of species

4.2.7.3 Description of Vegetation Cover

Spermatophytes dominated the proposed site locations with the predominance of the dicotyledons. The area is in the semi-arid region possessing thorn scrub vegetation which is a degraded stage of the tropical dry forests, modified by human and livestock use over hundreds of years and dispersed grasses. The incident plant types recorded within the sampling locations are presented in Table 4.12. There was sparse distribution of thorny scrubs, scanty of trees and distribution of herbaceous and graminaceous species in many parts of the sites. Loss of vegetation is attributed to grazing animals, clearing processes especially for agricultural practices. The composition of the incident species is presented in Table 4.12.

Saccharum officinarum was observed dominating the river bank of Zamfara River in Gummi area while *Hyparrhenia* sp. and some unidentified dried grass dominated the project area. Tree species noted include *Acacia* sp., *Bauhinia rufescens, Azadirachta indica* and *Adansonia digitata*. The most prominent anthropogenic activities influencing species diversity within the area is the subsistence farming activities within the area which is a major source of livelihood for the locals. Species mostly cultivate to generate income include the common grains; *Zea mays*, *Sorghum bicolor*, and edible vegetable; *Hibiscus sabdariffa, Lactuca sativa*, *Abelmoschus esculentus, Allium fistulosum*, *Solanum lycopersicum*, and *Solanum macrocarpon* (**Plates 4.5 and 4.6**). Hence, the vegetation within the area is said to have been modified.

Numerically, about forty-one (41) species were identified across the project sites and they were broadly grouped into seventeen (17) families (**Table 4.12**). As shown in Fig.4.14, the richest plant families were Malvaceae having 8 taxa followed by Poaceae with 6 taxa, while

Fabaceae, Asteraceae, and Solanaceae has five (5) and three 3 taxa, respectively. Furthermore, Fig.4.15 shows that the most dominant lifeform/habit were herbs ≤ 48% (15 species), shrub ≤ 18.92 (7 species each), grass ≤ 16.22 (6 species each), and tree ≤ 13.51% (5 species). Generally, herbs and grasses have the largest cover in terms of species population.

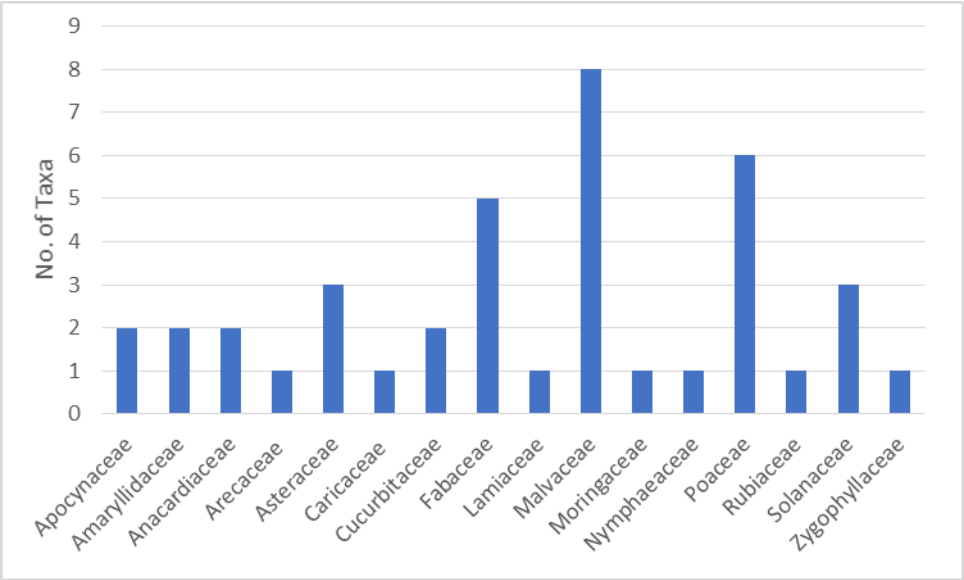


Figure 4.14: Family distribution within the study area

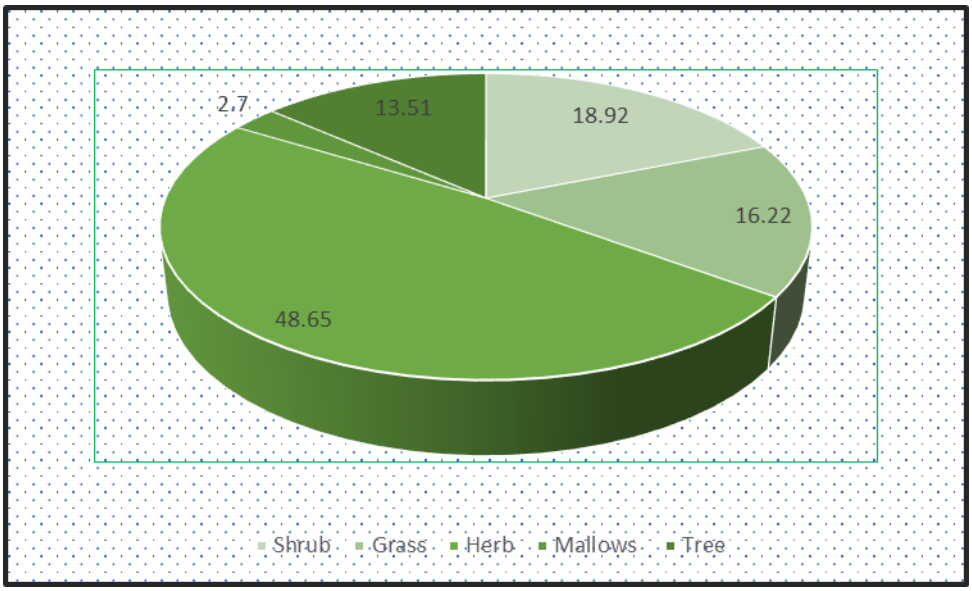


Figure 4.15: Composition of plant specifies habitat

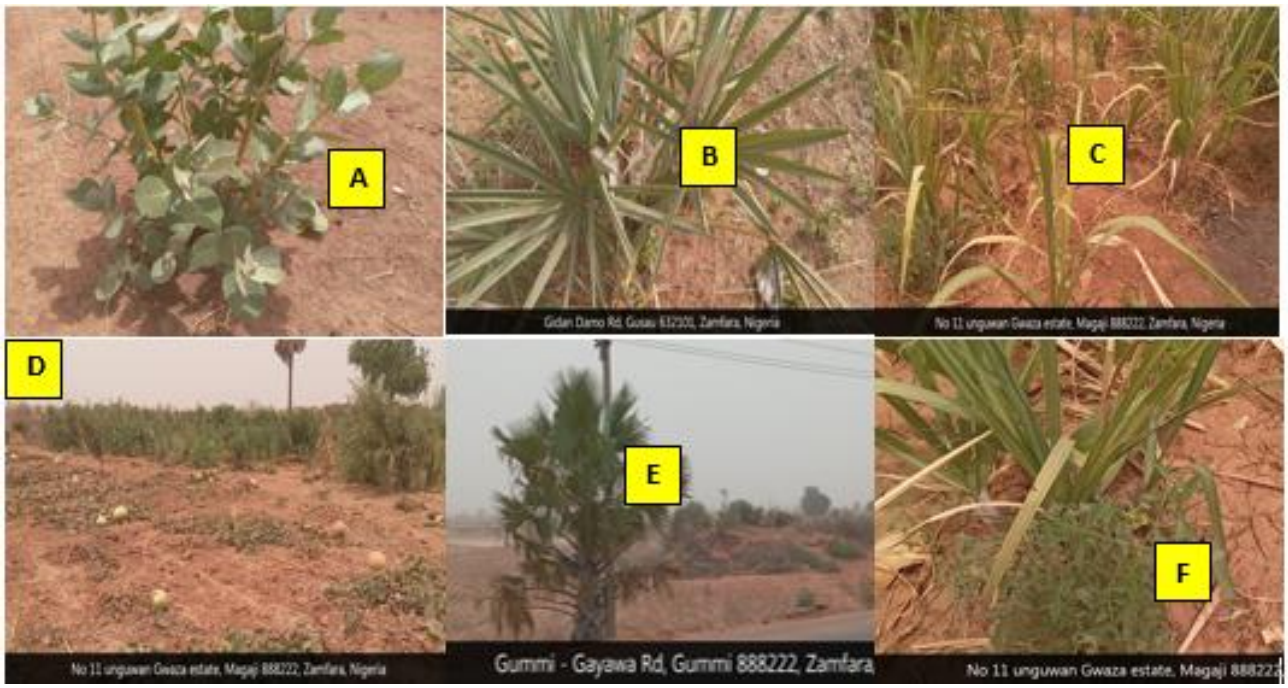


Plate 4.5: A- ***Calotropis procera;*** **B-*Ananas comosus;* C-*Saccharum officinarum;* D-** ***Citrus lanatus;*** **E-** ***Phoenix dactylifera*****; F-*Solanum lycopersicum***
Source: Fieldwork, March 2024

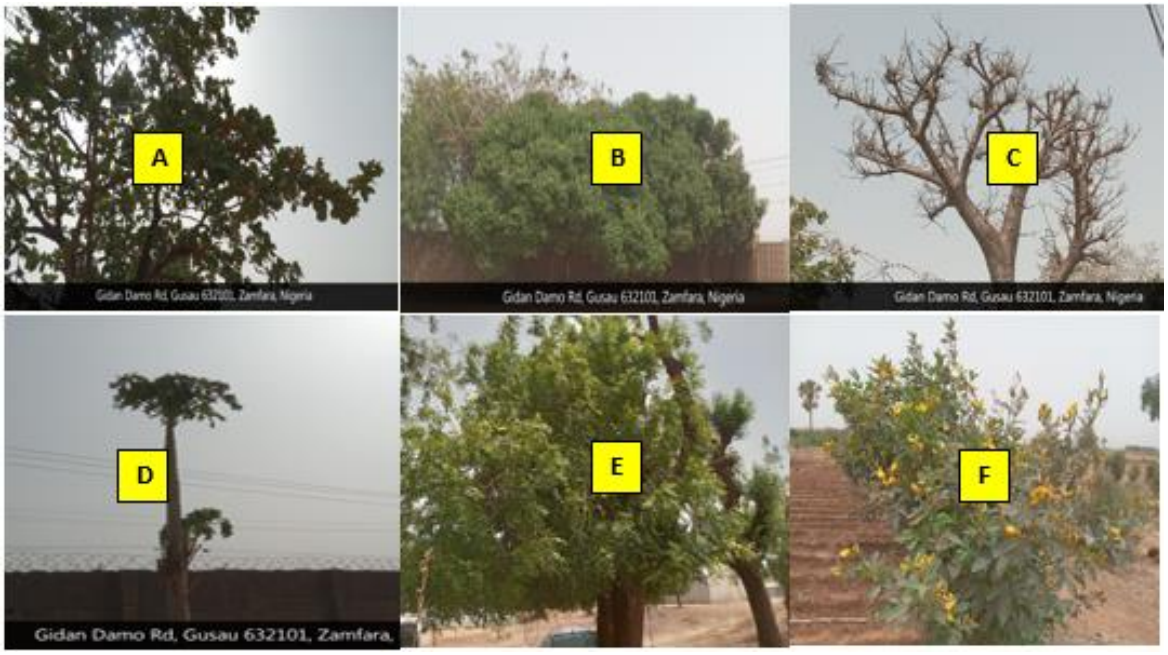


Plate 4.6: A- ***Anacardium occidentale;*** **B-*Mangifera indica ;* C-** ***Walteria indica;*** **D-*Carica papaya;* E-** ***Azadirachta indica*****; F-*Glycine max***
Source: Fieldwork, March 2024

4.2.7.3.1 Uses of the Encountered Plants and their Conservation Status

The reported plants have food, medicine and cosmetic importance as indicated on the Table that follows. Majority of their uses have been harnessed by factories for material

commercial production. Similarly, they are used at the local level by the native people on daily basis. However, considering the manner of usage and populations vis-à-vis their widespread and localization in the Sahel Sudan and arid environments which are the preferred ecosystems of these plants, they do not fall in the serious threat categories of the International Union for the Conservation of Nature (IUCN). The various categories are shown in the Table 4.12.

4.2.7.3.2 Conservation Status

Conservation status assessment is an important requirement when gathering ecological baseline data for an ESIA study. Information from such process is valuable in decision-making in terms of species and habitat critical protection and/or restoration. The assessment does not only review the presence or absence of vulnerable plant taxa (endangered or critically endangered species) that are of conservation interest in the study area, it also reviews potential critical habitats within such environment.

The conservation statuses of plant taxa recorded were determined using the International Union for Conservation of Nature (IUCN) Red List web-interface (version 2023-1). The IUCN categories against which the species were assessed include; Not Evaluated **(NE)**, Data Deficient **(DD)**, Least Concern **(LC)**, Near Threatened **(NT)**, Vulnerable **(VU)**, Endangered **(EN)**, Critically Endangered **(CR)**, Extinct in the Wild **(EW)**, and Extinct **(EX)**.

The assessment reviews that species recorded in the study area are classified into two IUCN categories (**Table 4.12**). However, none of the taxa recorded were of conservation significant as no endangered species was encountered. The findings of the assessment include;

- **Not Evaluated (NE)** species made up 57.5% (23 species); while
- **Least Concerned (LC)** species were 42.5% (17 species)

Therefore, none of the plants identified or within the project environment are on the IUCN red list of endangered species.

Table 4.14: Species Distribution across the Study Areas

S/N	Scientific Name of Encountered Species	Family	Habit	Common Name	IUCN Status	Economic Importance
1	*Calotropis procera*	Apocynaceae	Shrub	Apple of Sodom	LC	Use in cheese production
2	*Saccharum officinarum*	Poaceae	Grass	Sugar cane	NE	Source of Food/income
3	*Citrus lanatus*	Cucurbitaceae	Herb	Water melon	NE	Source of Food/income
4	*Phoenix* dactylifera	Arecaceae	Palm	Date palm	LC	Source of Food/income
5	*Solanum lycopersicum*	Solanaceae	Herb	Tomato	NE	Source of livelihood
6	*Anacardium occidentale*	Anacardiaceae	Tree	Cashew	LC	Source of Food/income
7	*Mangifera indica*	Anacardiaceae	Tree	Mango	LC	Source of Food
8	*Walteria indica*	Malvaceae	Mallows	Baobab	LC	Timber
9	*Carica papaya*	Caricaceae	Herb	Pawpaw	NE	Source of Food
10	*Azadirachta indica*	Meliaceae	Tree	Neem Tree	LC	Leaf is used as a local herb
11	*Oriza sativa*	Poaceae	Grass	Rice	NE	Source of Food
12	*Pennisetum gaucum*	Poaceae	Grass	Millet	NE	Source of Food
13	*Allium cepa*	Amaryllidaceae	Herb	Onions	NE	Source of Food

14	*Glycine max*	Fabaceae	Shrub	Soya beans	NE	Source of Food
15	*Abelmoschus esculentus*	Malvaceae	Shrub	Okra	NE	Source of Food
16	*Acacia sp.*	Fabaceae	Shrub	-	NE	-
17	*Adansonia digitata*	Malvaceae	Tree	Baobab	NE	Tree produces edible leaf
18	*Ageratum conyzoiodes*	Asteraceae	Herb	Billy goat weed	LC	Fodder, medicinal herb, and insect repellent
19	*Allium fistulosum*	Amaryllidaceae	Herb	Spring onions	NE	Edible vegetable
20	*Arachis hypogaea*	Fabaceae	Herb	Groundnut	NE	Edible seeds, when sold serve as a source of income for the locals
21	*Balanites aegyptiaca*	Zygophyllaceae	Shrub	Desert date	LC	-
22	*Bauhinia rufescens*	Fabaceae	Tree	-	LC	The leaf of the tree is gathered for medicinal use
23	*Calopogonium mucunoides Desv.*	Fabaceae	Climbers	Calopo	NE	Medicine: Powdered tuber for treating facial skin blemishes.
24	*Capsicum frutescens*	Solanaceae	Herb	Bird Pepper	LC	Produce edible fruit
25	*Citrullus colocynthis*	Cucurbitaceae	Creeper	Bitter apple	NE	Produce medicinal fruit
26	*Hibiscus sabdariffa*	Malvaceae	Shrub	Roselle	NE	Leaf serves as a source of food and flowers for making Zobo drink
27	*Hyparrhenia sp.*	Poaceae	Grass	-	NE	For thatching the roof.
28	*Lactuca sativa*	Asteraceae	Herb	Lettuce	NE	Edible vegetable
29	*Leptadenia pyrotechnica*	Apocynaceae	Herb	Broom brush	LC	-
30	*Leucas deflexa*	Lamiaceae	Herb	-	NE	-
31	*Mitracarpus hirtus L. DC.*	Rubiaceae	Herb	Tropical girdlepod	NE	Whole plant used to treat venereal diseases, skin diseases, and antidote for bites and stings
32	*Moringa oleifera*	Moringaceae	Shrub	Drumstick tree	LC	Medicinal
33	*Nymphaea lotus*	Nymphaeaceae	Herb	White Egyptian lotus	LC	-
34	*Sida acuta Burm. F.*	Malvaceae	Herb	Wire weed	LC	Medicine: for treating urinary disease.
36	*Solanum macrocarpon*	Solanaceae	Herb	Garden Egg	NE	Source of livelihood
37	*Sorghum bicolor*	Poaceae	Grass	Sorghum	LC	Source of livelihood
38	*Tridax procumbens L.*	Asteraceae	Herb	Coatbuttons	NE	Medicine: used for wound healing / Fodder plant
39	*Urena lobata L.*	Malvaceae	Herb	Caesarweed	LC	Medicine: used for treating skin diseases.
40	*Walteria indica*	Malvaceae	Herb		NE	Fodder crop
41	*Zea mays*	Poaceae	Grass	Maize	LC	Source of livelihood

IUCN – International Union for Conservation of Nature
S/N – Serial Number

Source: Fieldwork, March 2024

4.2.7.4 Fauna Distribution

The faunal diversity of the area was categorized based on habitat requirement, niche differentiation and energy pathways (food chain). They are disturbed at different levels of vegetation, i.e. on herbs, trees, shrubs and decaying vegetation. The site area wildlife was reducing based on development (clearing of vegetation for other uses), and among the reptiles encountered are lizards (*Agama agama*) and reported in the area are different species of reptiles. Seven groups (Reptilia, Avian, Amphibians, Mammals, Insecta, Arthropoda and Annelida) of fauna were observed (Table 4.13) at the study locations, avifauna were recorded as the dominant group. Invertebrates encountered were butterfly, ants, termites, millipedes (*Archispirostreptus* sp.), centipedes (Chilopoda) and earthworm. Invertebrate fauna was diverse and consisted of forest inhabitant species, butterflies and grasshoppers (*Acridomorha* sp.). The observed Agama lizard and Cattle egret during the filed sampling activities are shown in Plates 4.7 and 4.8. Some of these wild creatures, particularly the reptiles may be affected by the proposed project development in area where more land will be required for facility constructions.

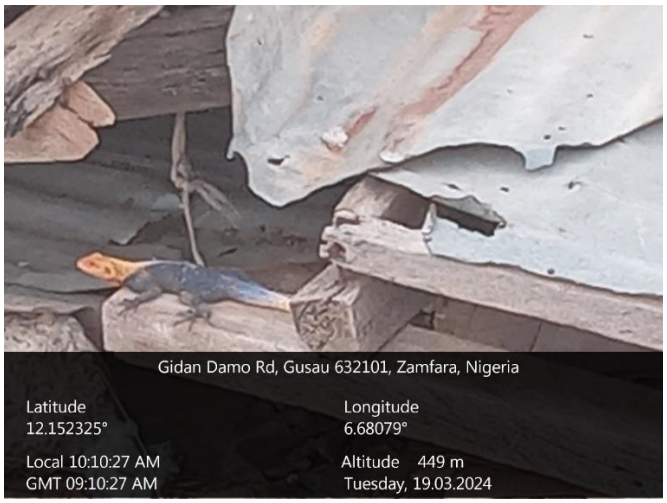


Plate 4.7: Agama lizard (Agama Agama) observed at Gusau AIH project location
Source: Fieldwork, March 2024

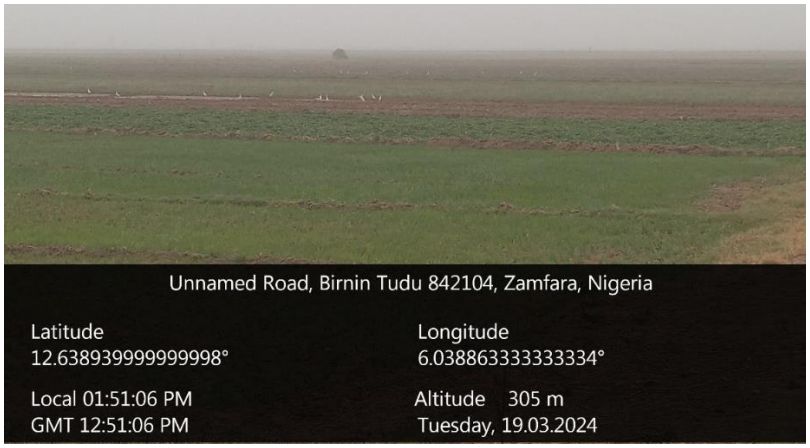


Plate 4.8: Cattle Egret (*Bubulcus ibis*) on cultivated farmland around Yargeda project Site
Source: Fieldwork, March 2024

Table 4.15: List of Fauna around the Proposed Project Locations

S/N	Common names	Scientific name	Family	Estimate of abundance	IUCN status
	REPTILIA				
1	Chameleon	*Chamaeleo* sp.	Chamaeleonidae	Very few	L C
2	Cobra	*Naja melanoleuca*	Viperidae	Few	L C
3		*Bitis gabonica*	Viperidae	Few	L C
4	Python	*Python sebae Python regius*	Pythonidae	Few	L C
5	Rough green, snake	*Opheodrys aestivus*	Pythonidae	Very few	L C
6	Monitor Lizard	*Varanus niloticus*	Varanidae	Few	LC
7	Agama lizard	*Agama agama*		Numerous	L C
	AVIAN				
8	Bush fowl	*Francolinus bicalcaratus*	Phasianidae	Numerous	LC
9	African Barn Owl	*Tyto alba*	Tytonidae	Numerous	LC
10	Little African Swift	*Apus affinis*	Apodidae	Numerous	LC
11	African Palm Swift	*Cypsivurus parvus*	Apodidae	Few	LC
12	Senegal coucal	*Centropus senegalensis*	Cuculidae	Few	LC
13	Village weaver	*Ploceus cucullatus*	Ploceidae	Numerous	LC
14	Grey parrot	*Psittacus erithacus*	Psittacidae	Few	LC
15	Cattle egret	*Ardeola ibis*	Ardeidae	Few	LC
16	Black Kite	*Muluus migrans*	Accipitridae	Few	LC
17	Purple heron	*Ardea purpurea*	Ardeidae	Numerous	LC
18	African hawk eagle	*Aquila spilogaster*	Accipitridae	Numerous	LC
19	Little sparrow Hawk	*Accipiter erythropus*	Accipitridae	Few	LC
20	African green fruit pigeon	*Treton calvus*	Columbidae	Numerous	LC
21	Speckle pigeon	*Columba guinea*	Columbidae	Few	LC
22	Heron	*Butorides striatus*		Numerous	LC
23	Woodland Kingfisher	*Halcyon senegalensis*		Few	LC
24	Palm swift	*Cypsium spariuus*		Numerous	LC
25	Common Bulbul	*Pycnonotus barbatus*		Numerous	LC
	AMPHIBIANS				
26	Frog	*Dicroglssus* sp.		Few	LC
27	Frog	*Ptychadaena* sp.		Few	LC
28	Toad	*Bufo rugularis*	Bufonidae	Few	LC
29	Toad	*Xenopolis* sp.	Pipidae	Few	LC
	MAMMALS				
30	Tree squirrel	*Myosciurus pumilio*	Sciuridae	Few	L C
31	African giant rat	*Cricetomys emini*	Nesomyidae	Numerous	L C
32	Ground squirrel	*Xerus erythropus*		Few	L C
33	Grass cutter	*Thryonomys* swinderianus	Thryonomyidae	Few	L C
34	Bat	*Lasiurus* sp.	Canidae	Few	L C

35	Monkey	*Macaca* sp.	Cercopithecidae	Few	L C
36	Cattle	*Bos* sp.	Bovinae	Numerous	L C
37	Dog	*Canis lupus*	Canidae	Numerous	L C
38	Donkey	*Equus africanus asinus*	Equidae	Numerous	L C
39	Cow	*Bos taurus*	Bovidae	Numerous	L C
40	Camels	*Camelus* sp.	Camelidae	Numerous	L C
41	Horse	*Equus caballus*	*Equidae*	Numerous	L C
42	Ram	*Ovis aries*		Numerous	L C
	INSECTA				
39	Butterfly	*Danaus* sp.	Nymphalidae	Numerous	L C
40	Red patch butterfly	*Chlosyne rosita*	Nymphalidae	Numerous	L C
41	White patch butterfly	*Chiomara asychis*	Hesperiidae	Numerous	L C
42	Moth	*Chrysiridia rhipheus*	Uraniidae	Numerous	L C
43	Soldier Ants, Black ants	*Neivamyrmex* sp. *Monomorium* sp.	Formicidae	Numerous	L C
44	Termites	*Macrotermes* sp.	Termitidae	Numerous	L C
45	Grasshopper	*Acridomorha* sp.	Romaleidae	Numerous	L C
46	Long horned grasshopper	*Tettigonia viridissima*	Tettigoniidae	Numerous	L C
47	Dragon fly	*Acanthaeschna victoria*	Aeishnidae	Numerous	L C
48	Cricket	*Gryllus* sp.	Gryllidae	Numerous	L C
49	Giant Wasps	*Vespa* sp.	Vespidae	Numerous	L C
50	Tsetse fly	*Glossina fusca*	Glossinidae	Numerous	L C
51	Praying Mantis	*Mantis sp.*	Mantidae	Few	L C
52	Giant African mantis	*Sphodromantis viridis*	Mnatidae	Few	L C
53	Africa cotton stainer	*Dysdercus fasciatus*	Pyrrhocoridae	Numerous	L C
54					
	ARTHROPODA				
55	Millipedes	*Archispirostreptus* sp.	Spirostretidae	Numerous	L C
56	Centipedes	*Scutigera* sp.		Numerous	L C
	ANNELIDA				
57	Earthworm	*Lumbricus terrestris*	Acanthodrilidae	Numerous	L C

Source: **Interviews, Report on Wildlife, &** ***Fieldwork, March 2024***

4.3 Socio-economic Environment

This section discusses themes and topics on population, land use, planned development activities, settlement and community structures, employment, distribution of income, goods, and services, recreation, health, and cultural properties as they are concerned with the project area. Specifically, the section entails a detailed discussion of the following:

- Socio-Economic Assessment: Analysis of existing livelihood opportunities, income, gender characteristics, age profile, health, transport access, existing community structures at the watershed, community, household, and individual levels etc.
- Gender-Based Violence: Analysis of the status of GBV/SEA in the project community and related issues;

- Grievance Redress Mechanism: Analysis of existing formal and informal grievance redress mechanisms in and around the intervention area;
- Public Consultation: Presentation of consultations with relevant stakeholders and affected persons.

4.3.1 Population Characteristics of the Project Area

Zamfara State has a population of 3,278,873, with a projected population of 5,833,500 for the year 2022. The population growth is +3.4%/year (2006 - 2022), with a density of approximately 82/km^2 and a total land area of 39,762km^2.

Table 4.16: Zamfara State Population Size (Estimation) and Projection

	Year	Total
Zamfara State	2006	3,278,873
	2022	5,833,500

***Source*: National Bureau Statistics (2012)**

Based on the 2006 census figures and as contained in tables 4.17, 4.18, 4.19 and 4.20, the population of Zamfara state comprise of 50.07% male and 49.93% female. The age distribution showed that 47.97% are between 0 -14 years while 49.19% are between 15-64 years with only 2.84% 65 years and above. This population dynamics provide a good advantage to Zamfara state with huge youthful population and less than 3% elderly showing dependency ratio of about 1 and hence a lower social support system. The distribution between male and female also calls for an increased role for the women folks.

Table 4.17: Zamfara State Population (1991 - 2006 - 2022)

S/N	Population Across LGAs	Population Census 1991-11-2	Population Census 2006-03-2	Population Projection 2022-03-2
1	Anka	...	143,637	255,500
2	Bakura	126,865	187,141	332,900
3	Birnin Magaji	...	184,083	327,500
4	Bukkuyum	121,069	216,348	384,900
5	Bungudu	189,783	258,644	460,200
6	Gummi	...	206,721	367,800
7	Gusau	259,336	383,712	682,700
8	Kaura Namoda	...	285,363	507,700
9	Maradun	131,423	207,563	369,300
10	Maru	...	293,141	521,500
11	Shinkafi	...	135,964	241,900
12	Talata Mafara	138,844	215,650	383,700
13	Tsafe	163,512	266,929	474,900
14	Zurmi	176,683	293,977	523,000
	Zamfara	2,051,591	3,278,873	5,833,500
	Source: National Population Commission of Nigeria (web), National Bureau of Statistics (web)			

Table 4.18: Gender Distribution (2006 Census Figure)

Gender	Total Population	%
Males	1,641,623	50.07
Females	1,637,250	49.93
Total	3,278,873	100.00
Source: National Population Commission of Nigeria (web), National Bureau of Statistics (web)		

Table 4.19: Age Distribution (C 2006)

Age Range	Total Population	%
0-9 years	1,215,042	37.06
10-19 years	672,714	20.52
20-29 years	539,415	16.45
30-39 years	359,844	10.97
40-49 years	214,693	6.55
50-59 years	128,463	3.92
60-69 years	72,771	2.22
70-79 years	41,511	1.27
80+ years	34,420	1.05
Total	3,278,873	100.00
Source: National Population Commission of Nigeria (web), National Bureau of Statistics (web)		

Table 4.20: Age Groups (C 2006)

Age Group	Total Population	%
0-14 years	1,572,822	47.97
15-64 years	1,613,022	49.19
65+ years	93,029	2.84
Total	3,278,873	100
Source: National Population Commission of Nigeria (web), National Bureau of Statistics (web)		

4.3.2 Common Demographic Characteristics of Sampled Population4.3.1.1 Common Demographic Characteristics of Sampled Population

Table 4.19 gives a description of the most common demographic characteristics of the respondents in the study community. Demographic variables such as respondent's gender, age, marital status, religion, household size, occupation and ethnic group are described. This information would present an understanding of the profile of the respondents in the project community.

Table 4.21: Respondent's Demographic Characteristics

Indicators	Options	Respondents (%)						Summary of Findings
		Bani Ga Hannu	Gidan Dawa	Gummi	Maru	Yargeda	Average	
Gender	Male	100	50.0	100	50.0	40.0	62.0	Male (62%) respondents outnumber female respondents (38%) across the project sites, reflecting the predominance of males in farming and field cropping operations, while females are limited to the processing of produce.
	Female	0.0	50.0	0.0	50.0	60.0	38.0	
Age (years)	18-45	75.0	75.0	60.0	50.0	60.0	64.0	Respondents within the age bracket of 18-45 years (64%) account for the highest proportion in the sample population, followed by a few within 46-65 years (36%). This implies that there is a youth population in
	46-65	25.0	25.0	40.0	50.0	40.0	36.0	

								the project area and the potential availability of an active workforce.
Marital status	Single	50.0	0.0	0.0	0.0	0.0	10.0	Married respondents make up 90% while singles constitute 10%. The dominance of married individuals signals stability, potential population growth, and maturity in the project area, reducing the likelihood of youth-related challenges during project implementation.
	Married	50.0	100	100	100	100	90.0	
Religion	Islam	100	100	100	100	100	100	Islam prevails at 96% in the communities. This homogenous religious landscape highlights the clear understanding and respect among community members to promote social cohesion and prevent conflicts.
Household size	Less than 5	0.0	0.0	20.0	0.0	0.0	4.0	Respondents report common household sizes, with 41% falling in the range of 6-10 members, 37% have above 16 persons living in their household, 18% having between 11 – 15, 4% has less than 5 family members. This suggests the potential for a substantial labour force within families, enabling distributed farm work and increased productivity.
	6-10	50.0	25.0	20.0	50.0	60.0	41.0	
	11-15	25.0	0.0	20.0	25.0	20.0	18.0	
	16 and above	25.0	75.0	40.0	25.0	20.0	37.0	
Ethnic	Hausa	100	100	80.0	100	60.0	88.0	The communities are mostly made up of the Hausa ethnic group (45.0%) and Fulani (12%). This indicates robust cultural diversity. Planning a project in this community requires cultural sensitivity, effective communication, and alignment with respective values of each ethnic group to ensure successful implementation.
	Fulani	0.0	0.0	20.0	0.0	40.0	12.0	
Education	No formal education	0.0	0.0	0.0	100	0.0	20.0	A person's level of education ensures his or her awareness and necessary knowledge of basic projects and activities carried out in one's environment. Most respondents (37%) have senior secondary school leaving certificates, 27% have primary school leaving certificates, 19% have obtained tertiary degrees (OND/HND/NCE) and 17% are university graduates. Those with no formal education account for 20%. Fair literacy level in the project areas will enable the farmers understand new techniques and improvement related to their operations. Also, the literacy level in the project area could be exploited for ease of communication that could facilitate mutual understandings.
	Primary school	25.0	0.0	20.0	50.0	40.0	27.0	
	Secondary school	0.0	75.0	0.0	50.0	60.0	37.0	
	Tertiary (Excluding university)	50.0	25.0	20.0	0.0	0.0	19.0	
	University Graduate	25.0	0.0	60.0	0.0	0.0	17.0	
Occupation	Farmers	50.0	50.0	40.0	75.0	80.0	59.0	The main occupation of respondents in the project communities is farming (59%). Their farming practices involve livestock and cultivation of crops such as rice, millet, maize, soybeans, sorghum amongst others. Proper care must be taken to reduce the impact of the project on farms as it is the main source of livelihood to most respondents.
	Employed (Salary)	25.0	0.0	20.0	0.0	0.0	9.0	
	Civil Servant	25.0	0.0	40.0	0.0	0.0	13.0	
	Unemployed	0.0	50.0	0.0	25.0	0.0	15.0	
	Others specify	0.0	0.0	0.0	0.0	20.0	4.0	
Residency period/ Status	Permanent resident	100	100	100	100	80.0	96.0	Most of the respondents (96%) are permanent residents in the project communities and have lived more than 10 years in their communities. This implies that they have stayed long enough to provide reliable information regarding the socio-economic condition of the project communities.
	Back Home (Returnee)	0.0	0.0	0.0	0.0	20.0	4.0	

4.3.3 Socio-Economic Assessment

The Socio-Economic Assessment covers income characteristics, healthcare, housing, assets, communication, transportation, standard of living, and social services. It delves into cultural practices, environmental factors, livelihoods, and community development initiatives. The assessment highlights challenges and opportunities, considers community influence, positive

and negative impacts of the project. and concludes with actionable recommendations for improvement

4.3.3.1 Income Characteristics of Sampled Population

The study indicates that (50%) of respondents in the Bani ga Hannu community earn N200,000 monthly. About 25% of the sampled population earn N30,000, while 25% earn between N70,000 - N80,000, respectively. Additionally, 25% of respondents receive monthly remittances of N80,000 from family members living outside the communities, while 75% rely primarily on their income. In the Gidan Dawa community, 50% of the respondents earn monthly incomes falling within N30,000- N40,000, and 50% earning between N50,000- N60,000. All the respondents indicated they do not receive remittances from a family member living elsewhere.

According to the respondents, in Gummi, 40% earn monthly incomes of N30,000 while 40% earn N40,000 and 20% earn N250,000 monthly. All the respondents indicated they do not receive remittances from a family member living elsewhere. In Maru, 25% of respondents report earning N26,000 monthly. Those earning between N50,000, N60,000 and N300,000 account for 25% each of the sampled population. Notably, 50% of respondents in the sampled population rely solely on their monthly income, with no identified additional sources, while 50% receive between N20,000- N35,000 as monthly remittances.

In Yargeda, 40% of respondents report monthly earnings between N60,000-N70,000, while those who earn between N90,000 - N100,000 account for 40% and 20% of the sampled population earn N300,000 monthly. This suggests that farming is a lucrative venture in the state. Notably, only 40% of the respondents claim to receive monthly remittances between N10,000- and N20,000 from family members, while 60% rely solely on their monthly income, as none receive remittances from family members elsewhere.

4.3.3.2 Housing Characteristics

In Bani ga Hannu (75%) of residents use plastered mud blocks, while (25%) use cement blocks, suggesting that a significant portion of the community utilizes more durable and modern building materials. The roofing materials are corrugated iron (75%) and aluminium (25%). A high proportion (50.0%) of the respondents indicated that their floors were made of concrete, while others stated (25%) earthen materials and tiles (25%). Pit latrines and pier latrines are equally prevalent, each accounting for 75% and 25%, respectively. As for the Number of rooms in each household, 3-4 represent (75%) while those living in 1-2 represent (25%). Regarding housing tenure, 50% of the sampled population indicated they own the land and houses, while 50% live on rented land and apartments.

In Gidan Dawa, (75%) of residents use cement blocks for walls, while (25%) prefer plastered mud, indicating a choice between traditional and modern building materials. The roofing materials are corrugated iron (50%) and aluminium (50%). Notably, 75% of respondents have concrete floors, while 25% use earthen materials. Regarding toilet facilities, (50%) use it as a water closet, while 50% use it as a pier latrine. Regarding household size, 3-4 rooms are predominant at 75%, with 25% representing 1-2 rooms. Other structures on the plot include animal granaries (25%) and shops (25%), while 50% indicate

the absence of additional structures. Housing tenure reveals that 50% of the sampled population owns land and houses, 25% rent land and apartments and 25% enjoy rent-free accommodation.

In Gummi, all the respondents (100%) indicated using cement blocks for wall construction. Roofing materials consist primarily of corrugated iron (40%), while 60% opt for aluminium. All of the respondents (100%) use concrete for flooring. Common toilet facilities include a pier latrine (100%), as indicated by the respondents. As indicated by all the respondents, the household sizes of 3-4 rooms (100%) are common. Concerning housing tenure, all the respondents (100%) indicated they own both land and houses occupied.

In Maru, 50% of residents use plastered mud for walls, while 50% use cement blocks. Roofing materials indicated by all the respondents include corrugated iron (100%). About (50%) of respondents have earthen materials, while 50% prefer concrete materials for flooring. Toilet facilities indicated are Pit latrines (75%) and pier latrines (25%). Regarding household sizes, 1-2 rooms are prevalent at 75%, while 25% represent 3-4 rooms. Additional structures, such as animal granaries, are present in 25% of cases, while 75% indicate the absence of other structures. Regarding housing tenure, 50% of the sampled population owns land and houses, 25% rent land and apartments, and 25% occupy rent-free accommodation.

In Yargeda, 80% of the respondents use plastered mud, while 20% use cement for their walls. Roofing materials are mostly corrugated iron (60%), with 40% using aluminium. A significant proportion (60%) of residents use concrete floors, while 40% have earthen materials. Toilet facilities indicated are Pit latrines (100%). Concerning household sizes, 1-2 rooms are prevalent at 60%, while 40% represent 3-4 rooms. All the respondents indicated the absence of other structures on the land. Regarding housing tenure, 60% of the sampled population owns land and houses, 20% rent land and apartments, and 20% enjoy rent-free accommodation.

Plate 4.9 Housing type in the project area

4.3.3.3 Household Solid Waste Management

Figure 4.16 shows the various household waste management methods adopted in the project communities. For waste management in Bana ga Hannu, 75% of respondents deposit refuse in the backyard of their houses, while 25% prefer burning waste after the gathering. Burning safe refuse in the community poses environmental risks, releasing harmful pollutants and contributing to health hazards and climate change. To mitigate these issues, promoting waste segregation and proper waste disposal services is crucial for fostering sustainable and eco-friendly waste management practices in the community. Gidan Dawa prefers depositing refuse in the backyard of the houses, with 75% of respondents adopting this method.

Additionally, 25% prefer dumping refuse in the community. All respondents in Gummi (100%) deposit refuse in the backyards of their houses. This suggests a uniform waste disposal method within the community, emphasizing the prevalence of poor waste management practices.

In Maru, 75% of respondents favour burning waste after gathering, while the remaining 25% deposit refuse in the backyard of the houses. Waste management in Yargeda is diverse, with 60% of respondents depositing refuse at the back of the house, 20% preferring burning after gathering waste, and 20% dumping in community refuse.

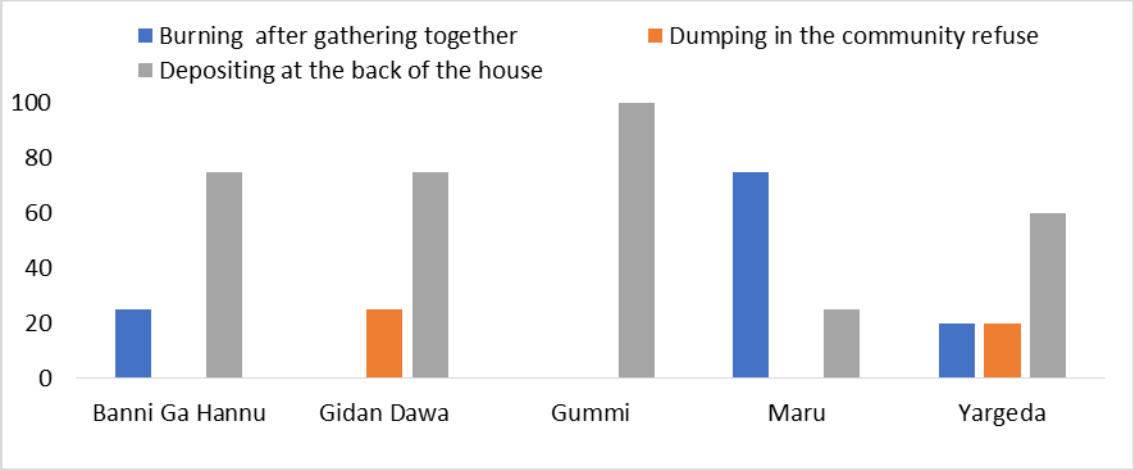


Figure 4.16: Solid Waste Management

4.3.3.4 Sources of Energy

The energy sources for various uses are different everywhere—Figures 4.17 and 4.18 show the energy sources for lighting and cooking in the project communities. In Bani ga Hannu, 50% of respondents rely on the PHCN for lighting, 25% use torchlight batteries and 25% use wood. All the respondents (100%) adopt firewood as the primary energy source for cooking. In Gidan Dawa, 75% of respondents rely on PHCN for lighting and 25% use torchlight batteries for lighting. For cooking, respondents show flexibility, with 75% relying on firewood and 25% choosing electricity.

In Gummi, residents cope with the unstable PHCN power supply by diversifying their energy sources. 40% of respondents use PHCN for lighting, 40% use generators, and 20%

rely on torchlight batteries. Multiple energy sources are evident, reflecting the community's adaptability. All respondents adopted firewood as the community's primary energy source for cooking. Maru residents navigate the challenges of PHCN insufficient power supply by diversifying their lighting sources. 50% of respondents use PHCN, while 50% rely on torchlight batteries. All respondents adopted firewood as the community's primary energy source for cooking. In Yargeda, 40% of respondents rely on PHCN for lighting, 20% use torchlight batteries, 20% use lanterns and 20% use kerosene. The fluctuating PHCN power supply prompts residents to adopt multiple sources for lighting. Respondents showcase a varied approach to cooking, with 60% using firewood, 20% using gas, and only 20% using crop residue/sawdust.

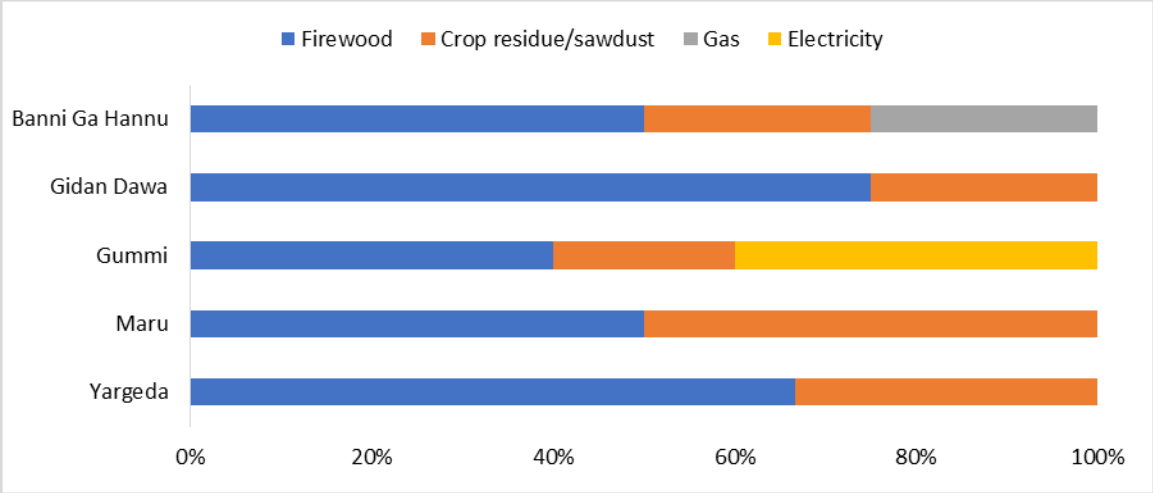


Figure 4.17: Sources of Energy for Lighting

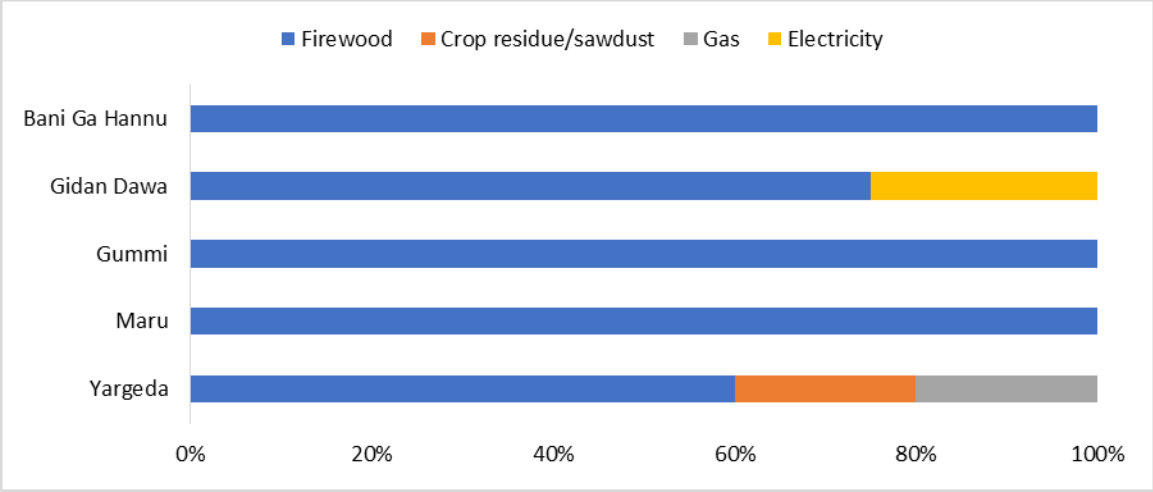


Fig. 4:18 Sources of Energy for Cooking

4.3.3.5 Sources of Water

Figure 4.19. shows the availability and accessibility of domestic and potable water to the residents in the project communities. The study reveals that hand-dug wells, water pumps, and community taps are familiar domestic water supply sources in the project communities. In Bani ga Hannu, the availability and accessibility of domestic and portable water are

facilitated primarily through water pumps (100%). These sources cater to the community's various needs, such as drinking, cooking, bathing, and washing. Gidan Dawa residents can access domestic water through hand-dug wells (75%) and boreholes/water pumps (25%). These sources contribute to meeting the community's essential needs, including drinking, cooking, bathing, and washing. In Gummi, domestic water supply for drinking, cooking, washing, and bathing primarily comes from hand-dug wells (40%) and water pumps (60%). These sources collectively ensure the accessibility of water for various household purposes.

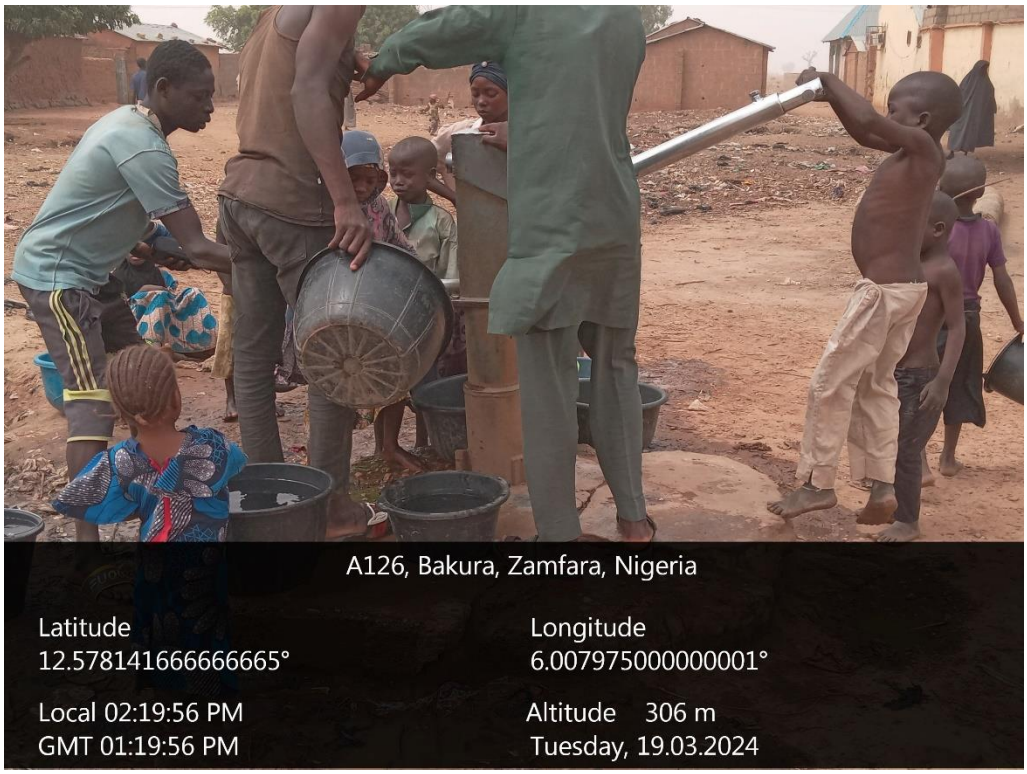


Plate 4.10 Public water supply in the project area

All respondents (100%) in Maru rely on Borehole/water pumps as familiar sources of domestic water supply for drinking, cooking, washing, and bathing. These sources play a crucial role in meeting the community's water needs. In Yargeda, all the respondents (100%) rely on boreholes/water pumps as the familiar sources of domestic water supply for residents. These sources contribute to water accessibility for drinking, cooking, bathing, and washing within the community.

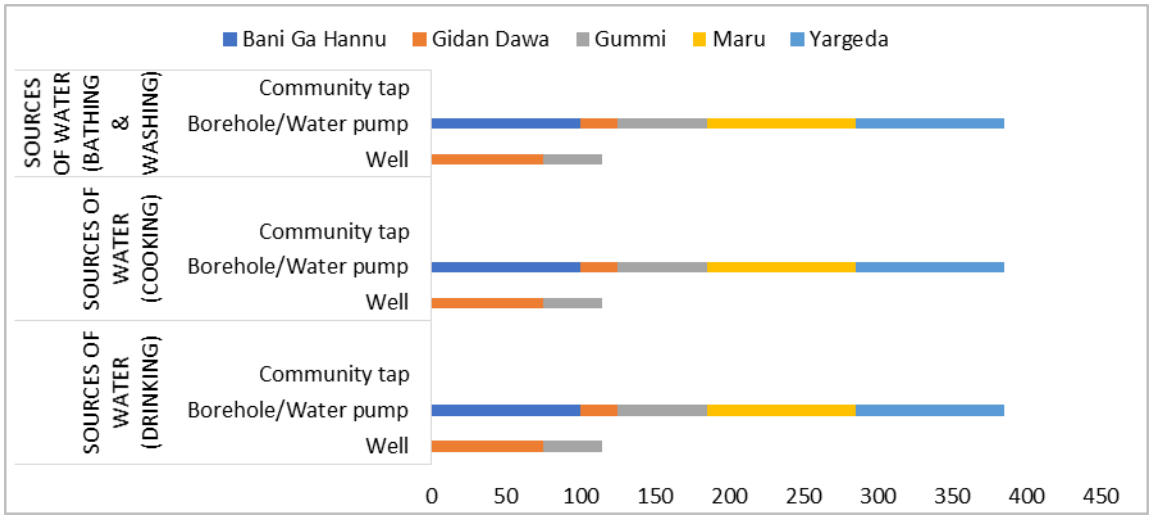


Figure 4.19: Sources of Water for Domestic Uses

4.3.3.6 Health Status

Table 4.20 show the health management methods frequently employed for the treatment of illness amongst respondents in the project areas. It also shows the frequency of visit to health facilities.

Table 4.22: **Respondents Health Characteristics**

Project areas	Common ailment/Management methods	Frequency of visits to health facilities
Bani ga Hannu	• Common ailments include dysentery (50%), pile (25%), and malaria (25%). • Health management methods adopted by residents involve attending clinics/hospitals (75%) and buying drugs from nearby chemists (25%).	• Of those that visit the hospital, 75% visited within the last six months and 25% visited in the last year. • Notably 75% of the respondents (100%) affirmed that their present health condition will not be worsened by the proposed intervention while 25% fear that their health may be worsen through providing breeding site for disease vectors.
Gidan Dawa	• Residents of Gidan Dawa commonly suffer from typhoid fever (50%), typhoid fever (25%), and whooping cough (25%). • Health management methods predominantly include attending clinics/hospitals (100%),	• When assessed on the frequency of the visit to health facilities, of those that visit the hospital, 75% visited within the last six months and 25% visited in the last five years. • About 50% of the respondents fear that their health may be worsen as a result of contamination of ground water while 25% worry about breeding site for disease vector while 25% affirmed that their present health condition will not be worsened by the proposed SAPZ intervention.
Gummi	• In Gummi, prevalent ailments are malaria (40%), typhoid fever (40%) and dysentery (20%). Health management methods adopted include attending clinics/hospitals (100%),	• For those who visited the hospital, 80% visited within the last six months and 20% visited in the last five years. • About 40% of the respondents fear that their health may be worsen as a result of contamination of ground water (20%) and breeding site for disease vectors (20%) while 20% affirmed that their present health condition will not be worsened by the proposed SAPZ intervention.

Maru	• Maru residents commonly suffer from malaria (50%), typhoid fever (30%), and dysentery (20%) • Health management methods involve attending clinics/hospitals (100%).	• On the frequency of visits to health facilities, 75% visited within the last six months and 25% visited in the last year. • 25% of respondents fear that their health conditions may worsen as a result of contamination of groundwater and noise/air pollution (25%) while 50% stated the contrary. Hence, there is need for mitigation to that effect.
Yargeda	• Residents of Yargeda commonly suffer from malaria (50%), and dysentery (25%). • Health management methods predominantly include attending clinics/hospitals (100%),	• Of those that visit the hospital, 80% visited within the last six months and 20% visited in the last five years. • All the respondents (100%) affirmed that their present health condition will not be worsened by the proposed intervention.

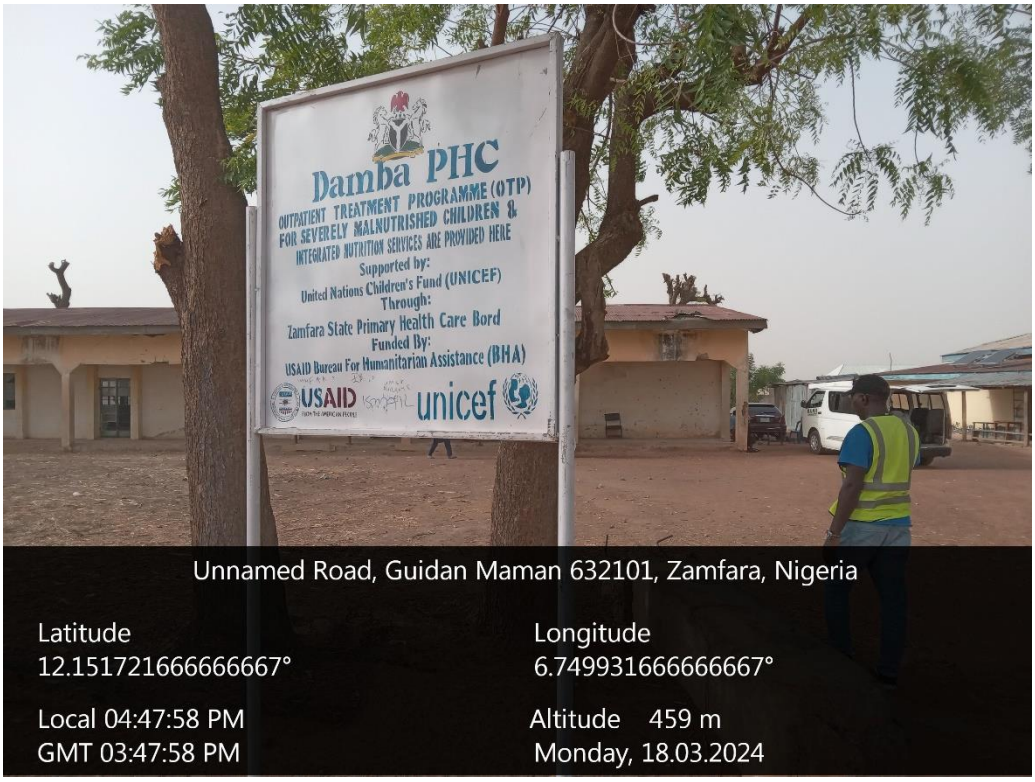


Plate 4.11 Health facility in the project area

4.3.3.7 Community Environmental Concerns

Existing environmental challenges within the project communities were assessed and these challenges vary from one cluster/community to another. The summary of responses is given in Table 4.21 below.

Table 4.23: **Respondents Community Environmental Concerns**

Project areas	Existing environmental challenges	Problems envisaged during construction and operation
Bani ga Hannu	• The current environmental challenge affecting their community is: o Soil infertility (25%) o Poor drainage system (50%) o Destruction of infrastructure (25%)	• Challenges envisaged during construction are: o Soil infertility (25%) o Poor drainage system (25%) o Pollution (air, surface water, groundwater, noise) (25%) o Flooding (25%) • Challenges envisaged during operation are o Poor drainage system (50%) o Pollution (25%) o Flooding (25%)
Gidan Dawa	• The current environmental challenge affecting their community is: o Bad road (75%) o Poor drainage (25%)	• Challenges envisaged during construction are: o Bad road (75%) o Flooding (25%) • Challenged envisaged during operation are: o Bad road (50%) o Low visibility (25%) o Erosion problems (25%)
Gummi	• The current environmental challenge affecting their community is o Soil infertility (60%) o Bad road (40%)	• Challenges envisaged during construction are: o Poor drainage system (60%) o Bad road (20%) o Erosion problems (20%) • Challenges envisaged during operation include o Poor drainage system (100%)
Maru	• Current environmental challenges affecting their community are o Soil infertility (50%) o Poor drainage system (25%) o Environmental degradation (25%)	o Challenges envisaged during construction are: o Poor drainage system (50%) o Pollution (25%) o Flooding (25%) • Challenges envisaged during operation are: o Pollution (50%) o Low visibility (25%) o Flooding (25%)
Yargeda	• The current environmental challenge affecting their community is o Soil infertility (60%) o Environmental degradation (20%) o Destruction of infrastructure (20%)	• Challenges envisaged during construction are: o Poor drainage system (60%) o Erosion problems (20%) o Flooding (20%) o Destruction of infrastructure (20%) o Pollution (20%)) • Challenges envisaged during operation include o Low visibility (40%) o Pollution (40%) o Encroachment of properties (20%)

4.3.3.8 Perception of the Respondents

Respondents' awareness of the project was assessed through significant sources, including community meetings and the media. In Bani ga Hannu, it was reported that all respondents (100%) had heard about the proposed project. Hence, the community is mainly aware of the proposed project. All of the respondents (100%) indicated that their source of information was the media (TV, radio, newspaper, Internet). All respondents stated that the project will

not lead to unrest in the community. However, during the SAPZ activities, all respondents indicated they expected local employment during the construction period.

Turning to Gidan Dawa, the community's awareness of the proposed project was assessed through media sources (TV, Radio, Newspaper, Internet). Results indicate that all respondents (100%) are knowledgeable about the project, reflecting a widespread awareness within the community. Notably, all respondents (100%) expressed confidence that the project is not causing unrest. Most respondents (60%) envisaged the employment of locals during the construction phase, and 40% indicated compensation for those whose properties will be affected during the proposed project activities.

In Gummi, the assessment of project awareness involved community meetings and media sources. The outcome reveals that all respondents (100%) in Gummi are well aware of the proposed project, underlining a comprehensive understanding within the community. Among those informed, 80% received information through media sources (TV, Radio, newspaper, Internet) and 20% mentioned association meetings. Confidence prevails as all respondents believe the project will not lead to unrest. Noteworthy is that all respondents (100%) expect the contractors to involve local labourers during the SAPZ activities.

In Maru's case, understanding the proposed project was evaluated through community meetings and media exposure. The findings indicate that all respondents (100%) in Maru are informed about the project, emphasizing widespread awareness. Among those aware, 75% attributed their knowledge to media sources and 25% through community meetings. All of the respondents believe the project will not lead to unrest. All the respondents (100%) indicated that their expectations on the activities of SAPZ intervention are mainly the employment of locals during construction.

In Yargeda, all respondents (100%) are well aware of the proposed project, underlining a comprehensive understanding within the community indicating media sources (TV, Radio, Newspaper, Internet). All respondents stated that the project will not lead to unrest in the community. Of significance, 80% of respondents indicated compensation for those whose properties will be affected during the proposed project activities, while 20% envisaged the employment of locals during the construction phase.

4.3.3.9 Perceived Impacts of the Proposed Intervention Project

The project is envisaged to have a range of positive and social impacts on the livelihood and environment of the project communities. The respondents were assessed based on this understanding and a summary of their responses is given below in Table 4.22.

Table 4.24: Perception of Respondents and Impacts Envisaged

Project areas	Positive impacts	Negative

Bani ga Hannu	• The envisaged positive impact of the proposed project on the community includes:
	  • Employment opportunity (50%)
	  • Increased standard of living (50%)
		• Pollution (80%)
		• Shortage of labourer (20%)

Gidan Dawa	• The envisaged positive impact of the proposed project on the community includes:
	  • Increased productivity (50%)
	  • Increased standard of living (25%)
	  • Employment opportunity (25%)
		• Destruction of soil structure (50%)
		• Vandalization of properties (25%)
		• Pollution (25%)

Gummi	• The envisaged positive impact of the proposed project on the community includes:
	  • Improved standard of living (40%);
	  • Job opportunity (20%)
	  • Increase in production (40%)
		• Pollution (70%)
		• Shortage of labourer (10%)
		• Vandalization of properties (10%)

Maru	• The envisaged positive impact of the proposed project on the community includes:
	  • Employment (25%)
	  • Market access (25%)
	  • Increased productivity (50%);
		• Destruction of soil structure (50%)
		• Pollution (50%)

Yargeda	• The envisaged positive impact of the proposed project on the community includes:
	  • Increased livelihood (50%)
	  • Market access (25%)
	  • Increased productivity (25%)
		• Land loss (50%)
		• Destruction of soil structure (20%)
		• Pollution (20%)
		• Loss of farmland (10%)

4.3.4 Analysis of the Status of GBV/SEA in the Project Community and Related Issues

Gender-based violence, or GBV, is one of the oppressive forms of gender inequality, posing a fundamental barrier to the equal participation of women and men in social, economic, and political spheres (World Bank, 2019). GBV affects both men and women, but women are much more vulnerable because violence reflects and reinforces existing interchangeably. GBV according to (Arango et al. 2014) includes among others:

- Intimate partner violence,
- Non-partner sexual assault,
- Female genital mutilation,
- Sexual exploitation and abuse,
- Child abuse,
- Child marriage

Such violence impedes gender equality and the achievement of a range of development outcomes. Gender violence precludes individuals from contributing to or benefiting from development initiatives by limiting their choices and ability to act (UN General Assembly 2006).

In Nigeria, gender-based violence (GBV) is still a problem. According to data from the National Demographic and Health Survey (NDHS, 2013) and the Multiple Indicator Cluster

Survey (MICS, 2016), 28% and 7% of women of reproductive age, respectively, have experienced physical or sexual abuse. According to the 2018 NDHS data, 31% of Nigerian women between the ages of 15 and 49 report having experienced physical abuse, with 6% reporting experiencing it while pregnant. The percentage of women who report having experienced physical violence increased from 28% in 2008 to 31% in 2018, which is a worrying trend. Additionally, 25% of married women have reported emotional, physical, or sexual abuse from their spouses.

Significant regional disparities are observable, particularly in the northeastern region, where the NDHS, 2013, indicates substantial percentages of women reporting physical violence (29.5%) and sexual assault (15.7%). The 2018 NDHS further reveals that the North East has the highest rate of sexual violence at 16%, contrasting with 10% or lower rates in other regions. The Northeastern Nigerian society is characterized by a pervasive patriarchal system, reinforcing unequal power dynamics, granting men control and authority over women, and influencing access and control over resources for both genders. Also, the insurgency crisis in the BAY states (Borno, Adamawa, and Zamfara) has endured for over 13 years, with heightened risks, especially for women and girls who confront escalating threats of violence, abduction, rape, gender-based violence, forced and child marriage, and other egregious rights violations. The situation underscores the pressing and alarming growth of Gender-Based Violence (GBV) amidst the prolonged crisis, necessitating immediate and targeted interventions to address and prevent such pervasive violence.

Furthermore, reporting incidents of rape is particularly sensitive. It necessitates a secure environment, and a male-dominated structure can act as a deterrent, eroding confidence in speaking up about such experiences. Additionally, poverty plays a facilitating role in sustaining harmful norms, such as forced marriages and clandestine prostitution.

Based on the above literature, GBV is widespread in the project areas, and the influx of migrants is likely to increase it. Consequently, studying the measures and effectively mitigating and managing this risk is crucial.

4.3.4.1 Gender-Based Violence/Sexual Exploitation and Abuse

Respondents' views (knowledge) on the prevalence of gender-based violence within the project communities were assessed. A summary of their responses is shown in Tables (4.15 – 4.19).

4.3.4.2 Provisions Restricting Women Access to Health and Other Social Services

There are existing customs, traditions and common practices that restrict women from access to health and social services in the community. A summary of their responses in Table 4.23 below shows that women in the proposed project communities are restricted to certain health services and often need permission from their husbands or a male figure to access health services.

Table 4.25: Provisions Restricting Women Access to Health and Other Social Services

Are there restrictions which….	Bani Ga Hannu		Gidan Dawa		Gummi		Maru		Yargeda	
	Yes (%)	No (%)	Yes (%)	No (%)	Yes (%)	No (%)	Yes (%)	No (%)	Yes (%)	No (%)
require the consent of a male relative/husband for a married woman's medical examination or treatment or access to contraceptives or abortion;	100	0.0	75.0	25.0	100	0.0	75.0	25.0	80.0	20.0
require parental consent in case of adolescents' access to contraceptives or abortion;	100	0.0	50.0	50.0	100	0.0	75.0	25.0	80.0	20.0
allow medical practitioners to refuse provision of a legal medical service on grounds of conscientious objection	75.0	25.0	25.0	75.0	60.0	40.0	50.0	50.0	40.0	60.0
prohibit certain medical services, or require that they be authorized by a physician, even where no medical procedure is required; in particular	75.0	25.0	25.0	75.0	20.0	80.0	50.0	50.0	20.0	80.0
are allowed to undergo IUDs (intrauterine devices) or hormonal contraceptives	50.0	50.0	25.0	75.0	20.0	80.0	50.0	50.0	40.0	60.0
are allowed emergency contraceptives, including the morning-after pill,	75.0	25.0	50.0	50.0	80.0	20.0	100	0.0	40.0	60.0
are allowed sterilization on request;	75.0	25.0	25.0	75.0	80.0	20.0	50.0	50.0	60.0	40.0
request on early abortion (in first trimester of pregnancy) are granted;	50.0	50.0	25.0	75.0	80.0	20.0	75.0	25.0	60.0	40.0
medically assisted or allowed on reproduction (e.g., in vitro fertilization)	50.0	50.0	25.0	75.0	80.0	20.0	100	0.0	60.0	40.0

4.3.4.3 Sexual Exploitation and Abuse

As shown in Table 4.24, certain acts such as child marriage, home births by obstetricians or midwives, transmission of HIV or other venerable diseases by women are fairly criticized in the project communities while female genital mutilation, adultery, abortion, prostitution, sexual orientation and gender identities, are not encouraged in the communities.

Table 4.26: Sexual Exploitation Criminalization

Are the following criminalized in the project area:	Bani Ga Hannu		Gidan Dawa		Gummi		Maru		Yargeda	
	Yes (%)	No (%)	Yes (%)	No (%)	Yes (%)	No (%)	Yes (%)	No (%)	Yes (%)	No (%)
transmission of HIV or other venereal diseases by women only	100	0.0	25.0	75.0	100	0.0	75.0	25.0	20.0	80.0
female genital mutilation	100	0.0	25.0	75.0	100	0.0	75.0	25.0	40.0	60.0
child marriage	75.0	25.0	0.0	100	80.0	20.0	50.0	50.0	20.0	80.0
home births with an obstetrician or midwife	100	0.0	0.0	100	80.0	20.0	75.0	25.0	20.0	80.0
Abortion	75.0	25.0	25.0	75.0	80.0	20.0	75.0	25.0	80.0	20.0
Adultery	75.0	25.0	25.0	75.0	80.0	20.0	75.0	25.0	80.0	20.0
Prostitution	75.0	25.0	25.0	75.0	80.0	20.0	75.0	25.0	80.0	20.0
sexual orientation and gender identity (homosexuality, lesbianism, transgender, etc.)	100	0.0	25.0	75.0	100	0.0	100	0.0	100	0.0

violations of modesty or indecent assault (e.g., not following dress code)	100	0.0	25.0	75.0	100	0.0	75.0	25.0	100	0.0

4.3.4.4 Respondents' Views on Purpose of Criminalizing Gender-Based Violence

As shown in Table 4.25 below, most respondents across the project communities indicated that sexual exploitation is criminalized to prevent sexually transmitted diseases (STD), unwanted pregnancies, and promote a healthy lifestyle for teenage girls.

Table 4.27: Purpose of Criminalization

Criminalized to:	**Bani Ga Hannu**		**Gidan Dawa**		**Gummi**		**Maru**		**Yargeda**	
	Yes (%)	**No (%)**	**Yes (%)**	**No (%)**	**Yes (%)**	**No (%)**	**Yes (%)**	**No (%)**	**Yes (%)**	**N (%)**
prevent of sexually transmitted diseases (STD)	50.0	50.0	75.0	25.0	60.0	40.0	75.0	25.0	100	0.0
prevent unwanted pregnancies	100	0.0	100	0.0	80.0	20.0	50.0	50.0	100	0.0
promote a healthy lifestyle, including prevention of dietary disorders of teenage girls, including anorexia and bulimia	100	0.0	100	0.0	40.0	60.0	75.0	25.0	40.0	60.0
promote psychological/psychiatric training on self-control of aggression, including sexual aggression	50.0	50.0	100	0.0	50.0	50.0	80.0	20.0	75.0	25.0

4.3.4.5 Measures and Programmes for Women

Most respondents in the sampled population indicated there are no measures and programs undertaken to increase women's safety (e.g., in public urban spaces, in public transportation, etc.) in their communities. Also as shown in Table 4.26, most respondents indicated there are some specific training programs in place for medical and legal professionals on the issue of gender-based discrimination in the area of health and safety.

Table 4.28: Measures and Programs for Women

Measure and Programs for Women	**Bani Ga Hannu**		**Gidan Dawa**		**Gummi**		**Maru**		**Yargeda**	
	Yes (%)	**No (%)**	**Yes (%)**	**No (%)**	**Yes (%)**	**No (%)**	**Yes (%)**	**No (%)**	**Yes (%)**	**No (%)**
Any measures and programs undertaken in order to increase women safety (e.g., in public urban spaces, in public transportation)	100	0.0	75.0	25.0	80.0	20.0	100	0.0	100	0.0
Are there specific training programs for medical and legal professionals on the issue of gender-based discrimination in the area of health and safety?	100	0.0	75.0	25.0	80.0	20.0	100	0.0	60.0	40.0
Do they cover the issues connected with specific women's needs in the area of health?	100	0.0	75.0	25.0	80.0	20.0	100	0.0	100	0.0
Specific women's vulnerability to be victims of gender-based violence or specific crimes	100	0.0	75.0	25.0	100	0.0	75.0	25.0	100	0.0
The nature of gender-based violence	100	0.0	50.0	50.0	80.0	20.0	75.0	25.0	100	0.0
Its occurrences and symptoms	100	0.0	50.0	50.0	80.0	20.0	100	0.0	100	0.0
Methods of detection	100	0.0	50.0	50.0	80.0	20.0	75.0	25.0	100	0.0
Medical protocols	100	0.0	50.0	50.0	80.0	20.0	50.0	50.0	100	0.0

Influence of gender-based violence, in particular, sexual violence on the future behaviours of victims (post-traumatic stress symptoms etc.)	75.0	25.0	50.0	50.0	80.0	20.0	100	0.0	80.0	20.0

4.3.4.6 Gender Equity

There are several approaches to ensure gender equity in a society. This may include female engagement in local politics and women's participation in leadership programmes. Table 4.27 below shows the responses of the respondents in the project communities. The study reveals that in the project areas, gender equity is ensured by giving women equal opportunities and access to education and employment, as indicated by 77% of respondents. In other words, males and females are sponsored or given equal opportunities in education and employment. Also, 13% of respondents indicated that women are elected to public offices, while 10% indicated that quotas on genders are ensured in leadership positions in the community. Proactive ways should be ensured to provide all-inclusive and equal benefits to mitigate gender inequity in the communities.

Table 4.29: Gender Equity

How do you ensure gender equity:	Bani Ga Hannu	Gidan Dawa	Gummi	Maru	Yargeda	Average
Women are elected in public office	0.0	0.0	40.0	25.0	0.0	13.0
Females are given equal opportunity and access to education and employment	100	50.0	60.0	75.0	100	77.0
Quotas on genders are ensured in leadership of community-based organizations.	0.0	50.0	0.0	0.0	0.0	10.0

4.3.5 Value Chain Selection in the Proposed Locations

Selecting the appropriate value chain for agricultural activities involves choosing the most suitable pathway from production to consumption, maximising efficiency and adding value at each stage. This entails identifying key steps such as cultivation, harvesting, processing, packaging, distribution, and marketing and determining the optimal sequence and integration of these activities to enhance competitiveness and profitability. Effective value chain selection involves understanding market dynamics, consumer preferences, technological advancements, and regulatory requirements to align production practices with market demand and achieve sustainable growth and development in the agricultural sector.

4.3.5.1 Proposed Agricultural Activities for Commercialization and Industrial Development

In all the proposed locations within Zamfara, all respondents (100%) have shown a clear preference for prioritizing the advancement of rice production and processing as a key component of the proposed project. Zamfara State boasts a rich agricultural heritage, with cereals and legumes forming the cornerstone of its agricultural landscape. Generations of farmers have cultivated these staple crops, leveraging the region's fertile soils and favourable climate conditions. Notably, rice production has emerged as a particularly profitable venture, fuelled by high demand.

4.3.5.2 Zamfara LGAs with Comparative Advantages in Selected Agricultural Services

The responses below describe Zamfara LGAs with relative strengths in specific agricultural services. It entails assessing soil fertility, climate suitability, existing infrastructure, and historical agricultural practices to determine which LGAs are better positioned to excel in particular agricultural activities. The aim is to pinpoint areas where investments and interventions can be targeted to maximize agricultural productivity and promote economic growth within the state.

In Bani Ga Hannu, rice stands out as the primary crop choice, with 70% of respondents opting for it. Among the LGAs where rice cultivation boasts a comparative advantage are Gusau, Talatan Mafara, and Bakura. Additionally, 10% of respondents expressed interest in groundnut cultivation in Bungudu LGA, while another 10% identified cotton as their preferred crop in Tsafe and Bungudu. Lastly, 10% of respondents indicated wheat cultivation in Bakura LGA. In Gidan Dawa, 60% of respondents expressed interest in rice production and cultivation, particularly in LGAs such as Talatan Mafara, Anka, Gusau, and Tsafe. Additionally, 10% of respondents indicated their preference for maize, millet, soybean, and sorghum cultivation, with these crops identified in Gusau LGA.

In all, 60% of respondents opted for rice processing, primarily in the Gusau LGAs. Additionally, 20% expressed interest in maize production, specifically in Talatan Mafara LGA. Furthermore, 10% of respondents preferred Guinea corn cultivation in Bukkuyum LGA and cotton farming in Maru, and 70% selected rice processing, particularly in Gusau, Talatan Mafara, Bakura, and Bungudu LGAs. Additionally, 10% indicated groundnut cultivation in Bungudu, while 20% expressed interest in wheat production in Maradun and Baura LGAs.

In Yargeda, 60% of respondents preferred engaging in rice production and processing activities, focusing on areas like Talatan Mafara and Bakura. Furthermore, 20% of the respondents expressed interest in cotton farming, specifying locations such as Tsafe and Bungudu. Additionally, 10% of respondents indicated an inclination towards wheat cultivation in Bakura and livestock farming in Maru. This distribution highlights the diverse agricultural interests and activities within different regions in Zamfara State, encompassing more crop cultivation than animal husbandry.

4.3.5.3 Farmland Characteristics of Farmers

The responses given in Table 4.28 offers insights into the various attributes of the farmland owned by the respondents in the proposed areas. These attributes include details such as the size of the land, its geographical location, the terrain or topography of the land, and potentially other relevant factors pertaining to the land's features and conditions.

Table 4.30: **Farmland Characteristics in the Proposed Locations**

Indicators	Options	Respondents (%)						Summary of Findings
		Bani Ga Hannu	Gidan Dawa	Gummi	Maru	Yargeda	Average	
Size of	< 3 ha	100	50.0	60.0	100	100	82	The majority of farmers, around 82%, cultivate on

farmland	4-5 ha	0.0	50.0	40.0	0.0	0.0	18	plots of land smaller than 3 hectares, while 18% operate on larger tracts exceeding 3 hectares. This distribution reflects factors such as land fragmentation, population density, and a focus on subsistence farming among smaller-scale farmers.
Location of farmlands	Bungudu	50.0	0.0	0.0	0.0	50.0	20.0	Farmers strategically own farmland across various LGAs to optimize resource usage, market access, and risk management in their agricultural activities. This widespread ownership allows them to leverage diverse soil conditions and climate variations, mitigate localized risks, access different markets, and implement sustainable farming practices. Overall, it reflects farmers' proactive efforts to enhance productivity, profitability, and resilience in their agricultural operations
	Tsafe	0.0	25.0	20.0	0.0	0.0	9.0	
		0.0	0.0	40.0	25.0	0.0	13.0	
	Bargaja	0.0	0.0	20.0	25.0	0.0	9.0	
	Other locations	50.0	75.0	20.0	50.0	50.0	49.0	
Topography	Flat	100	100	100	100	100	100	The flat topography of farmland offers several advantages, including ease of cultivation, efficient irrigation, optimal land use, reduced erosion risks, and cost-effective mechanization, contributing to improved agricultural productivity and profitability.
Ownership status of land	Owned	75.0	50.0	60.0	50.0	100	67.0	The majority of farmers, constituting 67%, claim ownership of their farmland, while 33% opt for rental arrangements. This distribution suggests varying preferences and circumstances among farmers, with ownership offering long-term security, control, and investment potential, while rental arrangements provide flexibility, access to land without large upfront costs, and potential for short-term experimentation or expansion.
	Rental	25.0	50.0	40.0	50.0	0.0	33.0	
Yield	<20 tons	75.0	100	100	100	60.0	87.0	87% of recorded yields falling below 20 tons indicates a concentration of yields within this range compared to higher yields. This concentration suggests that the majority of agricultural production is achieving yields within a relatively narrow band, with fewer instances of exceptionally high yields. It may indicate that the majority of agricultural practices, such as irrigation, fertilization, and pest control, are optimized to a certain extent, resulting in consistent but moderate yields.
	21 – 40 tons	25.0	0.0	0.0	0.0	20.0	9.0	
	40 tons above	0.0	0.0	0.0	0.0	20.0	4.0	

4.3.5.4 Method of Cultivation

The responses outlined in Table 4.29 the methods employed for cultivation by the respondents in the proposed locations. This encompasses techniques, practices, number of cropping season, providing insights into the agricultural practices prevalent among the respondents.

Table 4.31: **Method of Cultivation Amongst Farmers in the Proposed Locations**

Indicators	**Options**	**Respondents (%)**						**Summary of Findings**
		Bani Ga Hannu	**Gidan Dawa**	**Gummi**	**Maru**	**Yargeda**	**Average**	
Method of cultivation	Manual	75.0	75.0	100	75.0	60.0	77.0	63% of respondents indicated three cropping seasons, while the rest indicated one or two. This suggests a prevalent practice of multiple cropping seasons among the majority of respondents, reflecting their utilization of diverse planting schedules to optimize agricultural productivity
	Mechanized	25.0	25.0	0.0	25.0	20.0	19.0	
	Both	0.0	0.0	0.0	0.0	20.0	4.0	

								throughout the year.
Size of available land for cultivation	< 3 ha	50.0	50.0	60.0	75.0	60.0	59.0	Regarding the size of available land for cultivation, 59% of respondents specified having less than 3 hectares. This indicates that a substantial majority of respondents cultivate relatively small plots of land, potentially impacting their farming methods, crop choices, and overall agricultural output.
	4 – 6 ha	25.0	50.0	40.0	0.0	0.0	23.0	
	7 – 10 ha	25.0	0.0	0.0	25.0	20.0	14.0	
Number of cropping season	1	25.0	25.0	20.0	50.0	40.0	32.0	63% of respondents indicated three cropping seasons, while the rest indicated one or two. This suggests a prevalent practice of multiple cropping seasons among the majority of respondents, reflecting their utilization of diverse planting schedules to optimize agricultural productivity throughout the year.
	2	75.0	75.0	80.0	25.0	60.0	63.0	
	3	0.0	0.0	0.0	25.0	0.0	5.0	
Period of cultivation	April - May	0.0	25.0	40.0	0.0	20.0	17.0	The distribution of planting preferences reflects farmers' strategic decisions based on seasonal dynamics and crop requirements. With 32% choosing to plant between May and October, the breakdown shows variations in regional climates and farming practices. Overall, it highlights farmers' efforts to optimize yields and manage risks throughout the growing season.
	May - June	25.0	25.0	20.0	25.0	20.0	23.0	
	June - August	25.0	50.0	20.0	25.0	20.0	28.0	
	May - October	50.0	0.0	20.0	50.0	40.0	32.0	

4.3.5.5 Market Trends in the Proposed Locations

The responses in Table 4.30 various market trends observed by respondents in the proposed locations. This encompasses factors such as the number of buyers, purchasing methods, volume of transactions, prevailing selling prices, and peak periods of sales, offering insights into the dynamics of the agricultural market within these locations.

Table 4.32: **Market Trends in the Proposed Locations**

Indicators	**Options**	**Respondents (%)**						**Summary of Findings**
		Bani Ga Hannu	**Gidan Dawa**	**Gummi**	**Maru**	**Yargeda**	**Average**	
Number of buyers cotton/wheat	< 10	50.0	50.0	20.0	0.0	0.0	24.0	The prevalence of about 11-20 buyers (54%) reflects the scale of agricultural operations among respondents. Farmers with larger landholdings or higher production volumes may attract more buyers due to their capacity to supply larger quantities of cotton/wheat.
	11 - 20	50.0	50.0	20.0	25.0	80.0	45.0	
	Above 20	0.0	0.0	60.0	75.0	20.0	31.0	
Method of transaction	Wholesale	25.0	25.0	20.0	25.0	40.0	27.0	The data shows that 49% of respondents prefer retail as their primary method of transaction. This indicates a significant preference for direct sales to consumers, potentially driven by factors such as profitability, convenience, and market accessibility.
	Retail	50.0	25.0	60.0	50.0	60.0	49.0	
	Both	25.0	50.0	20.0	25.0	0.0	24.0	
Volume of sales per annum	<20 tons	75.0	50.0	40.0	75.0	60.0	60.0	The data indicates that 60% of respondents sell less than 20 tons annually, suggesting a prevalence of small-scale sales. In contrast, 13% sell between 21 - 40 tons, reflecting moderate-scale operations, while 32.5% sell 40 tons or more annually, indicating a substantial share of respondents engaged in larger-scale sales.
	21 – 40 tons	25.0	0.0	20.0	0.0	20.0	13.0	
	40 tons above	25.0	50.0	40.0	25.0	20.0	32.0	

Current selling price/bag (in naira)	40,000 – 50,000	50.0	25.0	60.0	50.0	40.0	45.0	The breakdown of current selling prices per bag among respondents reveals several pricing trends within the agricultural market. The largest proportion, 45%, sells their produce for N40,000 – N50,000 per bag, indicating a significant segment of the market operating within this price range. The cost breakdown indicates varying pricing strategies among farmers, potentially influenced by factors such as market demand, crop quality, and production costs.
	51,000 – 60,000	0.0	75.0	40.0	25.0	40.0	36.0	
	61,000 – 70,000	50.0	0.0	0.0	25.0	0.0	15.0	
	Above 80,000	0.0	0.0	0.0	0.0	20.0	4.0	
Size of bag in kg	100kg	100	100	100	100	100	100	All respondents indicated using bags with a size of 100 kilograms each. This uniformity suggests a standardized measurement for packaging agricultural produce among the surveyed individuals, potentially facilitating logistical processes and market transactions.
Peak period of sales	October - March	75.0	50.0	20.0	75.0	20.0	48.0	Among the respondents, 48% indicated October to March as the peak period of sales, while 38% stated December to March, and 16% mentioned January to March. This distribution highlights a predominant focus on sales activity during the later months of the year, potentially influenced by factors such as harvest timing, market demand fluctuations, and seasonal variations in crop availability.
	December - March	25.0	50.0	20.0	25.0	60.0	38.0	
	January - March	0.0	0.0	60.0	0.0	20.0	16.0	
Lowest period of sales	None	100	100	100	100	100	100	The absence of respondents indicating the lowest period of sales could imply a relatively consistent demand for agricultural products throughout the year, with no distinct break in sales activity.

4.3.5.6 Input and Agricultural Machinery in the Proposed Locations

The provided responses Table 4.31 offer a thorough understanding of agricultural inputs and machinery as reported by respondents in the proposed locations. These insights encompass a range of agricultural necessities, including quality seeds, planting machinery, mechanization equipment, and related items crucial for farming operations.

Table 4.33: **Input and Agricultural Machinery Employed in the Proposed Locations**

Indicators	**Options**	**Respondents (%)**						**Summary of Findings**
		Bani Ga Hannu	**Gidan Dawa**	**Gummi**	**Maru**	**Yargeda**	**Average**	
Which three inputs are most helpful?	Good seed, fertilizer, insecticide	50.0	100	80.0	75.0	60.0	73.0	73% of respondents indicated good seed, fertilizer, and insecticide. Good seed ensures the foundation for healthy crop growth and yield potential. Fertilizer contributes essential nutrients to the soil, enhancing plant growth and productivity. Insecticide helps protect crops from pests, minimizing yield losses due to pest damage. The high percentage of respondents selecting these inputs shows their critical role in optimizing
	Good seed, fertilizer, tractor (for tillage)	25.0	0.0	20.0	25.0	40.0	22.0	
	Fertilizer, insecticide, soil improvement	25.0	0.0	0.0	0.0	0.0	5.0	

								agricultural outcomes and reflects farmers' prioritization of key factors influencing crop health and productivity.
Are there mechanization service providers in your location?	Yes	0.0	50.0	20.0	100	100	54.0	56% of respondents answered affirmatively, while the remaining 44% stated that there were none. This suggests a significant presence of mechanization service providers in the areas surveyed.
	No	100	50.0	80.0	0.0	0.0	46.0	
What is the rate/ha of land cultivation service?	< 15,000	0.0	0.0	0.0	0.0	20.0	4.0	88% of respondents could not specify, compared to the low percentage that did provide a specific rate. This discrepancy suggests a lack of clarity or consistency regarding pricing among the majority of respondents, potentially indicating variations in service offerings.
	15,000 – 35,000	0.0	0.0	0.0	0.0	20.0	4.0	
	Above 35,00	0.0	0.0	0.0	0.0	20.0	4.0	
	Unspecified	100	100	100	100	40.0	88.0	
If you are using mechanization service providers, what way do you use?	Rental	100	100	100	100	80.0	96.0	This high preference for renting suggests that farmers are more inclined to access mechanization services through short-term agreements rather than acquiring machinery through long-term financial arrangements. This preference for renting may be driven by factors such as flexibility, affordability, and the ability to access machinery without the burden of ownership costs or long-term financial commitments.
	Loan	0.0	0.0	0.0	0.0	20.0	4.0	
If no, would you engage their service if it is made available?	Yes	100	100	100	100	100	100	All respondents expressed a willingness to engage mechanization service providers if made available, indicating a strong interest in adopting modern agricultural practices for improved efficiency and productivity.
Would you increase your hectarage of cultivation if mechanization service is more affordable?	Yes	100	100	100	100	100	100	All respondents indicated that they would increase their hectarage of cultivation if mechanization services were more affordable. This shows the significant impact of mechanization on agricultural expansion, indicating that accessibility to affordable mechanization services is perceived as a crucial factor influencing farmers' decisions to expand their cultivation areas.

4.3.5.7 Access to Financial Mechanisms in the Proposed Locations

Access to finance is critical to the success and sustainability of agricultural operations, particularly for smallholder farmers in developing countries. Financial resources include information on factors such as the availability of banking services, credit options, investment opportunities, and other financial mechanisms relevant to agricultural activities in the area.

All surveyed farmers (100%) in the proposed SAPZ locations unanimously stated that they do not access finance from either microfinance institutions or commercial banks for their farming activities. This widespread pattern suggests several plausible reasons for their reluctance. Challenges such as limited awareness about available financial services, high interest rates imposed by formal institutions, and stringent collateral requirements could contribute to farmers' avoidance of these avenues. Moreover, the complexity of loan

application processes and the preference for informal sources of financing, like family contributions or community lending groups, may further deter farmers from seeking formal financial assistance. Additionally, the irregular income nature of agriculture and the difficulty in meeting repayment schedules set by formal institutions could also hinder farmers' access to finance from commercial sources, reinforcing their reliance on informal alternatives.

4.3.5.8 Production Cost in the Proposed Locations

The responses in Table 4.32 offer an understanding of how respondents deal with production costs in the proposed locations. The insights provided encompass details on the financial aspects of agricultural production, including the amount of money spent, timing of expenditures, and key cost-intensive activities. This information sheds light on factors such as total production costs, peak spending periods throughout the agricultural cycle, and which specific activities incur the highest expenses. Understanding these financial dynamics is crucial for effective budgeting, resource allocation, and strategic decision-making within the agricultural sector.

Table 4.34: **Production Cost of Agriculture in the Proposed Locations**

Indicators	Options	Respondents (%)						Summary of Findings
		Bani Ga Hannu	Gidan Dawa	Gummi	Maru	Yargeda	Average	
When do you spend lots of money for production?	During planting	100	50.0	60.0	75.0	80.0	73.0	73% of respondents stated that they spend a significant amount of money during planting, while 27% mentioned spending more during harvest. The emphasis on spending during planting aligns with the critical role of inputs such as seeds, fertilizers, and labour at the outset of the growing season, highlighting farmers' prioritization of investment to ensure successful crop establishment and maximize yields.
	During harvest	0.0	50.0	40.0	25.0	20.0	27.0	
How much do you spend for production per hectare?	< 100,000	0.0	25.0	40.0	0.0	0.0	13.0	The distribution shows the varying levels of investment required for agricultural production, influenced by factors such as farm size, crop type, input costs, and production practices.
	100,000 – 300,000	50.0	0.0	40.0	50.0	60.0	40.0	
	300,000 – 500,00	25.0	50.0	0.0	25.0	20.0	24.0	
	Above 500,000	25.0	25.0	20.0	25.0	20.0	23.0	
Which activity cost you the most money?	Cultivation (land clearing, weeding)	25.0	50.0	40.0	25.0	20.0	32.0	About 56% of respondents cited fertilizers, 32% mentioned cultivation, and 12% stated harvesting. The distribution suggests that fertilizers constitute the largest expense for a majority of respondents, likely due to their essential role in enhancing soil fertility and crop productivity
	Fertilizer	75.0	50.0	20.0	75.0	60.0	56.0	
	Harvesting	0.0	0.0	40.0	0.0	20.0	12.0	

4.3.5.9 Crop Variety, Quality and Yield Characteristics in the Proposed Locations

The responses in Table 4.34 gave an understanding of how respondents deal with production cost in the proposed locations. The insights provided encompass details on the financial

aspects of agricultural production, including the amount of money spent, timing of expenditures, and key cost-intensive activities. This information sheds light on factors such as total production costs, peak spending periods throughout the agricultural cycle, and which specific activities incur the highest expenses. Understanding these financial dynamics is crucial for effective budgeting, resource allocation, and strategic decision-making within the agricultural sector.

Table 4.35: **Crop Variety, Quality and Yield Characteristics in the Proposed Locations**

Indicators	Options	Respondents (%)						Summary of Findings
		Bani Ga Hannu	Gidan Dawa	Gummi	Maru	Yargeda	Average	
What is the biggest challenge that affects farm quality?	Climate	25.0	0.0	0.0	25.0	20.0	14.0	35% of respondents identified the lack of inputs such as fertilizer and insecticide. This indicates a significant concern among farmers regarding the availability or accessibility of essential agricultural inputs crucial for optimizing crop health and productivity.
	Lack of inputs (fertilizer, insecticide)	25.0	25.0	60.0	25.0	40.0	35.0	
	Lack of improved seed	25.0	25.0	40.0	25.0	0.0	23.0	
	Soil infertility	25.0	25.0	0.0	0.0	20.0	14.0	
	Water scarcity	0.0	25.0	0.0	25.0	20.0	14.0	
What is the yield per ha?	<20 tons	25.0	25.0	0.0	20.0	0.0	14.0	42% stated yields ranging from 40 to 80 tons per hectare, while the remaining respondents indicated yields below this range. This range highlights the significant impact of input availability on yield levels, with a notable portion of respondents citing insufficient inputs as a limiting factor. Moreover, other ranges of reported yields show variability in agricultural productivity among respondents, influenced by factors such as input utilization, crop management practices, and environmental conditions.
	21 – 40 tons	50.0	50.0	40.0	20.0	40.0	40.0	
	40 – 80 tons	25.0	25.0	60.0	40.0	60.0	42.0	
	Above 80 tons	0.0	0.0	0.0	20.0	0.0	4.0	
Which crop variety is the most common? Why?	Rice	50.0	50.0	40.0	75.0	60.0	55.0	Rice is considered the most common crop variety by 55% of respondents, likely due to its status as a staple food, adaptability to diverse environments, government support, and economic viability for smallholder farmers.
	Millet	25.0	50.0	60.0	25.0	20.0	36.0	
	Soyabean	25.0	0.0	0.0	0.0	20.0	9.0	
Any issue related to paddy in your location?	None	100	100	100	100	100	100	All respondents reported no issues related to paddy cultivation in their location.

4.3.5.10 Market Access in the Proposed Locations

The responses provided in Table 4.35 gave insights into how respondents access markets to sell their agricultural produce. This includes information on the various channels and strategies employed by farmers to reach buyers and consumers, as well as any challenges or opportunities encountered in the process. By understanding these market access dynamics, stakeholders can better support farmers in maximizing their market opportunities and improving their livelihoods.

Table 4.36: **Market Access in the Proposed Locations**

Indicators	Options	Respondents (%)						Summary of Findings
		Bani Ga Hannu	Gidan Dawa	Gummi	Maru	Yargeda	Average	
Do you sell only locally or outside the state?	Locally	100	100	100	75.0	100	95.0	The majority of farmers (95%) prefer to sell their produce locally, while only a small minority (5%) opt to sell outside the state. This is likely driven by factors such as lower transportation costs, stable local markets and established buyer relationships.
	Both locally and outside state	0.0	0.0	0.0	25.0	0.0	5.0	
Do you always get buyers for your farm produce?	Yes	100	100	100	100	100	100	All farmers reported having buyers for their farm produce. This suggests a positive market outlook and demand for agricultural products offered.
Will you produce and sell to new agro-industries that need your produce?	Yes	75.0	50.0	60.0	75.0	100	72.0	There is reluctance among the majority of respondents to engage with new agro-industries, potentially due to factors such as uncertainty about market reliability or challenges associated with entering new markets.
	No	25.0	50.0	40.0	25.0	0.0	28.0	
Will you increase your production volume if market access improves?	Yes	100	100	100	100	100	100	All respondents expressed a willingness to increase production volume if market access improves.

4.3.5.11 Related Agricultural Policy and Regulation in the Proposed Locations

The information shared in Table 4.37 provides an understanding of how respondents perceive policies and regulations related to agricultural produce. This includes details on governmental rules, industry standards, and trade policies influencing the production, distribution, and marketing of agricultural products. Familiarity with these regulatory aspects is crucial for farmers to navigate requirements, ensure adherence, and capitalize on opportunities for market access and sectoral advancement.

Table 4.37: **Policy and Regulation in the Proposed Locations**

Indicators	Options	Respondents (%)						Summary of Findings
		Bani Ga Hannu	Gidan Dawa	Gummi	Maru	Yargeda	Average	
Have you benefitted from the agricultural project/program of government in the last five years?	Yes	75.0	50.0	100	75.0	100	80.0	Majority of respondents have received some form of assistance or support from government initiatives aimed at enhancing agricultural development.
	No	25.0	50.0	0.0	25.0	0.0	20.0	
If yes, what is the name of the project or program?	AMCO	25.0	0.0	0.0	0.0	0.0	5.0	Receiving government aid in agriculture can provide essential resources and support to farmers, leading to increased productivity, improved livelihoods, and rural development. These programs play a vital role in promoting sustainable farming practices, enhancing food security, and stimulating economic growth in agricultural
	FADAMA	50.0	0.0	0.0	25.0	0.0	15.0	
	GES	25.0	0.0	0.0	25.0	80.0	26.0	
	ACRO	0.0	50.0	0.0	0.0	0.0	10.0	
	ZACAREP	0.0	50.0	80.0	0.0	0.0	26.0	
	NAC	0.0	0.0	20.0	0.0	0.0	4.0	

	NG CARES	0.0	0.0	0.0	25.0	20.0	9.0	communities.
What was the nature of the benefit?	Grants	100	100	0.0	0.0	0.0	40.0	Most respondents cited benefits such as agricultural input like seeds and fertilizers, while others mentioned grants. Majority perceived direct agricultural inputs as the primary form of support, with a smaller group identifying grants, likely representing financial assistance.
	Input (seed, fertilizers)	0.0	0.0	100	100	100	60.0	
Are you aware of any agro-inputs prohibited by the law in Zamfara state?	None	100	100	100	100	100	100	All respondents indicated that they were not aware of any agro-inputs prohibited by law in Zamfara state. This suggests either a lack of regulatory clarity or a perception among farmers that such prohibitions do not exist in the state.
Is there any radio program on agriculture in the state that you listen to?	Yes	75.0	75.0	60.0	50.0	60.0	64.0	This suggests a large portion of the surveyed population actively engages with agricultural radio programming, potentially indicating a strong interest in agricultural information, education, and updates among farmers and stakeholders in the state.
	No	25.0	25.0	40.0	50.0	40.0	36.0	

CHAPTER FIVE

POTENTIAL ENVIRONMENTAL/SOCIAL IMPACT IDENTIFICATION AND EVALUATION

This chapter presents information on the assessment of the potential environmental and socio-economic impacts of the proposed programme. As indicated in previous chapters, the Zamfara state government intend focusing on 5 value chains for which it has comparative advantage (Cotton, Rice, Wheat, Soyabeans, and Maize). These value chains are proposed to be supported by the SAPZ in the following proposed sites:

- Gidan Dawa HUB Gusau LGA
- Yargeda ATC Bakura LGA
- Gummi ATC Gummi LGA
- Bani ga hannu ATC Kaura Namoda LGA
- Maru ATC Maru LGA

The environmental and social impact assessment was carried taking into cognizance the unique characteristics of the proposed sites and their roles as AIH and ATCs. A description of the identification and evaluation methodology used to assess the significance of impacts, having taken into account impact magnitude and sensitivity of receptors and resources affected, is provided below.

5.1 Methodology for Impact Identification and Evaluation

The potential environmental and social impacts that are likely to arise as a result of the Zamfara State SAPZ programme were assessed by harmonizing the programme components with the surrounding environmental, social and cultural resources. This chapter therefore presents the potential impacts that could result from the proposed intervention programmes. A combination of methods was employed in assessing the potential impacts of the proposed intervention across Zamfara State. These methods include: the use of checklists, matrix, consultations, professional experience and judgment. The phases of impacts assessment include:

- Impact Identification: to specify the impacts associated with each phase of the programme activities;
- Impact Prediction: to forecast the nature, magnitude, extent and duration of the impacts; and
- Impact Evaluation – to determine the significance of the impacts

5.1.1 Impact Identification

A checklist based on an in-depth understanding of the local environment, existing baseline information and the key programme activities was used to develop a list of the potential impacts of the programme. The following were thus appraised:

- The source and/or the cause of the problem (programme activity/environment aspect);

- The receptor of the impact (environment component i.e., existing ecological and socioeconomic condition of the programme environment);
- The way in which the effect is transmitted from the source to the receptor (pathway); and
- The potential consequences (environmental impact).

5.1.2 Impacts Prediction

In order to further qualify the impacts of the various programme activities on the environment, the identified impacts were characterised based on the nature, duration, and reversibility of the impacts as follows:

- Beneficial Impacts – these are impact that have positive and beneficial effects;
- Adverse Impacts – these are impact that have negative and untoward effects;
- Direct Impacts – these are impacts that are most obvious and are directly related to the proposed programme and can be connected to the actions that caused them;
- Indirect Impacts – these are secondary impacts that occur later in time or further away from the impact source;
- Cumulative Impacts – these typically occur from the incremental impact of an action when combined with impacts from programmes that have been undertaken recently or would be carried out in the near future;
- Reversible Impacts – these are impact over which the components involved have the ability to recover after the disturbances caused by the impact;
- Irreversible Impacts – these are impact whose effects are such that the environmental component cannot be returned to its original State even after adequate mitigation measures are applied;
- Residual Impacts – these are impact whose effects remain after mitigation measures have been applied;
- Short Term Impacts – these are impact whose effects remain over a short period of time and are removed after the application of mitigation measures;
- Long Term Impacts- these are impact whose effects remain over a long period of time, even after the application of mitigation measures.

5.1.3 Impacts Evaluation

The third stage in the assessment procedure involved the evaluation of the concerns, issues and impacts identified. At this stage, an assessment of the significance of impacts that may result from the proposed programme was carried out. This also include outlines of the general assessment methods and a presentation of the criteria for determining receptor sensitivity, impact magnitude and impact significance. Thus, impact evaluation is based on the following:

Duration of the Impact:

- A temporary impact can last days, weeks or months, but must be associated to the notion of reversibility;
- A permanent impact is often irreversible. It is observed permanently or may last for a very long term.

Extent of the Impact:

- The extent is regional if an impact on a component is felt over a vast territory or affects a large portion of its population;
- The extent is local if the impact is felt on a limited portion of the zone of study or by a small group of its population;
- The extent is site-specific if the impact is felt in a small and well-defined space or by only some individuals.

Intensity of the Impact:

- The intensity of an impact is qualified as strong when it is linked to very significant modifications of a component;
- An impact is considered to be of average intensity when it generates perceptible disturbance in the use of a component or of its characteristics, but not in a way to reduce them completely and irreversible;
- A weak intensity is associated with an impact generating only weak modifications to the component considered, without putting at risk some of its utilization or its characteristics.

Impacts Severity:

Once the magnitude of the impact and sensitivity of a receptor have been characterized, the significance can be determined for each impact. The impact significance rating was determined, using the matrix provided in Table 5.1.

Table 5.1: Impact Evaluation Matrix

		Sensitivity/Vulnerability of Receptor		
		Low	Medium	High
Magnitude of Impact	Negligible	Negligible	Negligible	Negligible
	Small	Negligible	Minor	Moderate
	Medium	Minor	Moderate	Major
	Large	Moderate	Major	Major

- Major Impact: An impact of major significance, hereafter referred to as a ‘major impact’ is one where an accepted limit or standard may be exceeded, or large magnitude impacts occur to a highly valued/sensitive resource/receptors. Repercussions on the environment are very strong and cannot easily be reduced.
- Moderate Impact: An impact of moderate significance hereafter referred to as a ‘moderate impact’, will be within the accepted limits and standards. Moderate impacts may cover a broad range, from a threshold below which the impact is minor, up to a level that might be just short of breaching an established (legal) limit. Repercussions on the environment are substantial but can be reduced through specific measures.
- Minor Impact: An impact of minor significance, hereafter referred to as a ‘minor impact’ is one where an effect will be experienced, but whose magnitude is sufficiently small and well within accepted standards, and/or the receptor is of low sensitivity/value. Repercussions on the environment are significant but subdued and may or may not require the application of mitigation measures.

The following environmental indicators, receptors or resources affected by potential impacts were also considered:

The Biophysical Environment:

- Air quality;
- Noise, vibration;
- Soils and geology;
- Water resources;
- Ecology.

The Socio-economic Environment:

- Visual amenities;
- Community level impacts;
- Gender;
- Vulnerable;
- Community health, safety and security;
- Resettlement;
- Labour and working conditions;
- Infrastructure;
- Employment and economy; and
- Cultural Heritage.

5.2 Project Activities of Environmental and Social Concern

The SAPZ programme as stated earlier is designed to transform the existing large expanse of agricultural land (brown field) into an agricultural production / processing zone. The programme activities have been divided into three types which include; Agricultural activities, Agro-Processing facilities and Infrastructural development as outlined below:

Enhancement of Agricultural Production and Productivity in Proximity to Agro-Industrial Clusters: This entails crop production that would lead to:

Development and operation of agricultural fields:

- Site clearing and/or levelling;
- Compacting;
- Use of heavy equipment and hazardous materials;
- Material Extraction/quarrying, Slope stability/Excavation, cutting, and filling;
- Hazardous materials storage and disposal;
- Waste management;
- Construction camp and crew set up.

Agro-Processing activities: These entail crop and crop processing and value addition leading to:

- Dealing with waste;
- Treatment technologies for wastes from processing.
- Processing Infrastructure development/Construction and/or upgrading of Agro-Industrial Hub infrastructures such as:
- Transmission and distribution of electricity;
- Water supply system;
- Access Roads:
- Site clearing and/or levelling;
- Compacting;
- Use of heavy equipment and hazardous materials;
- Material Extraction/quarrying, Slope stability/Excavation, cutting, and filling;
- Hazardous materials storage and disposal;
- Waste management;
- Construction camp and crew set up.

5.3 Evaluation of Potential Impacts of the Proposed SAPZ Programme

5.3.1 Potential Positive Environmental and Social Impact

The potential positive impacts of the proposed Zamfara SAPZ programme are listed below and evaluated in Table 5.2.

- Increased farm incomes from crop output and ensuring dignity in farming practices;
- Elevation of rural income and national economy;
- Employment creation for community members;
- Improved infrastructure;
- Employment generation for youth and women;
- Enhanced income and livelihoods of farmers; and
- Improvement in the revenue base of key institutions and regulatory bodies

Table 5.2: Evaluation of Potential Positive Impacts

S/N	Potential Impact	Key Receptors	Evaluation	Significance
1	Improved crop productivity of farmers;	Farmers	Improved methods of crop production and less dependence on rainfall will reduce production losses. Provision of warehousing and rehabilitation of farm access/inspection roads will also reduce postharvest losses by farmers. The magnitude is medium and the sensitivity is high.	Major
2	Increased farm incomes from crop output and ensuring dignity in farming practices;	Farmers	The proposed SAPZ programme will have a positive impact on food security. This, combined with improved access to markets, will help commercial farmers to make better production decisions that will increase their income variability. The magnitude is large and the sensitivity is high	Major
3	Elevation of rural income and national economy;	• Farmers, Neighbouring • communities, • State and • national • economy	The local and national economy will be boosted through the following: • direct and indirect job creation; • increased income for workers; • increase in business activities in the • communities; • increased food production will reduce food cost; • payment of taxes will improve the revenue base of the economy. On the national front, the expected increment in food	Major

			productivity can contribute to reducing the nation's food importation bill. The impact will be regional and permanent, lasting throughout the duration of the programme. The magnitude is large and the sensitivity is high.	
4	Employment creation for community members;	• Farmers, Community • members, • people from • other • communities	• The proposed programme will result in the engagement of skilled and unskilled labour for the planning, construction, operation, maintenance phases of the programme. The programme will also improve the capacity of farmers to employ more hands on their farms owing to the increase in productivity. • The programme will therefore have a major positive impact on the socio-economic conditions of the local communities in and around the programme area as a whole through the creation of permanent and temporary direct jobs as well as indirect jobs. The magnitude is large and the sensitivity is high.	Major
5	Improved infrastructure;	Farm, community	The proposed programme in improving infrastructure will have socio-economic benefits which includes the all-weather road reducing transportation costs, increased access to markets for local produce and products, better access to health care and other social services. The provision of storage facilities will significantly reduce post-harvest losses of farmers on the programme. In the long term, this will have more positive benefits to local economic development. The impact will be major and of regional extent. The magnitude is large and the sensitivity is high	Major
6	Employment generation for youth and women;	Neighbouring community	It is anticipated that 35 percent of the total direct beneficiaries will be women. By design, the programme has a dedicated sub-component to benefit women and youth in such a way that will allow them to develop agri-business that is expected to create jobs and improve their livelihoods. The impact will be major and of regional extent. The magnitude is large and the sensitivity is high	Major
7	Enhanced income and livelihoods of farmers;	Farmers and Community members	The incomes and livelihoods of the participating farmers will be enhanced through the following: • all year-round cropping will ensure farmers have reliable source of income; • reduction in investment losses by farmers; • efficient and effective management unit will ensure ready market for farmers; • increased crop productivity of farmers will boost their incomes and livelihoods; • women will participate in the programme earning some income to support their families.	Major

			The implementation of the programme will inspire commercial activity in the programme area and also provide direct and indirect jobs. The impact on out growers and other workers' incomes and livelihoods will be major and permanent. The magnitude is large and the sensitivity is high	
8	Improvement in the revenue base of key institutions and regulatory bodies	Local government, State and National economy	Revenue will accrue to traditional authorities and regulatory institutions through the payment of royalties and regulatory fees and levies. The impact will be permanent, lasting throughout the duration of the programme. The magnitude is large and the sensitivity is Medium	Major
9	Improved standard of living among people in the project area			

5.3.2 Potential Negative Impacts

The potential negative impacts of the programme activities by the Zamfara State SAPZ with a focus on the five value chains (Cotton, Rice, Wheat, Soyabeans, and Maize) are consistent with category 1 programmes. While the potential negative impacts that could emanate from the programme activities are outlined below, evaluation of their potential impacts are presented in Tables 5.3 - 5.7 based on the value chains.

Enhance Agricultural Production and Productivity in Proximity to Agro-Industrial Clusters

Environmental

- disturbance of flora and fauna;
- loss of vegetation and impacts on flora and fauna;
- air quality deterioration;
- vibration & noise nuisance;
- water quality issues;
- changes in soil nutrient cycles;
- soil impacts and sediment transport.

Social

- land acquisition and compensation issues;
- loss of employment;
- generation and disposal of solid waste;

- elimination of smallholder farmers;
- increasing demand for lands for farming/ settlements by fringe communities because productive lands not available;
- chance finds of cultural resources;
- interference with local cultural identity and heritage
- occupational health & safety issues;
- public safety;
- restriction and outright loss of land;
- increase in Gender Based Violence;
- increase in Child labour incidents;
- social exclusion of women or the vulnerable persons;
- influx of workers and migrants resulting in spread of communicable diseases.

Crop processing

Environmental

- impacts on natural habitats;
- impacts from air emissions;
- soil quality degradation;
- impact from water abstraction;
- pollution of environment due to processing with high concentration of organic matter, cyanide and processing chemicals;
- pollution of water sources;
- dust emissions from milling operations
- noise and vibration;
- water quality impacts.

Social

- impacts of waste generation and disposal;
- occupational health and safety;
- sanitation issues and public health;
- impacts on livelihood;
- visual intrusion;

- conflicts over land and water use and plot allocation;
- fire risk;
- pest and rodent infestation;
- post-harvest losses;
- impacts on Physical Cultural Resources
- impact on nearby communities; and
- sustainability of the farming venture.

Infrastructure Support

Environmental

- impact on sensitive terrestrial ecosystems;
- alterations in local natural water cycles/ hydrology;
- degradation due to vehicular movement, mobilization of equipment, construction activities such as earthworks;
- deterioration from burning of biomass from clearing and addition of carbon into atmosphere;
- damage local habitat, compact soil, and create erosion via building and occupation of construction camp;
- contaminate surface water;
- obstruction of access ways to communities;
- road impacts & traffic issues.

Social

- generation of construction and other types of waste;
- utility disruption;
- impacts on Physical Cultural Resources;
- impact on nearby communities;
- alteration of socio-cultural values and the stability of communities adversely affected by the programme;
- exposure to rapid social change or tourism;
- accidents from operation of construction equipment;
- social tension due to the exclusion of local people from the programme activities;

- pastoralists loss of feed for their livestock;
- failure of equipment and facilities.

Table 5.3: Evaluation of Potential Negative Impacts - Proposed site for Agro-Industrial Hub (AIH) - Gidan Dawa, Gusau

S/N	Proposed Project Activities	Environmental Impacts	Key Receptors	Evaluation	Significance
1	• Enhance Agricultural Production and Productivity in Proximity to Agro-Industrial Clusters • Slope stability/Excavation, cutting, and filling • Hazardous materials storage and disposal, • Waste management, • Construction camp and crew set up	Deforestation in the process of land preparation for cropping	Flora, fauna	• The SAPZ programme focuses on green and brown fields. It will therefore not significantly result in extensive deforestation/the loss of any species of conservation value. • Disturbed fauna can migrate to nearby bushes. Impact is limited to programme site and of local extent. The magnitude and the sensitivity are medium.	Moderate
2		Alterations of local natural water cycles / Depletion of groundwater for irrigation purposes	Groundwater aquifer	• Water abstraction by the programme will be from the groundwater aquifer (borehole). This will not compromise the source or affect its supply in general. • The magnitude is small and the sensitivity is medium.	Minor
3		Soil quality degradation	Soil, fauna, water bodies	• Soil quality degradation may result from the following: • continuous use of agrochemicals and fertilizers may result in the death of soil fauna and also cause soil pollution; • continuous application of ammonium-based inorganic fertilizers may result in soil acidification; • land preparation, tilling and other physical farming practices may result in the death of soil fauna; • loosened and exposed soils will be susceptible to water and	Major

				wind erosion; • soil compaction in areas of the land under continuous use of heavy machinery; • continuous tilling of the soil, hard pan formation, erosion and effects on soil fauna may adversely affect the soil structure. • The impact is local but will last throughout the life span of the programme and may have lasting effects on the soil. The magnitude is medium and the sensitivity is high.	
4		Surface and ground water pollution	Water, aquatic life	• erosion from farmlands may result in the transport of soil sediments into the drains and into rivers. • Pollution of surface water sources through the transport of agrochemicals in runoff and waste water; • eutrophication of surrounding water bodies through transport of nutrient rich sediments; • the use of chemicals i.e. fertilizers, herbicides etc. which enter the water bodies through runoff may decrease the quality of the water overtime; • possible pollution of groundwater through the percolation of agrochemicals through the soil; • impacts may occur throughout the lifespan of the programme. The magnitude and the sensitivity are high.	Major
5		Air pollution due to increased mechanized	Air, workers, public	• Likely sources of air emissions will be land preparation works for subsequent planting and movement of vehicles on	Minor

		farming, vehicular movement and increased burning of biomass of cleared forest post-harvest waste		untarred surfaces which will result in the increase of airborne particulates. This will affect the air quality in the immediate surroundings. Emissions and fumes from machinery and equipment, • Any impacts from air emissions are therefore likely to be within WHO/FMEnv.'s acceptable limits. The magnitude is medium and the sensitivity is low.	
6		Improper disposal of agricultural waste, fertilizer and chemical containers	Soil, water bodies	• Periodic vegetation removal, farm produce waste, used agro-chemical containers, used fertilizer bags etc. are the main waste to be generated on the farms during the operational phase. • Servicing and maintenance of machinery and equipment may also generate waste such as scrap metal, empty lubricant containers, waste lubricants, rubber seals, etc. • Domestic/commercial wastes such as used polythene bags, food wastes, food wrappers, used water sachets and bottles, human wastes will be generated etc. • The impact is local and will last throughout the agricultural development and operations phase. The magnitude is medium and the sensitivity is high.	Major
7		Pest and rodent infestation of matured crop	Matured crop, farmers, public	• Matured crop is susceptible to attacks from insects and rodents. Specifically, birds attack on matured crops have been challenging.	Major

				• The magnitude is large and the sensitivity is high.	
8		Noise and vibration;	Workers, public	• The main sources of noise by the programme site will be from machineries used for the agricultural activities (tractor, growers, harvester etc). • Other likely sources of noise in the immediate programme area will be through the movement of vehicles. • Most impact will be of weak intensity and of local extent as the communities are not close to the area. The magnitude and the sensitivity are medium.	Moderate
9		Impacts on water quality	Community members, downstream users, soil	• Improper use of pesticides during farming may contaminate the underlying groundwater and move along ground water paths to surface water over a period of time. This may result in health impacts and alteration of the aquatic life as a large range of agrochemicals are toxic. • The magnitude and the sensitivity are high.	Major
10		Fire risk	Farmers, public property, workers	• Farms are highly susceptible to fires which could result in death, burns and loss of property (crops on farm and structures) and investment of the farmers and also adjacent farmers. • The fires could emanate from within the farm (uncontrolled burning, smoking, cooking, etc.) or spread from outside the farm area. The magnitude is medium and the sensitivity is high.	Major

		Social Impacts			
11		Land Use Rights	Farmers, Neighbouring communities	• The land used for crop cultivation across the State are acquired based on the leasehold tenure system from the neighbouring communities. • Disagreement between the parties and/or decision of the land owners to use the land for other purposes (real estate) will definitely thwart the agricultural activities despite all the investment. The magnitude is large and the sensitivity is high.	Major
12		Increasing demand for lands for farming;	Farmers, Neighbouring communities	• With the proposed intervention by Zamfara State SAPZ programme, there will be the need for farm expansion and demand for land. This may result in an increase in the cost of leasehold land tenure system currently being practiced by most farmers across the programme areas. • The magnitude and the sensitivity are medium.	Moderate
13		Loss of fallow and other agricultural land	Farmers	• The practice of fallow land farming system may be difficult with the increasing demand for land for crop cultivation. The magnitude and the sensitivity are medium.	Moderate
14		Elimination of smallholder farmers	Farmers	• Medium and Large-scale farmers with economic and political powers and influence may push out smallholder farmers by buying their portions due to the potential increase demand for land to enhance productivity. The magnitude and	Moderate

				the sensitivity are medium.	
15		Occupational health & safety	Workers	• Workers may be exposed to injury from machines and equipment as well as from bites from dangerous reptiles and other animals such as snakes, scorpions, bees, ants, etc. • This effect can be prevented or minimized through the use of appropriate personal and protective equipment such as safety boots and gloves. • The impact is temporary lasting during agricultural activities. The magnitude is small and the sensitivity is medium.	Minor
16		Increased spate of GBV due to the need and participation of more women	Farmers, women	• The influx of labour from other communities and towns during the programme implementation will potentially escalate the spate of GBV cases especially incidences of non-partner sexual assault, sexual exploitation and abuse, child abuse and child marriage within the programme area. • The magnitude is medium and the sensitivity is high.	Major
17		Conflicts over land and water use and plot allocation;	Farmers, Neighbouring communities	• Conflicts over water use may arise from non-synchronization of planting. • The magnitude is medium and the sensitivity is low.	Moderate
18		Sanitation issues and public health;	Soil, Water, Workers	• Indiscriminate disposal of farm generated waste will potentially create unsightly conditions. Poor sanitation conditions may pollute nearby water sources. Indiscriminate disposal of used agrochemical containers may pose serious	Major

				health risk to members of the public who reuse them. • Additionally, bushy areas and stagnant water in canals will provide favourable breeding grounds for mosquitoes and could lead to an increase in malaria occurrence. • Failure to provide appropriate sanitation facilities at vantage points within the programme area may encourage, and to some extent leave no option than, open defecation in the fields. • Women suffer more in this respect as it puts their dignity at risk and predisposes them to rape. • The magnitude is medium and the sensitivity is high.	
19		Impacts on Communities	Neighbouring communities	• Communities within the programme area may be significantly impacted by programme activities. Spray drift from the application of agrochemicals as well as dust and noise from land preparation activities for subsequent planting seasons may also negatively impact on the communities. • Impacts from the use of pesticides/ agrochemicals on aquatic life and subsequently health impacts on individuals who rely on the water for domestic purposes. • The impact will last for the lifespan of the programme. The magnitude is medium and the sensitivity is high.	Major
20		Sustainability of the farming venture	Farmers	• Inadequate workforce and/or machinery may derail the cropping calendar of farmers to undertake land preparation,	Major

				planting and harvesting tasks for crop production, which subsequently may affect the long-term viability of the programme. • Unavailability of ready market and low prices may affect revenue generation. Pest and disease infestation may also adversely affect crop productivity. Failure of the storage facilities may also reduce the shelf life of crops and result in high postharvest losses. • Emergency situations may arise from various activities within and outside of the farm. For example, vehicular accidents, bush fires, power failures, etc. may have disastrous consequences if no emergency response plans are put in place. The losses could be higher and result in joblessness of the farmers if appropriate measures are not put in place. Lack of human resources, technical know-how and logistics to implement environmental and social safeguards could also significantly hamper the successful implementation of the proposed programme. • The magnitude is medium and the sensitivity is high.	
	Agro-Processing activities ○ Crop processing ○ Dealing with waste, ○ Treatment	Environmental Impacts			
21		Noise and vibration	Air, workers, public	• The main sources of noise at the programme site will be from crop processing activities. • Other likely sources of noise in the immediate programme area will be through the use of machines and equipment and	Minor

	technologies for wastes from processing			the movement of vehicles. No major heavy machinery and equipment will be used during the operational phase which could result in major vibrations. • Any impact will be of weak intensity and of local extent. • The magnitude is medium and the sensitivity is low.	
22		Impact on air quality	Air, workers, public	• Crop processing activities, mainly milling may constitute the main sources of air emissions that may result from increased particulate matter in the air. Impact from air emissions is therefore likely to be within FMEnv.'s acceptable limits. • The magnitude is medium and the sensitivity is low.	Minor
23		Noise and vibration	Air, workers, public	• The main sources of noise at the programme site will come from crop processing activities. Other likely sources of noise in the immediate programme area will be through the use of machines and equipment and the movement of vehicles. No major heavy machinery and equipment will be used during the operational phase which could result in major vibrations. Impact will be of weak intensity and of local extent as the communities are not close to the area. • The magnitude is medium and the sensitivity is low.	Minor

24		Fire Risk	Farmers, public property, workers	• Processing plants are highly susceptible to fires which could result in death, burns and loss of property. The fires could emanate from within the plant through uncontrolled smoking, cooking or electrical shock, etc. or spread from outside the plant. • The magnitude is medium and the sensitivity is high	Major
		Social Impacts			
25		Sustainability of the processing plant	Farmers, Workers	• The sustainability of the crop processing plant may be hampered by inadequate workforce/or machinery. • Lack of human resources, technical know-how and logistics to operate and maintain the plants could also significantly hamper the successful implementation of the proposed programme. • Failure of the storage facilities may also reduce the shelf life of produce and result in high postharvest losses. • The magnitude is medium and the sensitivity is high.	Major
26		Occupational health & safety	Processing plant workers	• Machine operators will be exposed to noise, dust and vibrations especially without the use of appropriate PPEs. There is a high risk of accidents and injury from the use of machinery and equipment if safety procedures are not followed. • The use of appropriate PPEs and adherence to safety and operational procedures will reduce this impact. The	Major

				magnitude is medium and the sensitivity is high.	
27		Sanitation issues and public health	Land, water bodies	• Failure to provide appropriate sanitation facilities at vantage points within the programme area may encourage, and to some extent leave no option than, open defecation in the fields. Women suffer more in this respect as it puts their dignity at risk and predisposes them to rape. The magnitude is medium and the sensitivity is high.	Major
28		Pest/rodent infestation and contamination of stored produce	Stored produce, farmers, public	• Stored produce is susceptible to attacks from insects and rodents if the necessary management practices and storage conditions for the produce are not followed. • Improper post-harvest management practices on The Farm may introduce insects such as weevils into the produce prior to storage. Insects and rodents may feed on stored produce, resulting in losses in quantity and quality of produce and consequently investment losses which could be high. • In addition to feeding on stored produce, rodents may also contaminate stored produce through their droppings, urine,	Major

				hairs and may spread human diseases. This could have health implications for the public. • The impact on health could be high and of regional extent. The magnitude and the sensitivity are high.	
29		Post-harvest losses	Farmers	• Post-harvest losses may arise from disease infestation, pests and rodent infestation and improper storage conditions which may reduce the shelf life of produce. Improper storage conditions such as poor ventilation, poor housekeeping and leakages in the roof may lead to mould development and disease infestation. Improper drying of produces to reach the recommended moisture content for storage (13-14%) may reduce the shelf life and make it susceptible to disease infestation. Any infested produce will be permanently impacted and the investment losses to farmers could be major. • The magnitude is large and the sensitivity is high	Major
	Processing Infrastructure development/Construction and/or upgrading of Agro-Industrial Hub infrastructure	Environmental Impacts			

30	• Transmission and distribution of electricity, • Water supply system, • Access Roads • Site clearing and/or levelling, • Compacting, • Use of heavy equipment and hazardous materials • Material Extraction, Slope stability/Excavation, cutting, and filling • Hazardous materials storage and disposal, • Waste management, • Construction	Air quality deterioration	Project affected communities, construction workers, farmers	• Dust generation will arise from site preparation, excavations, general construction works and topsoil handling by mechanical equipment and portable auxiliary equipment. Vehicular/truck movements and transport of materials/ equipment to and from site on the untarred routes/roads and cleared will also generate dust. • Loading, haulage and dumping of sand/stone aggregates as well as cement handling will also generate dust that can increase the air borne particulate in the vicinity. • Use of construction vehicles, trucks and generators will generate fumes/gaseous emissions from combustion of diesel engines of such equipment. • Inhalation of fumes and gaseous emissions such as carbon monoxide, sulphur oxides and nitrous oxides can affect the health of persons exposed to these gases for prolonged periods. • The impact is direct, temporary and likely, lasting during the construction phase; the impact is also local in extent i.e. limited to the programme site and adjacent properties. • However, based on the scale of the proposed infrastructure development (small and medium), The magnitude and the sensitivity are medium.	Moderate
31		Vibration and noise nuisance	Workers, public	• Activities that will contribute to increased noise levels during the construction phase include: vehicular and truck	Moderate

	camp and crew set up			movement, site clearing and preparation, dredging works, piling, construction of breakwater, etc. • Typical noise level from construction activities ranges from 80 dBA to 112 dBA (BS 5228-1:2009) within the construction areas and is expected to significantly reduce to 30 dBA to 62 dBA at a distance of about 80m from the site. • The impact is direct, temporary and likely, moderate in scale; the impact is also local in extent i.e. limited to the programme site and adjacent properties. The application of standard noise control measures will assist in ensuring that these issues are reduced. • However, based on the scale of the proposed infrastructure development (small and medium), The magnitude and the sensitivity are medium.	
32		Loss of vegetation and impacts on flora and fauna	Flora and fauna, within access road and other infrastructure RoW	• The proposed intervention by the Zamfara SAPZ programme is meant for brown and green fields. In essence, the sites can be classified as Modified habitat, deficient in fauna largely due to the degradation of the original habitat by human activities and its nature as semi-arid. Therefore, impact on terrestrial fauna will be limited. Disturbed fauna can migrate to nearby bushes. • The magnitude and the sensitivity are medium	Moderate

		Surface water contamination/ impact on aquatic organisms	Streams, and Rivers.	• Site preparation, comprising clearance of vegetation in the RoW as well as grading and trenching works for the road and drainages will result in loosening and exposure of top soil. This will facilitate their erosion and sediment transport into the nearby streams and rivers. • Disposal of discharge construction wastewater into natural water bodies may also adversely affect the flow regime of the affected water bodies and its aquatic life. • The impact is direct, temporary and likely, lasting during the construction phase; the impact is also local in extent i.e. limited to the programme site and nearby streams and river, and moderate in scale. The magnitude is medium and the sensitivity is high.	Major
		Social Impacts			
33		Obstruction of access ways to communities	Community members	• The road network to the proposed site serves as access roads to some of the communities in the programme area, Construction works at the programme may render portions of the roads and existing footpaths inaccessible, temporarily closed or unmotorable during the constructional phase. Alternatives routes will have to be provided for use by commuters/motorists. This may create inconvenience and increase travel time to and from the communities. The impact is temporary, lasting during the constructional phase.	Moderate

				• The magnitude is small and the sensitivity is high.	
		Influx of workers and migrants	Workers, public	• Construction activities may result in the movement of workers to the programme area and people from other communities in search of job opportunities. Influx of people during the construction period may promote irresponsible sexual behaviour which could lead to teenage pregnancies HIV/AIDS and other STD infections. • The impact may be permanent or irreversible in nature. The magnitude is medium and the sensitivity is high	Major
34		Public safety	Workers, public	• Project communities may be at risk from the movement of trucks/vehicles and other machinery, as well as from unsecured excavations (drains). This is particularly critical for children in the communities. • The transportation of construction materials and the movement of heavy equipment to the programme site, as well as the transport of waste from the site, may pose risks to inhabitants/communities. Improperly covered trenches may result in stagnated water and mosquitoes breeding site. • This impact is temporary, lasting during the constructional phase. The magnitude is medium and the sensitivity is high.	Major
		Road impacts & traffic issues	Road network, communities	• Increased traffic though significant is not expected to hinder road traffic on the road. The road to the programme site has low traffic volume, which is typical of rural setting and can	Major

				accommodate the movement of haulage trucks to the programme site. • It must however be noted that all materials for filling will be obtained in-situ and from nearby borrow-pits while stone aggregates for concrete works will however be transported from the quarry sites. Any unattended mechanical breakdown of such cargo trucks on the roads can induce traffic and serious accidents. Any traffic impacts will be of moderate intensity. • The magnitude is medium and the sensitivity is high.	
35		Occupational health & safety	Processing plant workers	• Construction workers will be exposed to noise, dust and vibrations especially without the use of appropriate PPEs. There is a high risk of accidents and injury from the use of machinery and equipment if safety procedures are not diligently followed. • The use of appropriate PPEs and adherence to safety and operational procedures will reduce this impact. The magnitude is medium and the sensitivity is high.	Major
36		Waste generation and disposal	Soil, water bodies	• Servicing and maintenance of machinery may also generate waste such as scrap metal, empty lubricant containers, waste lubricants, rubber seals, etc. Domestic/office wastes such as used polythene bags, food wastes, food wrappers, used water sachets and bottles, office wastes and human wastes will be generated etc. The impact is local and will last throughout	Major

				the agricultural development and operation phase. • The magnitude is medium and the sensitivity is high.	
37		Sanitation issues and public health	Land, water bodies	• Failure to provide appropriate sanitation facilities at the appropriate points within the programme area may encourage, and to some extent leave no option than open defecation in the fields. Women suffer more in this respect as it puts their dignity at risk and predisposes them to rape. • The magnitude is medium and the sensitivity is high.	Major

Table 5.4: Evaluation of Potential Negative Impacts Yargeda – Talata Mafara (ATC)

S/N	Proposed Project Activities				
		Environmental Impacts	Key Receptors	Evaluation	Significance
1	• Enhance Agricultural Production and Productivity in Proximity	Deforestation in the process of land preparation for cropping	Flora, fauna	• The SAPZ programme focuses on green and brown fields. It will therefore not significantly result in extensive deforestation/the loss of any species of conservation value. Disturbed fauna	Moderate

	to Agro-Industrial Clusters • Slope stability/Excavation, cutting, and filling • Hazardous materials storage and disposal, • Waste management, • Construction camp and crew set up			can migrate to nearby bushes. Impact is limited to programme site and of local extent. • The magnitude and the sensitivity are medium.	
2		Alterations of local natural water cycles / Depletion of groundwater for irrigation purposes	Groundwater aquifer	• Water abstraction by the programme will be from the groundwater aquifer (borehole). This will not compromise the source or affect its supply in general. • The magnitude is small and the sensitivity is medium.	Minor
3		Soil quality degradation	Soil, fauna, water bodies	• Soil quality degradation may result from the following: ○ continuous use of agrochemicals and fertilizers may result in the death of soil fauna and also cause soil pollution; ○ continuous application of ammonium-based inorganic fertilizers may result in soil acidification; ○ land preparation, tilling and other	Major

				physical farming practices may result in the death of soil fauna; ○ loosened and exposed soils will be susceptible to water and wind erosion; ○ soil compaction in areas of the land under continuous use of heavy machinery; ○ continuous tilling of the soil, hard pan formation, erosion and effects on soil fauna may adversely affect the soil structure. • The impact is local but will last throughout the life span of the programme and may have lasting effects on the soil. The magnitude is medium and the sensitivity is high.	
4		Surface and ground water pollution	Water, aquatic life	• Erosion from farmlands may result in the transport of soil sediments into the drains and into rivers. Pollution of surface water sources through the transport of agrochemicals in runoff and waste water;	Major

				• eutrophication of surrounding water bodies through transport of nutrient rich sediments; • the use of chemicals i.e. fertilizers, herbicides etc. which enter the water bodies through runoff may decrease the quality of the water overtime; • possible pollution of groundwater through the percolation of agrochemicals through the soil; • impacts may occur throughout the lifespan of the programme. • The magnitude and the sensitivity are high.	
5		Air pollution due to increased mechanized farming, vehicular movement and increased burning of biomass of cleared forest post-harvest waste	Air, workers, public	• Likely sources of air emissions will be land preparation works for subsequent planting and movement of vehicles on untarred surfaces which will result in the increase of airborne particulates. This will affect the air quality in the immediate surroundings. Emissions and fumes from machinery and equipment, • Any impacts from air emissions is therefore likely to be within WHO/FMEnv.'s acceptable	Minor

				limits. • The magnitude is medium and the sensitivity is low.	
6		Improper disposal of agricultural waste, fertilizer and chemical containers	Soil, water bodies	• Periodic vegetation removal, farm produce waste, used agro-chemical containers, used fertilizer bags etc. are the main waste to be generated on the proposed site during the operational phase. • Servicing and maintenance of machinery and equipment may also generate waste such as scrap metal, empty lubricant containers, waste lubricants, rubber seals, etc. • Domestic/commercial wastes such as used polythene bags, food wastes, food wrappers, used water sachets and bottles, human wastes will be generated etc.	Major

				• The impact is local and will last throughout the agricultural development and operations phase. • The magnitude is medium and the sensitivity is high.	
7		Pest and rodent infestation of matured crop	Matured crop, farmers, public	• Matured crop is susceptible to attacks from insects and rodents. Specifically, birds attack on matured crops have been challenging. • The magnitude is large and the sensitivity is high.	Major
8		Noise and vibration;	Workers, public	• The main sources of noise at the programme site will be from machineries used for the agricultural activities (tractor, growers, harvester etc). • Other likely sources of noise in the immediate	Moderate

				programme area will be through the movement of vehicles. Most impact will be of weak intensity and of local extent as the communities are not close to the area. • The magnitude and the sensitivity are medium.	
9		Impacts on water quality	Community members, downstream users, soil	• Improper use of pesticides during farming may contaminate the underlying groundwater and move along ground water paths to surface water over a period of time. This may result in health impacts and alteration of the aquatic life as a large range of agrochemicals are toxic. • The magnitude and the sensitivity are high.	Major
10		Fire risk	Farmers, public property, workers	• Farms are highly susceptible to fires which could result in death, burns and loss of property (crops on farm and structures) and investment of the farmers and also adjacent farmers. The fires could emanate from within the farm (uncontrolled burning, smoking, cooking, etc.) or spread from outside the farm area.	Major

				• The magnitude is medium and the sensitivity is high.	
		Social Impacts			
11		Land Use Rights	Farmers, Neighbouring communities	• The land used for cultivation across the State are acquired based on the leasehold tenure system from the neighbouring communities. Disagreement between the parties and/or decision of the land owners to use the land for other purposes (real estate) will definitely thwart the agricultural activities despite all the investment. • The magnitude is large and the sensitivity is high.	Major
12		Increasing demand for lands for farming;	Farmers, Neighbouring communities	• With the proposed intervention by Zamfara State SAPZ programme, there will be the need for farm expansion and demand for land. This may result in an increase in the cost of leasehold land tenure system currently being practiced by most farmers across the	Moderate

				programme areas. • The magnitude and the sensitivity are medium.	
13		Loss of fallow and other agricultural land	Farmers	• The practice of fallow land farming system may be difficult with the increasing demand for land for cultivation. • The magnitude and the sensitivity are medium.	Moderate
14		Elimination of smallholder farmers	Farmers	• Medium and Large-scale farmers with economic and political powers and influence may push out smallholder farmers by buying their portions due to the potential increase demand for land to enhance productivity. • The magnitude and the sensitivity are medium.	Moderate

15		Occupational health & safety	Workers	• Workers may be exposed to injury from machines and equipment as well as from bites from dangerous reptiles and other animals such as snakes, scorpions, bees, ants, etc. • This effect can be prevented or minimized through the use of appropriate personal and protective equipment such as safety boots and gloves. The impact is temporary lasting during agricultural activities. • The magnitude is small and the sensitivity is medium.	Minor
16		Increased spate of GBV due to the need and participation of more women	Farmers, women	• The influx of labour from other communities and towns during the programme implementation will potentially escalate the spate of GBV cases especially incidences of non-partner sexual assault, sexual exploitation and abuse, child abuse and child marriage within the programme area. • The magnitude is medium and the sensitivity is high.	Major

17		Conflicts over land and water use and plot allocation;	Farmers, Neighbouring communities	• Conflicts over water use may arise from non-synchronization of planting. • The magnitude is medium and the sensitivity is low.	Moderate
18		Sanitation issues and public health;	Soil, Water, Workers	• Indiscriminate disposal of farm generated waste will potentially create unsightly conditions. Poor sanitation conditions may pollute nearby water sources. Indiscriminate disposal of used agrochemical containers may pose serious health risk to members of the public who reuse them. Additionally, bushy areas and stagnant water in canals will provide favourable breeding grounds for mosquitoes and could lead to an increase in malaria occurrence. Failure to provide appropriate sanitation facilities at vantage points within the programme area may encourage, and to some extent leave no option than, open defecation in the fields. Women suffer more in this respect as it puts their dignity at risk and predisposes them to rape.	Major

19		Impacts on Communities	Neighbouring communities	• Communities within the programme area may be significantly impacted by programme activities. Spray drift from the application of agrochemicals as well as dust and noise from land preparation activities for subsequent planting seasons may also negatively impact on the communities. • Impacts from the use of pesticides/ agrochemicals on aquatic life and subsequently health impacts on individuals who rely on the water for domestic purposes. • The impact will last for the lifespan of the programme. • The magnitude is medium and the sensitivity is high.	Major
20		Sustainability of the farming venture	Farmers	• Inadequate workforce and/or machinery may derail the cropping calendar of farmers to undertake land preparation, planting and harvesting tasks for production, which subsequently may affect the long-term viability of the programme.	Major

				• Unavailability of ready market and low prices may affect revenue generation. Pest and disease infestation may also adversely affect crop productivity. Failure of the storage facilities may also reduce the shelf life of crops and result in high postharvest losses. • Emergency situations may arise from various activities within and outside of the farm. For example, vehicular accidents, bush fires, power failures, etc. may have disastrous consequences if no emergency response plans are put in place. The losses could be higher and result in joblessness of the farmers if appropriate measures are not put in place. Lack of human resources, technical know-how and logistics to implement environmental and social safeguards could also significantly hamper the successful implementation of the proposed programme. • The magnitude is medium and the sensitivity is high.	
	Agro-Processing activities	Environmental Impacts			

21	Crop processing ○ Dealing with waste, ○ Treatment technologies for wastes from processing	Noise and vibration	Air, workers, public	• The main sources of noise at the programme site will be from crop processing activities, mainly milling operations. • Other likely sources of noise in the immediate programme area will be through the use of machines and equipment and the movement of vehicles. No major heavy machinery and equipment will be used during the operational phase which could result in major vibrations. • Any impact will be of weak intensity and of local extent as the communities are not close to the area. • The magnitude is medium and the sensitivity is low.	Minor
22		Impact on air quality	Air, workers, public	• processing activities, mainly milling may constitute the main sources of air emissions that may result from increased particulate matter in the air. Impact from air emissions is therefore likely to be within FMEnv's acceptable limits. • The magnitude is medium and the sensitivity is	Minor

				low.	
23		Noise and vibration	Air, workers, public	• The main sources of noise at the programme site will come from processing activities. Other likely sources of noise in the immediate programme area will be through the use of machines and equipment and the movement of vehicles. No major heavy machinery and equipment will be used during the operational phase which could result in major vibrations. Impact will be of weak intensity and of local extent as the communities are not close to the area. • The magnitude is medium and the sensitivity is low.	Minor
24		Fire Risk	Farmers, public property, workers	• Processing plants are highly susceptible to fires which could result in death, burns and loss of property. The fires could emanate from within the plant through uncontrolled smoking, cooking or electrical shock, etc. or spread from outside the plant. • The magnitude is medium and the sensitivity is	Major

				high	
		Social Impacts			
25		Sustainability of the processing plant	Farmers, Workers	• The sustainability of the processing plant may be hampered by inadequate workforce/or machinery. • Lack of human resources, technical know-how and logistics to operate and maintain the plants could also significantly hamper the successful implementation of the proposed programme. • Failure of the storage facilities may also reduce the shelf life and result in high postharvest losses. • The magnitude is medium and the sensitivity is high.	Major

26		Occupational health & safety	Processing plant workers	• Machine operators will be exposed to noise, dust and vibrations especially without the use of appropriate PPEs. There is a high risk of accidents and injury from the use of machinery and equipment if safety procedures are not followed. • The use of appropriate PPEs and adherence to safety and operational procedures will reduce this impact. • The magnitude is medium and the sensitivity is high.	Major
27		Sanitation issues and public health	Land, water bodies	• Failure to provide appropriate sanitation facilities at vantage points within the programme area may encourage, and to some extent leave no option than, open defecation in the fields. Women suffer more in this respect as it puts their dignity at risk and predisposes them to rape. • The magnitude is medium and the sensitivity is high.	Major

28		Pest/rodent infestation and contamination of stored	Stored produce, farmers, public	• Stored produce is susceptible to attacks from insects and rodents if the necessary management practices and storage conditions for the produce are not followed. • Improper post-harvest management practices on The Farm may introduce insects such as weevils into the produce prior to storage. Insects and rodents may feed on stored produce, resulting in losses in quantity and quality of produce and consequently investment losses which could be high. • In addition to feeding on stored produce, rodents may also contaminate stored produce through their droppings, urine, hairs and may spread human diseases. This could have health implications for the public. • The impact on health could be high and of regional extent. • The magnitude and the sensitivity are high.	Major
29		Post-harvest losses	Farmers	• Post-harvest losses may arise from disease infestation, pests and rodent infestation and	Major

				improper storage conditions which may reduce the shelf life of produce. Improper storage conditions such as poor ventilation, poor housekeeping and leakages in the roof may lead to mould development and disease infestation. Improper drying of crop to reach the recommended moisture content for storage (13-14%) may reduce the shelf life and make it susceptible to disease infestation. Any infested produce will be permanently impacted and the investment losses to farmers could be major. • The magnitude is large and the sensitivity is high	
	Processing Infrastructure development/Construction and/or upgrading of Agro-Industrial Hub infrastructure o Transmission and distribution of electricity, o Water supply system,	Environmental Impacts			
30		Air quality deterioration	Project affected communities, construction workers, farmers	• Dust generation will arise from site preparation, excavations, general construction works and topsoil handling by mechanical equipment and portable auxiliary equipment. Vehicular/truck movements and transport of materials/ equipment to and from site on the untarred routes/roads and cleared will also	Moderate

	○ Access Roads ○ Site clearing and/or levelling, ○ Compacting, ○ Use of heavy equipment and hazardous materials ○ Material Extraction, Slope stability/Excavation, cutting, and filling ○ Hazardous materials storage and disposal, ○ Waste management, ○ Construction camp and crew set up			generate dust. • Loading, haulage and dumping of sand/stone aggregates as well as cement handling will also generate dust that can increase the air borne particulate in the vicinity. • Use of construction vehicles, trucks and generators will generate fumes/gaseous emissions from combustion of diesel engines of such equipment. • Inhalation of fumes and gaseous emissions such as carbon monoxide, sulphur oxides and nitrous oxides can affect the health of persons exposed to these gases for prolonged periods. • The impact is direct, temporary and likely, lasting during the construction phase; the impact is also local in extent i.e. limited to the programme site and adjacent properties. • However, based on the scale of the proposed infrastructure development (small and medium),	

				• The magnitude and the sensitivity are medium.	
31		Vibration and noise nuisance	Workers, public	• Activities that will contribute to increased noise levels during the construction phase include: vehicular and truck movement, site clearing and preparation, dredging works, piling, construction of breakwater, subsea trenching for pipeline installation, etc. • Typical noise level from construction activities ranges from 80 dB(A) to 112 dBA (BS 5228-1:2009) within the construction areas and is expected to significantly reduce to 30 dBA to 62 dB(A) at a distance of about 80m from the site. • The impact is direct, temporary and likely, moderate in scale; the impact is also local in extent i.e. limited to the programme site and adjacent properties. The application of standard noise control measures will assist in ensuring that these issues are reduced. • However, based on the scale of the proposed infrastructure development (small and	Moderate

				medium), • The magnitude and the sensitivity are medium.	

32		Loss of vegetation and impacts on flora and fauna	Flora and fauna, within access road and other infrastructure RoW	• The proposed intervention by the Zamfara SAPZ programme is meant for brown and green fields. In essence, the sites can be classified as Modified habitat, deficient in fauna largely due to the degradation of the original habitat by human activities therefore, impact on terrestrial fauna will be limited. Disturbed fauna can migrate to nearby bushes. • The magnitude is small and the sensitivity is medium	Minor
		Surface water contamination/ impact on aquatic organisms	Streams, and Rivers.	• Site preparation, comprising clearance of vegetation in the RoW as well as grading and trenching works for the road and drainages will result in loosening and exposure of top soil. This will facilitate their erosion and sediment transport into the nearby streams and the rivers. • Disposal of discharge construction wastewater into natural water bodies may also adversely affect the flow regime of the affected water bodies and its aquatic life. • The impact is direct, temporary and likely,	Major

				lasting during the construction phase; the impact is also local in extent i.e. limited to the programme site and nearby stream and river, and moderate in scale. • The magnitude is medium and the sensitivity is high.	
		Social Impacts			
33		Obstruction of access ways to communities	Community members	• The road network to the proposed site serves as access roads to some of the communities in the programme area, Construction works at the programme may render portions of the roads and existing footpaths inaccessible, temporarily closed or unmotorable during the constructional phase. Alternatives routes will have to be provided for use by commuters/motorists. This may create inconvenience and increase travel time to and from the communities. The impact is temporary, lasting during the constructional phase. • The magnitude is small and the sensitivity is	Moderate

				high.	
		Influx of workers and migrants	Workers, public	• Construction activities may result in the movement of workers to the programme area and people from other communities in search of job opportunities. Influx of people during the construction period may promote irresponsible sexual behaviour which could lead to teenage pregnancies HIV/AIDS and other STD infections. The impact may be permanent or irreversible in nature. • The magnitude is medium and the sensitivity is high	Major

34		Public safety	Workers, public	• Project communities may be at risk from the movement of trucks/vehicles and other machinery, as well as from unsecured excavations (drains). This is particularly critical for children in the communities. • The transportation of construction materials and the movement of heavy equipment to the programme site, as well as the transport of waste from the site, may pose risks to inhabitants/communities. Improperly covered trenches may result in stagnated water and mosquitoes breeding site. This impact is temporary, lasting during the constructional phase. • The magnitude is medium and the sensitivity is high.	Major
		Road impacts & traffic issues	Road network, communities	• Increased traffic though significant is not expected to hinder road traffic on the road. The road to the programme site has low traffic volume, which is typical of rural setting and can accommodate the movement of haulage trucks to the programme site. It must however	Major

				be noted that all materials for filling will be obtained in-situ and from nearby borrow-pits while stone aggregates for concrete works will however be transported from the quarry sites. Any unattended mechanical breakdown of such cargo trucks on the roads can induce traffic and serious accidents. Any traffic impacts will be of moderate intensity. • The magnitude is medium and the sensitivity is high.	
35		Occupational health & safety	Processing plant workers	• Construction workers will be exposed to noise, dust and vibrations especially without the use of appropriate PPEs. There is a high risk of accidents and injury from the use of machinery and equipment if safety procedures are not diligently followed. • The use of appropriate PPEs and adherence to safety and operational procedures will reduce this impact. • The magnitude is medium and the sensitivity is high.	Major

36		Waste generation and disposal	Soil, water bodies	• Servicing and maintenance of machinery may also generate waste such as scrap metal, empty lubricant containers, waste lubricants, rubber seals, etc. Domestic/office wastes such as used polythene bags, food wastes, food wrappers, used water sachets and bottles, office wastes and human wastes will be generated etc. The impact is local and will last throughout the agricultural development and operation phase. • The magnitude is medium and the sensitivity is high.	Major
37		Sanitation issues and public health	Land, water bodies	• Failure to provide appropriate sanitation facilities at the appropriate points within the programme area may encourage, and to some extent leave no option than open defecation in the fields. Women suffer more in this respect as it puts their dignity at risk and predisposes them to rape. • The magnitude is medium and the sensitivity is high.	Major

Table 5.5: Evaluation of Potential Negative Impacts Gumil (ATC)

S/N	Proposed Project Activities				
		Environmental Impacts	Key Receptors	Evaluation	Significance
1	Enhance Agricultural Production and Productivity in Proximity to Agro-Industrial Clusters ○ Slope stability/Excavation, cutting, and filling ○ Hazardous materials storage and disposal, ○ Waste management, ○ Construction camp and crew set up	Deforestation in the process of land preparation for cropping	Flora, fauna	• The SAPZ programme focuses on green and brown fields. It will therefore not significantly result in extensive deforestation/the loss of any species of conservation value. • Disturbed fauna can migrate to nearby bushes. Impact is limited to programme site and of local extent. The magnitude and the sensitivity are medium.	Moderate
2		Alterations of local natural water cycles / Depletion of groundwater for irrigation purposes	Groundwater aquifer	• Water abstraction by the programme will be from the groundwater aquifer (borehole) . • This will not compromise the source or affect its supply in general. The magnitude is small and the sensitivity is medium.	Minor

3		Soil quality degradation	Soil, fauna, water bodies	• Soil quality degradation may result from the following: • continuous use of agrochemicals and fertilizers may result in the death of soil fauna and also cause soil pollution; • continuous application of ammonium-based inorganic fertilizers may result in soil acidification; • land preparation, tilling and other physical farming practices may result in the death of soil fauna; • loosened and exposed soils will be susceptible to water and wind erosion; • soil compaction in areas of the land under continuous use of heavy machinery; • continuous tilling of the soil, hard pan formation, erosion and effects on soil fauna may adversely affect the soil structure. • The impact is local but will last throughout the life span of the programme and may have	Major

				lasting effects on the soil. The magnitude is medium and the sensitivity is high.	
4		Surface and ground water pollution	Water, aquatic life	• erosion from farmlands may result in the transport of soil sediments into the drains and into rivers. Pollution of surface water sources through the transport of agrochemicals in runoff and waste water; • eutrophication of surrounding water bodies through transport of nutrient rich sediments; • the use of chemicals i.e. fertilizers, herbicides etc. which enter the water bodies through runoff may decrease the quality of the water overtime; • possible pollution of groundwater through the percolation of agrochemicals through the soil; • impacts may occur throughout the lifespan of the programme. The magnitude and the sensitivity are high.	Major

5		Air pollution due to increased mechanized farming, vehicular movement and increased burning of biomass of cleared forest post-harvest waste	Air, workers, public	• Likely sources of air emissions will be land preparation works for subsequent planting and movement of vehicles on untarred surfaces which will result in the increase of airborne particulates. This will affect the air quality in the immediate surroundings. Emissions and fumes from machinery and equipment, • Any impacts from air emissions are therefore likely to be within WHO/FMEnv's acceptable limits. The magnitude is medium and the sensitivity is low.	Minor
6		Improper disposal of agricultural waste, fertilizer and chemical containers	Soil, water bodies	• Periodic vegetation removal, farm produce waste, used agro-chemical containers, used fertilizer bags etc. are the main waste to be generated on the proposed site during the operational phase. • Servicing and maintenance of machinery and equipment may also generate waste such as scrap metal, empty lubricant containers, waste lubricants, rubber seals, etc. • Domestic/commercial wastes such as used	Major

				polythene bags, food wastes, food wrappers, used water sachets and bottles, human wastes will be generated etc. • The impact is local and will last throughout the agricultural development and operations phase. The magnitude is medium and the sensitivity is high.	
7		Pest and rodent infestation of matured crop	Matured crop, farmers, public	• Matured crop is susceptible to attacks from insects and rodents. Specifically, birds attack on matured crops have been challenging. • The magnitude is large and the sensitivity is high.	Major
8		Noise and vibration;	Workers, public	• The main sources of noise at the programme site will be from machineries used for the agricultural activities (tractor, growers, harvester etc). • Other likely sources of noise in the immediate programme area will be through the movement of vehicles. Most impact will be of weak intensity and of local extent as the	Moderate

				communities are not close to the area. The magnitude and the sensitivity are medium.	
9		Impacts on water quality	Community members, downstream users, soil	• Improper use of pesticides during farming may contaminate the underlying groundwater and move along ground water paths to surface water over a period of time. This may result in health impacts and alteration of the aquatic life as a large range of agrochemicals are toxic. The magnitude and the sensitivity are high.	Major
10		Fire risk	Farmers, public property, workers	• Farms are highly susceptible to fires which could result in death, burns and loss of property (crops on farm and structures) and investment of the farmers and also adjacent farmers. The fires could emanate from within the farm (uncontrolled burning, smoking, cooking, etc.) or spread from outside the farm area. The magnitude is medium and the sensitivity is high.	Major
		Social Impacts			

11		Land Use Rights	Farmers, Neighbouring communities	• The land used for cultivation across the State are acquired based on the leasehold tenure system from the neighbouring communities. Disagreement between the parties and/or decision of the land owners to use the land for other purposes (real estate) will definitely thwart the agricultural activities despite all the investment. The magnitude is large and the sensitivity is high.	Major
12		Increasing demand for lands for farming;	Farmers, Neighbouring communities	• With the proposed intervention by Zamfara State SAPZ programme, there will be the need for farm expansion and demand for land. This may result in an increase in the cost of leasehold land tenure system currently being practiced by most farmers across the programme areas. The magnitude and the sensitivity are medium.	Moderate
13		Loss of fallow and other agricultural land	Farmers	• The practice of fallow land farming system may be difficult with the increasing demand for land for cultivation. The magnitude and the sensitivity are medium.	Moderate

14		Elimination of smallholder farmers	Farmers	• Medium and Large-scale farmers with economic and political powers and influence may push out smallholder farmers by buying their portions due to the potential increase demand for land to enhance productivity. The magnitude and the sensitivity are medium.	Moderate
15		Occupational health & safety	Workers	• Workers may be exposed to injury from machines and equipment as well as from bites from dangerous reptiles and other animals such as snakes, scorpions, bees, ants, etc. • This effect can be prevented or minimized through the use of appropriate personal and protective equipment such as safety boots and gloves. The impact is temporary lasting during agricultural activities. The magnitude is small and the sensitivity is medium.	Minor
16		Increased spate of GBV due to the need and participation of more women	Farmers, women	• The influx of labour from other communities and towns during the programme implementation will potentially escalate the spate of GBV cases especially incidences of non-partner sexual assault, sexual	Major

				exploitation and abuse, child abuse and child marriage within the programme area. The magnitude is medium and the sensitivity is high.	
17		Conflicts over land and water use and plot allocation;	Farmers, Neighbouring communities	• Conflicts over water use may arise from non-synchronization of planting. The magnitude is medium and the sensitivity is low.	Moderate
18		Sanitation issues and public health;	Soil, Water, Workers	• Indiscriminate disposal of farm generated waste will potentially create unsightly conditions. Poor sanitation conditions may pollute nearby water sources. Indiscriminate disposal of used agrochemical containers may pose serious health risk to members of the public who reuse them. Additionally, bushy areas and stagnant water in canals will provide favourable breeding grounds for mosquitoes and could lead to an increase in malaria occurrence. Failure to provide appropriate sanitation facilities at vantage points within the programme area may encourage, and to some extent leave no option than, open defecation in the fields.	Major

				Women suffer more in this respect as it puts their dignity at risk and predisposes them to rape.	
19		Impacts on Communities	Neighbouring communities	• Communities within the programme area may be significantly impacted by programme activities. Spray drift from the application of agrochemicals as well as dust and noise from land preparation activities for subsequent planting seasons may also negatively impact on the communities. • Impacts from the use of pesticides/ agrochemicals on aquatic life and subsequently health impacts on individuals who rely on the water for domestic purposes. • The impact will last for the lifespan of the programme. The magnitude is medium and the sensitivity is high.	Major
20		Sustainability of the farming venture	Farmers	• Inadequate workforce and/or machinery may derail the cropping calendar of farmers to undertake land preparation, planting and harvesting tasks for crop production, which	Major

				subsequently may affect the long-term viability of the programme. • Unavailability of ready market and low ps may affect revenue generation. Pest and disease infestation may also adversely affect crop productivity. Failure of the storage facilities may also reduce the shelf life of crops and result in high postharvest losses. • Emergency situations may arise from various activities within and outside of the farm. For example, vehicular accidents, bush fires, power failures, etc. may have disastrous consequences if no emergency response plans are put in place. The losses could be higher and result in joblessness of the farmers if appropriate measures are not put in place. Lack of human resources, technical know-how and logistics to implement environmental and social safeguards could also significantly hamper the successful implementation of the proposed programme. • The magnitude is medium and the sensitivity	

				is high.	
	Agro-Processing activities ○ Crop processing ○ Dealing with waste, ○ Treatment technologies for wastes from processing	Environmental Impacts			
21		Noise and vibration	Air, workers, public	• The main sources of noise at the programme site will be from crop processing activities, mainly crop milling operations. • Other likely sources of noise in the immediate programme area will be through the use of machines and equipment and the movement of vehicles. No major heavy machinery and equipment will be used during the operational phase which could result in major vibrations. • Any impact will be of weak intensity and of local extent as the communities are not close to the area. The magnitude is medium and the sensitivity is low.	Minor

22		Impact on air quality	Air, workers, public	• processing activities, mainly crop milling may constitute the main sources of air emissions that may result from increased particulate matter in the air. Impact from air emissions is therefore likely to be within FMEnv's acceptable limits. The magnitude is medium and the sensitivity is low.	Minor
23		Noise and vibration	Air, workers, public	• The main sources of noise at the programme site will come from crop processing activities. Other likely sources of noise in the immediate programme area will be through the use of machines and equipment and the movement of vehicles. No major heavy machinery and equipment will be used during the operational phase which could result in major vibrations. Impact will be of weak intensity and of local extent as the communities are not close to the area. The magnitude is medium and the sensitivity is low.	Minor
24		Fire Risk	Farmers, public property, workers	• Processing plants are highly susceptible to fires which could result in death, burns and	Major

				loss of property. The fires could emanate from within the plant through uncontrolled smoking, cooking or electrical shock, etc. or spread from outside the plant. The magnitude is medium and the sensitivity is high	
		Social Impacts			
25		Sustainability of the processing plant	Farmers, Workers	• The sustainability of the crop processing plant may be hampered by inadequate workforce/or machinery. • Lack of human resources, technical know-how and logistics to operate and maintain the plants could also significantly hamper the successful implementation of the proposed programme. • Failure of the storage facilities may also reduce the shelf life of crops and result in high postharvest losses. • The magnitude is medium and the sensitivity is high.	Major

26		Occupational health & safety	Processing plant workers	• Machine operators will be exposed to noise, dust and vibrations especially without the use of appropriate PPEs. There is a high risk of accidents and injury from the use of machinery and equipment if safety procedures are not followed. • The use of appropriate PPEs and adherence to safety and operational procedures will reduce this impact. The magnitude is medium and the sensitivity is high.	Major
27		Sanitation issues and public health	Land, water bodies	• Failure to provide appropriate sanitation facilities at vantage points within the programme area may encourage, and to some extent leave no option than, open defecation in the fields. Women suffer more in this respect as it puts their dignity at risk and predisposes them to rape. The magnitude is medium and the sensitivity is high.	Major
28		Pest/rodent infestation and contamination of stored produce	Stored produce, farmers, public	• Stored produce is susceptible to attacks from insects and rodents if the necessary management practices and storage conditions	Major

				for the produce are not followed. • Improper post-harvest management practices on The Farm may introduce insects such as weevils into the produce prior to storage. Insects and rodents may feed on stored produce, resulting in losses in quantity and quality of produce and consequently investment losses which could be high. • In addition to feeding on stored produce, rodents may also contaminate stored produce through their droppings, urine, hairs and may spread human diseases. This could have health implications for the public. • The impact on health could be high and of regional extent. The magnitude and the sensitivity are high.	
29		Post-harvest losses	Farmers	• Post-harvest losses may arise from disease infestation, pests and rodent infestation and improper storage conditions which may reduce the shelf life of produce. Improper storage conditions such as poor ventilation, poor housekeeping and leakages in the roof	Major

				may lead to mould development and disease infestation. Improper drying of produces to reach the recommended moisture content for storage (13-14%) may reduce the shelf life and make it susceptible to disease infestation. Any infested produce will be permanently impacted and the investment losses to farmers could be major. The magnitude is large and the sensitivity is high	
	• Processing Infrastructure development/Construction and/or upgrading of Agro-Industrial Hub infrastructure ○ Transmission and distribution of electricity, ○ Water supply system, ○ Access Roads	Environmental Impacts			
30		Air quality deterioration	Project affected communities, construction workers, farmers	• Dust generation will arise from site preparation, excavations, general construction works and topsoil handling by mechanical equipment and portable auxiliary equipment. Vehicular/truck movements and transport of materials/ equipment to and from site on the untarred routes/roads and cleared will also generate dust. • Loading, haulage and dumping of sand/stone aggregates as well as cement handling will also generate dust that can increase the air	Moderate

	○ Site clearing and/or levelling, ○ Compacting, ○ Use of heavy equipment and hazardous materials ○ Material Extraction, Slope stability/Excavation, cutting, and filling ○ Hazardous materials storage and disposal, ○ Waste management,			borne particulate in the vicinity. • Use of construction vehicles, trucks and generators will generate fumes/gaseous emissions from combustion of diesel engines of such equipment. • Inhalation of fumes and gaseous emissions such as carbon monoxide, sulphur oxides and nitrous oxides can affect the health of persons exposed to these gases for prolonged periods. • The impact is direct, temporary and likely, lasting during the construction phase; the impact is also local in extent i.e. limited to the programme site and adjacent properties. • However, based on the scale of the proposed infrastructure development (small and medium), The magnitude and the sensitivity are medium.	

31	○ Construction camp and crew set up	Vibration and noise nuisance	Workers, public	• Activities that will contribute to increased noise levels during the construction phase include: vehicular and truck movement, site clearing and preparation, piling, construction of breakwater, subsea trenching for pipeline installation, etc. • Typical noise level from construction activities ranges from 80 dBA to 112 dBA (BS 5228-1:2009) within the construction areas and is expected to significantly reduce to 30 dBA to 62 dBA at a distance of about 80m from the site. • The impact is direct, temporary and likely, moderate in scale; the impact is also local in extent i.e. limited to the programme site and adjacent properties. The application of standard noise control measures will assist in ensuring that these issues are reduced. • However, based on the scale of the proposed infrastructure development (small and medium), The magnitude and the sensitivity are medium.	Moderate

32		Loss of vegetation and impacts on flora and fauna	Flora and fauna, within access road and other infrastructure RoW	• The proposed intervention by the Zamfara SAPZ programme is meant for brown and green fields. In essence, the sites can be classified as Modified habitat, deficient in fauna largely due to the degradation of the original habitat by human activities therefore, impact on terrestrial fauna will be limited. Disturbed fauna can migrate to nearby bushes. The magnitude is small and the sensitivity is medium	Minor
		Surface water contamination/ impact on aquatic organisms	Streams, and Rivers.	• Site preparation, comprising clearance of vegetation in the RoW as well as grading and trenching works for the road and drainages will result in loosening and exposure of top soil. This will facilitate their erosion and sediment transport into the nearby streams and the rivers. • Disposal of discharge construction wastewater into natural water bodies may also adversely affect the flow regime of the affected water bodies and its aquatic life. • The impact is direct, temporary and likely,	Major

				lasting during the construction phase; the impact is also local in extent i.e. limited to the programme site and nearby stream and river, and moderate in scale. The magnitude is medium and the sensitivity is high.	
		Social Impacts			
33		Obstruction of access ways to communities	Community members	• The road network to the proposed site serves as access roads to some of the communities in the programme area, Construction works at the programme may render portions of the roads and existing footpaths inaccessible, temporarily closed or unmotorable during the constructional phase. Alternatives routes will have to be provided for use by commuters/motorists. This may create inconvenience and increase travel time to and from the communities. The impact is temporary, lasting during the constructional phase. The magnitude is small and the sensitivity is high.	Moderate

		Influx of workers and migrants	Workers, public	• Construction activities may result in the movement of workers to the programme area and people from other communities in search of job opportunities. Influx of people during the construction period may promote irresponsible sexual behaviour which could lead to teenage pregnancies HIV/AIDS and other STD infections. The impact may be permanent or irreversible in nature. The magnitude is medium and the sensitivity is high	Major
34		Public safety	Workers, public	• Project communities may be at risk from the movement of trucks/vehicles and other machinery, as well as from unsecured excavations (drains). This is particularly critical for children in the communities. • The transportation of construction materials and the movement of heavy equipment to the programme site, as well as the transport of waste from the site, may pose risks to inhabitants/communities. Improperly covered trenches may result in stagnated water and mosquitoes breeding site. This impact is	Major

				temporary, lasting during the constructional phase. The magnitude is medium and the sensitivity is high.	
		Road impacts & traffic issues	Road network, communities	• Increased traffic though significant is not expected to hinder road traffic on the road. The road to the programme site has low traffic volume, which is typical of rural setting and can accommodate the movement of haulage trucks to the programme site. It must however be noted that all materials for filling will be obtained in-situ and from nearby borrow-pits while stone aggregates for concrete works will however be transported from the quarry sites. Any unattended mechanical breakdown of such cargo trucks on the roads can induce traffic and serious accidents. Any traffic impacts will be of moderate intensity. • The magnitude is medium and the sensitivity is high.	Major
35		Occupational health &	Processing plant	• Construction workers will be exposed to noise, dust and vibrations especially without	Major

		safety	workers	the use of appropriate PPEs. There is a high risk of accidents and injury from the use of machinery and equipment if safety procedures are not diligently followed. • The use of appropriate PPEs and adherence to safety and operational procedures will reduce this impact. The magnitude is medium and the sensitivity is high.	
36		Waste generation and disposal	Soil, water bodies	• Servicing and maintenance of machinery may also generate waste such as scrap metal, empty lubricant containers, waste lubricants, rubber seals, etc. Domestic/office wastes such as used polythene bags, food wastes, food wrappers, used water sachets and bottles, office wastes and human wastes will be generated etc. The impact is local and will last throughout the agricultural development and operation phase. The magnitude is medium and the sensitivity is high.	Major
37		Sanitation issues and public health	Land, water bodies	• Failure to provide appropriate sanitation facilities at the appropriate points within the programme area may encourage, and to some	Major

				extent leave no option than open defecation in the fields. Women suffer more in this respect as it puts their dignity at risk and predisposes them to rape.	

Table 5.6: Evaluation of Potential Negative Impacts – Banni ga Hannu – Kaura Namoda (ATC)

S/N	Proposed Project Activities				
		Environmental Impacts	Key Receptors	Evaluation	Significance
1	Enhance Agricultural Production and Productivity in Proximity to Agro-Industrial Clusters • Development and operation of agricultural fields, • Construction of small dams, dykes and weirs	Deforestation in the process of land preparation for Crop cultivation	Flora, fauna	• The SAPZ programme focuses on brown and green fields. It will thus significantly result in extensive deforestation/the loss of any species of conservation value. Disturbed fauna can migrate to nearby bushes. Impact is limited to programme site and of local extent. The magnitude is large and the sensitivity are high.	Major

2	○ Site clearing and/or levelling, ○ Compacting, ○ Use of heavy equipment and hazardous materials ○ Material Extraction, Slope stability/Excavation, cutting, and filling ○ Hazardous materials storage and disposal, ○ Waste management, ○ Construction camp and crew set up	Alterations of local natural water cycles / Depletion of groundwater for irrigation purposes	Groundwater aquifer	• Water abstraction by the programme will be from the groundwater aquifer (borehole) . This will not compromise the source or affect its supply in general. The magnitude is small and the sensitivity is medium.	Minor
3		Soil quality degradation	Soil, fauna, water bodies	• Soil quality degradation may result from the following: • continuous use of agrochemicals and fertilizers may result in the death of soil fauna and also cause soil pollution; • continuous application of ammonium-based inorganic fertilizers may result in soil acidification; • land preparation, tilling and other physical farming practices may result in the death of soil fauna; • loosened and exposed soils will be susceptible to water and wind erosion; • soil compaction in areas of the land under	Major

				continuous use of heavy machinery; • continuous tilling of the soil, hard pan formation, erosion and effects on soil fauna may adversely affect the soil structure. • The impact is local but will last throughout the life span of the programme and may have lasting effects on the soil. The magnitude is medium and the sensitivity is high.	

4		Surface and ground water pollution	Water, aquatic life	• erosion from farmlands may result in the transport of soil sediments into the drains and into rivers. Pollution of surface water sources through the transport of agrochemicals in runoff and waste water; • eutrophication of surrounding water bodies through transport of nutrient rich sediments; • the use of chemicals i.e. fertilizers, herbicides etc. which enter the water bodies through runoff may decrease the quality of the water overtime; • possible pollution of groundwater through the percolation of agrochemicals through the soil; • impacts may occur throughout the lifespan of the programme. The magnitude and the sensitivity are high.	Major

5		Air pollution due to increased mechanized farming, vehicular movement and increased burning of biomass of cleared forest post-harvest waste	Air, workers, public	• The likely sources of air pollution will come from land preparation works for subsequent planting and movement of vehicles on untarred surfaces which will result in the increase of airborne particulates. They will affect the air quality in the immediate surroundings. pollution and fumes from machinery and equipment, • Any impacts from air emissions is therefore likely to be within WHO/FMEnv.'s acceptable limits. The magnitude is medium and the sensitivity is low.	Minor

6		Improper disposal of agricultural waste, fertilizer and chemical containers	Soil, water bodies	• Periodic vegetation removal, farm produce waste, used agro-chemical containers, used fertilizer bags etc. are the main waste to be generated on the proposed site during the operational phase. • Servicing and maintenance of machinery and equipment may also generate waste such as scrap metal, empty lubricant containers, waste lubricants, rubber seals, etc. • Domestic/commercial wastes such as used polythene bags, food wastes, food wrappers, used water sachets and bottles, human wastes will be generated etc. • The impact is local and will last throughout the agricultural development and operations phase. The magnitude is medium and the sensitivity is high.	Major
7		Pest, rodent and animal infestation of matured crop	Matured crop, farmers, public	• Matured crop is susceptible to attacks from insects, rodent, rabbits and other animals. Specifically, rabbits attack on matured	Major

				crops have been challenging. • The magnitude is large and the sensitivity is high.	
8		Noise and vibration;		• The main sources of noise at the programme site will be from machineries used for the agricultural activities (tractor, growers, harvester etc). • Other likely sources of noise in the immediate programme area will be through the movement of vehicles. Most impact will be of weak intensity and of local extent as the communities are not close to the area. The magnitude and the sensitivity are medium.	Moderate
9		Impacts on water quality	Community members downstream users, soil	• Improper use of pesticides during farming may contaminate the underlying groundwater and move along ground water paths to surface water over a period of time. This may result in health impacts and alteration of the aquatic life as a large range of agrochemicals are toxic. The magnitude	Major

				and the sensitivity are high.	
10		Fire risk	Farmers, public property, workers	• Farms are highly susceptible to fires which could result in death, burns and loss of property (crops on farm and structures) and investment of the farmers and also adjacent farmers. The fires could emanate from within The Farm (uncontrolled burning, smoking, cooking, etc.) or spread from outside The Farm area. The magnitude is medium and the sensitivity is high.	Major
		Social Impacts		•	
11		Land Use Rights	Farmers, Neighbouring communities	• The land used for Crop cultivation across the State are acquired based on the leasehold tenure system from the neighbouring communities. Disagreement between the parties and/or decision of the land owners to use the land for other purposes (real estate) will definitely thwart the agricultural activities despite all the	Major

				investment. The magnitude is large and the sensitivity is high.	
12		Increasing demand for lands for farming;	Farmers, Neighbouring communities	• With the proposed intervention by Zamfara State SAPZ programme, there will be the need for farm expansion and demand for land. This may result in an increase in the cost of leasehold land tenure system currently being practiced by most farmers across the programme areas. The magnitude and the sensitivity are medium.	Moderate
13		Loss of fallow and other agricultural land	Farmers	• The practice of fallow land farming system may be difficult with the increasing demand for land for Crop cultivation. The magnitude and the sensitivity are medium.	Moderate
14		Elimination of smallholder farmers	Farmers	• Medium and Large-scale farmers with economic and political powers and influence may push out smallholder farmers by buying their portions due to the	Moderate

				potential increase demand for land to enhance productivity. The magnitude and the sensitivity are medium.	
15		Occupational health & safety	Workers	• Workers may be exposed to injury from machines and equipment as well as from bites from dangerous reptiles and other animals such as snakes, scorpions, bees, ants, etc. • These effects can be prevented or minimized through the use of appropriate personal and protective equipment such as safety boots and gloves. The impact is temporary lasting during agricultural activities. The magnitude is small and the sensitivity is medium.	Minor
16		Increase spate of GBV due to the need and participation of more women	Farmers, women	• The influx of labour from other communities and towns during the programme implementation will potentially escalate the spate of GBV cases especially incidences of non-partner sexual assault, sexual exploitation and abuse, child abuse and child marriage within the programme	Major

				area. The magnitude is medium and the sensitivity is high.	
17		Conflicts over land and water use and plot allocation;	Farmers, Neighbouring communities	• Conflicts over water use may arise from non- synchronization of Crop planting. The magnitude is medium and the sensitivity is low.	Moderate

18		Sanitation issues and public health;	Soil, Water, Workers	• Indiscriminate disposal of waste will create unsightly conditions. Poor sanitation conditions may pollute nearby water sources. Indiscriminate disposal of used agrochemical containers may pose serious health risk to members of the public who reuse them. Additionally, bushy areas and stagnant water in canals will provide favourable breeding grounds for mosquitoes and could lead to an increase in malaria occurrence. Failure to provide appropriate sanition facilities at strategic points within the programme area may encourage, and to some extent leave no option than, open defecation in the fields. Women suffer more in this respect as it puts their dignity at risk and predisposes them to rape.	Major
19		Impacts on Communities	Neighbouring communities	• Communities within the programme area may be significantly impacted by programme activities. Spray drift from the application of agrochemicals as well as dust and noise from land preparation activities for subsequent planting seasons may also	Major

				negatively impact on the communities. • Impacts from the use of pesticides/ agrochemicals on aquatic life and subsequently health impacts on individuals who rely on the water for domestic purposes. • The impact will last for the lifespan of the programme. The magnitude is medium and the sensitivity is high.	
20		Sustainability of the farming venture	Farmers	• Inadequate workforce and/or machinery may derail the cropping calendar of farmers to undertake land preparation, planting and harvesting tasks for Crop production, which subsequently may affect the long-term viability of the programme. • Unavailability of ready market and low Crops may affect revenue generation. Pest and disease infestation may also adversely affect crop productivity. Failure of the storage facilities may also reduce the shelf life of crops and result in high postharvest	Major

				losses. • Emergency situations may arise from various activities within and outside of the farm. For example, vehicular accidents, bush fires, power failures, etc. may have disastrous consequences if no emergency response plans are put in place. The losses could be higher and result in joblessness of the farmers if appropriate measures are not put in place. Lack of human resources, technical know-how and logistics to implement environmental and social safeguards could also significantly hamper the successful implementation of the proposed programme. • The magnitude is medium and the sensitivity is high.	
	Agro-Processing activities	• Environmental Impacts			

21	Crop processing • Dealing with waste, • Treatment technologies for wastes from processing	Noise and vibration	Air, workers, public	• The main sources of noise at the programme site will come from crop processing activities, mainly Crop milling operations. • Other likely sources of noise in the immediate programme area will be through the use of machines and equipment and the movement of vehicles. No major heavy machinery and equipment will be used during the operational phase which could result in major vibrations. • Any impact will be of weak intensity and of local extent as the communities are not close to the area. The magnitude is medium and the sensitivity is low.	Minor
22		Impact on air quality	Air, workers, public	• Crop processing activities, mainly Crop milling may be the main sources of air pollution that may result from increased particulate matter in the air. Impact from air pollution is therefore likely to be within FMEnv's acceptable limits. The magnitude is medium and the sensitivity is low.	Minor

23		Noise and vibration	Air, workers, public	• The main sources of noise at the programme site will come from Crop processing activities. Other likely sources of noise in the immediate programme area will be through the use of machines and equipment and the movement of vehicles. No major heavy machinery and equipment will be used during the operational phase which could result in major vibrations. Impact will be of weak intensity and of local extent as the communities are not close to the area. The magnitude is medium and the sensitivity is low.	Minor
24		Fire Risk	Farmers, public property, workers	• Processing plants are highly susceptible to fires which could result in death, burns and loss of property. The fires could emanate from within the plant through uncontrolled smoking, cooking or electrical shock, etc. or spread from outside the plant. The magnitude is medium and the sensitivity is high	Major
		Social Impacts			

25		Sustainability of the processing plant	Farmers, Workers	• The sustainability of the Crop processing plant may be hampered by inadequate workforce/or machinery. • Lack of human resources, technical know-how and logistics to operate and maintain the plants could also significantly hamper the successful implementation of the proposed programme. • Failure of the storage facilities may also reduce the shelf life of Crop and result in high postharvest losses. • The magnitude is medium and the sensitivity is high.	Major
26		Occupational health & safety	Processing plant workers	• Machine operators will be exposed to noise, dust and vibrations especially without the use of appropriate PPEs. There is a high risk of accidents and injury from the use of machinery and equipment if safety procedures are not followed. • The use of appropriate PPEs and adherence to safety and operational procedures will	Major

				reduce this impact. The magnitude is medium and the sensitivity is high.	
27		Sanitation issues and public health	Land, water bodies	• Failure to provide appropriate sanitation facilities at vantage points within the programme area may encourage, and to some extent leave no option than, open defecation in the fields. Women suffer more in this respect as it puts their dignity at risk and predisposes them to rape. The magnitude is medium and the sensitivity is high.	Major
28		Pest/rodent infestation and contamination of stored Crop	Stored Crop, farmers, public	• Stored Crop is susceptible to attacks from insects and rodents if the necessary management practices and storage conditions for the produce are not followed. • Improper post-harvest management practices on The Farm may introduce insects into the Crop prior to storage. Insects and rodents may feed on stored Crop, resulting in losses in quantity and quality of produce and consequently	Major

				investment losses which could be high. • In addition to feeding on stored Crop, rodents may also contaminate stored Crop through their droppings, urine, hairs and may spread human diseases. This could have health implications for the public. • The impact on health could be high and of regional extent. The magnitude and the sensitivity are high.	
29		Post-harvest losses	Farmers	• Post-harvest losses may arise from disease infestation, pests and rodent infestation and improper storage conditions which may reduce the shelf life of produce. Improper storage conditions such as poor ventilation, poor housekeeping and leakages in the roof may lead to mould development and disease infestation. Any infested produce will be permanently impacted and the investment losses to farmers could be major. The magnitude is large and the sensitivity is high	Major

	Processing Infrastructure development/Construction and/or upgrading of Agro-Industrial Hub infrastructure • Transmission and distribution of electricity, • Water supply system, • Access Roads • Site clearing and/or levelling, • Compacting , • Use of heavy equipment and hazardous materials • Material Extraction, Slope stability/Excavation, cutting, and filling • Hazardous materials storage and disposal,	• Environmental Impacts			
30		Air quality deterioration	Project affected communities, construction workers, farmers	• Dust generation will arise from site preparation, excavations, general construction works and topsoil handling by mechanical equipment and portable auxiliary equipment. Vehicular/truck movements and transport of materials/ equipment to and from site on the untarred routes/roads will also generate dust. • Loading, haulage and dumping of sand/stone aggregates as well as cement handling will also generate dust that can increase the air borne particulate in the vicinity. • Use of construction vehicles, trucks and generators will generate fumes/gaseous emissions from combustion of diesel engines of such equipment. • Inhalation of fumes and gaseous emissions such as carbon monoxide, sulphur oxides and nitrous oxides can affect the health of persons exposed to these gases for	Moderate

	• Waste management, • Construction camp and crew set up			prolonged periods. • The impact is direct, temporary and likely, lasting during the construction phase; the impact is also local in extent i.e. limited to the programme site and adjacent properties. • However, based on the scale of the proposed infrastructure development (small and medium), The magnitude and the sensitivity are medium.	
31		Vibration and noise nuisance	Project affected communities, construction workers, farmers	• Activities that will contribute to increased noise levels during the construction phase include; vehicular and truck movement, site clearing and preparation, dredging works, piling, construction of breakwater, subsea trenching for pipeline installation, etc. • Typical noise level from construction activities ranges from 80 dBA to 112 dBA (BS 5228-1:2009) within the construction areas and is expected to significantly reduce to 30 dBA to 62 dBA at a distance of about 80 m from the site.	Moderate

				• The impact is direct, temporary and likely, moderate in scale; the impact is also local in extent i.e. limited to the programme site and adjacent properties. The application of standard noise control measures will assist in ensuring that these issues are reduced. • However, based on the scale of the proposed infrastructure development (small and medium), The magnitude and the sensitivity are medium.	
32		Loss of vegetation and impacts on flora and fauna	Flora and fauna, within access road and other infrastructure RoW	• The proposed intervention by the Zamfara SAPZ programme is meant for brown and green fields. In essence, the sites can be classified as Modified habitat. The programme site is deficient in fauna largely due to the degradation of the original habitat by human activities therefore, impact on terrestrial fauna will be limited. Disturbed fauna can migrate to nearby bushes. The magnitude is small and the sensitivity is medium	Minor

		Surface water contamination/ impact on aquatic organisms	Streams, and Rivers.	• Site preparation, comprising clearance of vegetation in the RoW as well as grading and trenching works for the road and drainages will result in loosening and exposure of top soil. This will facilitate their erosion and sediment transport into the nearby streams and rivers. • Disposal of discharge construction wastewater into natural water bodies may also adversely affect the flow regime of the affected water bodies and its aquatic life. • The impact is direct, temporary and likely, it can last during the construction phase; the impact is also local in extent i.e. limited to the programme site and nearby stream and river, and moderate in scale. The magnitude is medium and the sensitivity is high.	Major
		Social Impacts			

33		Obstruction of access ways to communities	Community members	• The road network to the proposed site serves as access roads to some of the communities in the programme area, Construction works at the programme may render portions of the roads and existing footpaths inaccessible, temporarily closed or unmotorable during the constructional phase. Alternatives routes will have to be provided for use by commuters/motorists. This may create inconvenience and increase travel time to and from the communities. The impact is temporary, lasting during the constructional phase. The magnitude is small and the sensitivity is high.	Moderate

		Influx of workers and migrants	Workers, public	• Construction activities may result in the movement of workers to the programme area and people from other communities in search of job opportunities. Influx of people during the construction period may promote irresponsible sexual behaviour which could lead to teenage pregnancies, HIV/AIDS and other STD infections. The impact may be permanent or irreversible in nature. The magnitude is medium and the sensitivity is high	Major
34		Public safety	Workers, public	• Project communities may be at risk from the movement of trucks/vehicles and other machinery, as well as from unsecured excavations (drains). This is particularly critical for children in the communities. • The transportation of construction materials and the movement of heavy equipment to the programme site, as well as the transport of waste from the site, may pose risks to inhabitants/communities. Improperly covered trenches may result in stagnant water and breed mosquitoes. This impact is	Major

				temporary, lasting during the constructional phase. The magnitude is medium and the sensitivity is high.	
		Road impacts & traffic issues	Road network, communities	• Increased traffic though significant is not expected to hinder road traffic on the road. The road to the programme site has low traffic volume, which is typical of rural setting and can accommodate the movement of haulage trucks to the programme site. It must however be noted that all materials for filling will be obtained in-situ and from nearby borrow-pits while stone aggregates for concrete works will however be transported from the quarry sites. Any unattended mechanical breakdown of such cargo trucks on the roads can induce traffic and serious accidents. Any traffic impacts will be of moderate intensity. The magnitude is medium and the sensitivity is high.	Major
35		Occupational health & safety	Processing plant workers	• Construction workers will be exposed to noise, dust and vibrations especially	Major

				without the use of appropriate PPEs. There is a high risk of accidents and injury from the use of machinery and equipment if safety procedures are not diligently followed. • The use of appropriate PPEs and adherence to safety and operational procedures will reduce this impact. The magnitude is medium and the sensitivity is high.	
36		Waste generation and disposal	Soil, water bodies	• Servicing and maintenance of machinery may also generate waste such as scrap metal, empty lubricant containers, waste lubricants, rubber seals, etc. Domestic/office wastes such as used polythene bags, food wastes, food wrappers, used water sachets and bottles, office wastes and human wastes will be generated etc. The impact is local and will last throughout the agricultural development and operation phase. The magnitude is medium and the sensitivity is high.	Major

37		Sanitation issues and public health	Land, water bodies	• Failure to provide appropriate sanitation facilities at strategic points within the programme area may encourage, and to some extent leave no option than open defecation in the fields. Women suffer more in this respect as it puts their dignity at risk and predisposes them to rape.	Major

Table 5.7: Evaluation of Potential Negative Impacts - Maru (ATC)

S/N	Proposed Project Activities				
		Environmental Impacts	Key Receptors	Evaluation	Significance
1	Enhance Crop Production and Productivity in Proximity to Agro-Industrial Clusters	Increased crop production and escalation of waste problem.	Air, Water and land	• Solid waste from Crop production and other farm operations has an implication on environment and social lives of the affected people. Though the impacts are less significant but requires an improvement on the air quality. The magnitude is medium and the sensitivity is high.	Major

2		General waste management issues.	Air, Water and land	• The Crop production typically generates large volumes of solid waste. The effluents contain high organic loads, cleansing and blanching agents, salt, and suspended solids such as fibres and soil particles. They may also contain pesticide residues washed from the raw materials. Odour problems can occur with poor management of solid wastes and effluents. The magnitude is medium and the sensitivity is high.	Major

3		Water pollution and negative effects on surrounding ecosystem;	Water aquatic life and humans	• Wastewater from Crop production proposed site may result in: • Pollution of surface water sources through the transport of agrochemicals; • eutrophication of surrounding water bodies through transport of nutrient rich sediments; • the use of chemicals (antibiotics) which enter the water bodies through runoff may decrease the quality of the water overtime; • possible pollution of groundwater through the percolation of agrochemicals through the soil. • Impacts may occur throughout the lifespan of the programme. The magnitude is large and the sensitivity is high.	Major
5		Impacts on water quality	Community members downstream users	• Improper use of antibiotics may contaminate underlying groundwater and move along ground water paths to surface water over a period of time. This may result in health impacts and alteration of aquatic life.	Major

				• Data on groundwater pollution in developing countries, resulting from excess chemical input and irrigation, is not well documented, but it is likely to show an increasing trend. The magnitude is large and the sensitivity is high.	
6		Depletion of groundwater due to increased extraction for Crop production management	Groundwater aquifer	• Water abstraction by the programme will not compromise the State of the aquifer. The magnitude is small and the sensitivity is medium.	Minor
		• Social Impacts			
7		Sustainability of the Crop production farming venture	Workers, public	• Inadequate workforce and/or machinery may derail the plan of the farmer, which subsequently may affect the long-term viability of the programme in the following ways: • Flooding of The Farm area may occur from continuous heavy rainfall resulting in pools of water in low lying areas of the field; • Unavailability of ready market and low prices may affect revenue generation;	Major

				• Pest and disease infestation may also adversely affect productivity; • Failure of the storage facilities may also reduce the shelf life of the Crop production product; • Emergency situations may arise from various activities within and outside of the farm. For example, vehicular accidents, power failures, etc. may have disastrous consequences if no emergency response plans are put in place. The losses could be higher and result in joblessness of the farmers if appropriate measures are not put in place; • Lack of human resources, technical know-how and logistics to implement environmental and social safeguards could also significantly hamper the successful implementation of the proposed programme; • The magnitude is medium and the sensitivity is high.	

8		Lack of space for proper rearing of crop production	Farmers	• The risk of concentrating large number of crop production within a small space could lead to the escalation of crop production disease; • Pressure on available space and risk of death of crop production due to over concentration of crop production within limited space; • Poor management of space could lead to low crop production productivity. The magnitude is medium and the sensitivity is high.	Major
9		Conflict with neighbours due to air pollution and improper disposal of waste	Air, Land, water bodies	• Neighbouring individuals/communities may be affected by increase in productivity if the increasing crop production and associated waste is not properly managed. The magnitude is medium and the sensitivity is high.	Major
10		Occupational health and safety;	Farmers	• Workers may be exposed to injury from machines and equipment as well as bites from dangerous reptiles and other animals such as snakes, scorpions, bees, ants, etc. The impact is temporary lasting during these activities. The magnitude is small and the sensitivity is medium.	Low

11		Sanitation issues and public health;	Air, Land, water bodies	• Indiscriminate disposal of farm generated waste will create unsightly conditions. • Poor sanitation conditions may pollute nearby water sources; • Indiscriminate disposal of used agrochemical containers may pose serious health risk to members of the public who reuse them; • Additionally, bushy areas and stagnant water in canals will provide favourable breeding grounds for mosquitoes and could lead to an increase in malaria occurrence. • Failure to provide appropriate latrine facilities at vantage points within the programme area may encourage, and to some extent leave no option than, open defecation in the fields. The magnitude is medium and the sensitivity is high.	Major
12		Increased spate of GBV due to the need and participation of more women	Farmers, women	• The influx of labour from other communities and towns during the programme implementation will potentially escalate the spate of GBV cases especially incidence of non-partner sexual assault, sexual exploitation and abuse, child abuse and	Major

				child marriage within the programme area. The magnitude is medium and the sensitivity is high.	
		Labour Influx leading to the transmission of diseases	Farmers, neighbouring communities	• New comers from within and outside the State in search of employment opportunities will come to the programme site, with the possible implication that negative social behaviours (including the expansion of sex immorality, drug use, alcohol abuse, insecurity, banditry, theft, COVID-19, STD, HIV/AIDS etc.) will become rampant. The magnitude is medium and the sensitivity is high.	Major
	Agro-Processing activities • Dealing with waste, • Treatment technologies for wastes from processing	• Environmental Impacts			
13		Impact on air quality	Air, workers, public	• Crop processing activities, mainly roasting may be the main sources of air emissions that may result from increased particulate matter in the air. Any impacts from air emissions is therefore likely to be within theFMEnv's acceptable limits. The magnitude is medium and the sensitivity is low.	Minor
14		Noise pollution	Workers, public	• All crop processing and services equipment produce various levels of noise. This has	Moderate

				insignificant impact on environment and communities. The magnitude is however medium and the sensitivity is medium	
15		Waste management		• All plants and processing facilities with steam or hot water boilers or heating systems using solid fuel (coal, wood etc.) produce solid waste from ash and clinker. The magnitude is large and the sensitivity is high.	Major
16		Fire Risk	Farmers, public property, workers	• Processing plants such as collection centres are highly susceptible to fires which could result in death, burns and loss of property. The fires could emanate from within the plant (through uncontrolled smoking, cooking and/or electrical faults) or spread from outside the plant. The magnitude is medium and the sensitivity is high.	Major
		• Social Impacts			
17		Sustainability of the Crop processing plant	Farmers, Workers	• The sustainability of the crop processing plant such as collection centres may be hampered by inadequate workforce/or machinery.	Major

				• Lack of human resources, technical know-how and logistics to operate and maintain the plants could also significantly hamper the successful implementation of the proposed programme. • Failure of the storage facilities may also reduce the shelf life of crop productio and result in high postharvest losses.	
18		Occupational health & safety	Processing plant workers	• Machine operators will be exposed to noise, dust and vibrations especially without the use of appropriate PPEs. There is also a high risk of accidents and injury from the use of machinery and equipment if safety procedures are not followed. • The use of appropriate PPEs and adherence to safety and operational procedures will reduce this impact. The magnitude is medium and the sensitivity is high.	Major

19		Post-harvest losses	Farmers	• Post-harvest losses may arise from disease infestation, pests and rodent infestation and improper storage conditions which reduce the shelf life of the produce. • Improper storage conditions such as poor ventilation, poor housekeeping and power outage without alternative power supply may lead to the degradation of crop production products. • These will lead to loss in market value and investment losses. Any spoilt produce will be permanently impacted and the investment losses to farmers could be major. The magnitude is large and the sensitivity is high.	Major
20		Waste generation and disposal	Soil, water bodies	• Servicing and maintenance of machinery and equipment may also generate waste such as scrap metal, empty lubricant containers, waste lubricants, rubber seals, etc. Domestic/office wastes such as used polythene bags, food wastes, food wrappers, used water sachets and bottles, office wastes and human wastes will be generated etc. The impact is local and will last through the agricultural development and operations phase.	Major

				The magnitude is medium and the sensitivity is high.	
21		Sanitation issues and public health	Land, water bodies	• Failure to provide appropriate latrine facilities at vantage points within the programme area may encourage, and to some extent leave no option than, open defecation in the fields. Women suffer more in this respect as it puts their dignity at risk and predispose them to rape. • The magnitude is medium and the sensitivity is high.	Major

22		Pest/rodent infestation and contamination of stored Crop production	Stored Crop production, farmers, public	• Stored crop products are susceptible to attacks from rodents and reptiles (rat) if the necessary management practices and storage conditions for the produce are not diligently followed. • They may feed on stored crop production, and this may result in losses in the quantity and quality of produce and consequently investment losses which could be high. • In addition to feeding on the produce, rodents may also contaminate stored produce through their droppings, urine, hairs and may spread human diseases. This could have health implications for the public. • The impact on health could be high and of regional extent. The magnitude is large and the sensitivity is high.	Major
	Processing Infrastructure development/Construction and/or upgrading of Agro-Industrial Hub infrastructure	Environmental Impacts			
23		Air quality deterioration	Project affected communities, construction	• Dust generation will arise from site preparation, excavations, general construction works and topsoil handling by mechanical equipment and	Moderate

			workers, farmers	portable auxiliary equipment. Vehicular/truck movements and transport of materials/ equipment to and from site on the untarred routes/roads and cleared will also generate dust. • Loading, haulage and dumping of sand/stone aggregates as well as cement handling will also generate dust that can increase the air borne particulate in the vicinity. • Use of construction vehicles, trucks and generators will generate fumes/gaseous emissions from combustion of diesel engines of such equipment. • Inhaling of fumes and gaseous emissions such as carbon monoxide, sulphur oxides and nitrous oxides can affect the health of persons exposed to these gases for prolonged periods. • The impact is direct, temporary and likely, lasting during the constructional phase; the impact is also local in extent i.e. limited to the programme site and adjacent properties. • However, based on the scale of the proposed infrastructure development (small and medium),	

				The magnitude is medium and the sensitivity is medium.	
24		Vibration and noise nuisance	Workers, public	• Activities that will contribute to increased noise levels during the construction phase include; vehicular and truck movement, site clearing and preparation, dredging works, piling, construction of breakwater, underwater blasting, subsea trenching for pipeline installation, etc. • Typical noise level from construction activities ranges from 80 dBA to 112 dBA (BS 5228-1:2009) within the operation areas and is expected to significantly reduce to 30 dBA to 62 dBA at a distance of about 80 m from the site. • The impact is direct, temporary and likely, moderate in scale; the impact is also local in extent i.e., limited to the programme site and adjacent properties. • The application of standard noise control measures will assist in ensuring that these issues are reduced. • However, based on the scale of the proposed infrastructure development (small and medium),	Moderate

				The magnitude and the sensitivity are medium.	
25		Loss of vegetation and impacts on flora and fauna	Flora and fauna, within access road and other infrastructure RoW	• The proposed intervention by the Zamfara SAPZ programme is meant for brown and green fields. In essence, most of the sites can be classified as Modified habitat deficient in fauna largely due to the degradation of the original habitat by human activities and the semi-arid nature of the area. Therefore impact on terrestrial fauna will be limited. • Disturbed fauna can migrate to nearby bushes. The magnitude and the sensitivity are both medium.	Minor
26		Surface water contamination/ impact on aquatic organisms	Streams, Rivers and Lagoon	• Site preparation, comprising clearance of vegetation in the RoW as well as grading and trenching works for the road and drainages will result in loosening and exposure of top soil. This will facilitate their erosion and sediment transport into nearby streams and the Lagoon. • Disposal of discharge construction wastewater into the natural water bodies may also adversely affect the flow regime of the affected water bodies	Major

				and its aquatic life. • The impact is direct, temporary and likely, lasting during the constructional phase; the impact is also local in extent i.e. limited to the programme site and nearby stream and river, and moderate in scale. The magnitude is medium and the sensitivity is high.	
		Social Impacts			
27		Risk of flooding	Farmers, Neighbouring communities,	• Since the proposed programme intends to construct access roads, excavation to construct the new drains and the blockage of the existing drains may lead to flooding around the programme area. • This will however be limited to the rainy season. The magnitude is medium and the sensitivity is medium.	Moderate
28		Increase in Crime and insecurity issues	Neighbouring communities,	• Some concerns raised during Consultation with the people in this respect showed that some communities are currently experiencing upsurge in criminal activities such as kidnapping, banditry,	Moderate

				stealing and burglary. • This will possibly increase during the construction phase with the influx of new comers. The magnitude is medium and the sensitivity is medium.	
29		Sanitation Issues	Neighbouring communities,	• Some of the significant sanitation and health concerns associated with the new programmes include shortage of facilities like toilets and catering facilities for construction workers. It was actually revealed during the town hall meeting that the programme site is currently experiencing waste management problems. This may be escalated by the proposed programme if adequate provisions of waste management facilities are not made. The magnitude is medium and the sensitivity is high.	Major
30		Interference from local community causing disruptions to work	Farmers	• Inadequate consultation and poor management of community issues may lead to undue interference that may disrupt the intervention programme. This may also be caused by poor management of the compensation process and non-adherence to the cultural norms of the community. The magnitude	Moderate

				and the sensitivity are both medium.	
31		Labour influx and risk of disease transmission	Neighbouring communities, contractor	• Speculative job seekers, mainly unskilled youth and some skilled persons will throng the programme area to look for jobs and may end up residing in the local communities. This may put pressure on the existing social facilities and could induce anti-social behaviours (including the expansion of sex immorality, drug use, alcohol abuse, insecurity, banditry, theft, COVID-19, STD, HIV/AIDS etc.) • Non-locals, mainly unskilled youth, who will be engaged are likely to reside in the nearby local communities due to proximity to programme sites, and this will put pressure on the existing social amenities and environmental resources in the communities • Indirect labour influx will result from mainly non-local traders, especially women who will bring food/water and goods to sell to construction workers could generate some conflict between them and the locals • The magnitude is medium and the sensitivity is	Major

				high.	
32		Occupational health, safety and labour issues	Construction workers,	• Workers will be exposed to risks during construction works. The risks include hazards from the operation of construction machinery/equipment, transportation of construction materials, inhalation of dust and	Major

				fumes, drowning from marine works, accidents from falling objects, etc. • Unhygienic working conditions, discriminatory practices, engagement of child labour could bring about social and labour conflicts and may trigger labour rights concerns. • Poor management of waste could also significantly affect safety in the workplace. • Risk of accidents from the materials management at the work camps, including accidents from poorly managed workspace and fire from fuel storage facilities, overtopping of trucks during breakwater extension works. • The improper handling of hazardous materials is also a health threat to workers. • Site preparatory activities such as vegetation clearance exposes expose workers to dangerous reptiles such as snakes and other animals. • The impact is direct, temporary and likely, lasting during the construction phase; the impact is local and may also involve foreign nationals as well. In	

				terms of number of people to engaged, the scale could range from minor to severe. • The magnitude is medium and the sensitivity is high.	
33		Road rehabilitation and traffic impact	Commercial and private vehicles	• The existing road across the intervention areas mostly untarred and in deplorable State are used by cars and other commercial vehicles as well as private vehicles to access the proposed site and neighbouring communities. The rehabilitation of these roads can generate minor to moderate traffic impacts. • The impact is likely, direct, temporary, local and minor to moderate in scale. The magnitude is medium and the sensitivity is medium.	Moderate
34		Impact on cultural heritage	Neighbouring communities	• No major culturally sensitive issue was identified to be potentially affected by the proposed programme. • However, a chance find procedure will be put in place to ensure that any cultural resource chanced upon is retrieved, identified and appropriately	Minor

				accounted for. • The impact is unlikely, direct and local, and of a minor scale. • The magnitude and the sensitivity are medium.	

CHAPTER SIX

MITIGATION AND ENHANCEMENT MEASURES

Mitigation measures against the potential adverse impacts are proposed in Table 6.1. The measures are highlighted to ensure that the programme impacts are managed within reasonable and acceptable limits. The general rules followed in designing the mitigation measures are listed below:

- Avoidance of major impacts: major impacts are impacts where an accepted limit or standard may be exceeded, or large magnitude impacts occur to highly valued/sensitive resources/receptors;
- Reduction of major and moderate impacts: moderate impacts are impacts within accepted limits and standards. Moderate impacts may cover a broad range, from a threshold below which the impact is minor, up to a level that might be just short of breaching an established (legal) limit; and
- Minor impacts occur where effects are experienced, but the impact magnitudes are sufficiently small and well within accepted standards, and/or the receptors are of low sensitivity/value.

6.1 Types of Mitigation Measures

The mitigation measures adopted may be categorized as:

- preventive measures;
- control measures; and
- compensatory measures.

6.1.1 Preventive Measures

These are measures adopted during the design and pre-construction phase. The measures are aimed at avoiding or minimizing the potential major impacts at source. Avoiding or reducing an impact at source is essentially about ‘designing’ the programme so that a feature causing an impact is designed (e.g. site selection to avoid sensitive areas) or altered (e.g. working at night where necessary) or avoided (e.g. community sensitization programmes to avoid conflicts or confrontations).

6.1.2 Control Measures

These are measures adopted to abate or remedy the impacts occurring during the construction and operation/maintenance phases. Impacts can be abated on site or at receptor end. Repair or remedy of impacts involves unavoidable damage to a resource, e.g., vegetation clearing during land preparation. In this case repair will essentially involve the re-vegetation of the affected parts.

6.1.3 Compensatory Measures

Where other mitigation measures are not possible or fully effective, compensation when required, will be provided in accordance with the national standards as set down by the relevant entities.

6.2 Significant Potential Adverse Impacts

The significant potential adverse impacts (rated as moderate or major) identified from the analysis and evaluation of the potential impacts from the proposed programme based on the value chain can be found in the preceding chapter. Summary of these impacts can also be found in tables 6.1, 6.2 and 6.3

6.3 Mitigation Measures for Significant Potential Adverse Impacts

Tables 6.1, 6.2 and 6.3 provide the recommended mitigation measure for each impact for the crop production, respectively. The application of the mitigation measures in general is expected to reduce major and moderate impacts to minor or negligible impacts that may not require further mitigation.

Table 6.1: Mitigation Measures for Significant Potential Adverse Impacts - Gidan Dawa AIH

S/N	Proposed Project Activities	Environmental Impacts	Key Receptors	Evaluation
1	○ Enhanced Agricultural Production and Productivity in Proximity to Agro-Industrial Clusters ○ Development and operation of agricultural fields, ○ Construction of small dams, dykes and weirs ○ Site clearing and/or levelling, ○ Compacting, ○ Use of heavy equipment and hazardous materials ○ Material Extraction, Slope stability/Excavation, cutting, and filling ○ Hazardous materials storage and disposal, ○ Waste management, ○ Construction camp and crew set up	Deforestation in the process of land preparation for crops	Flora, fauna	○ Trees should be planted in the open farm access roads; ○ The landscape should be permitted to regrow based on application of some control mechanism to prevent wildlife intrusion into residential and administrative quarters.
2		Alterations of local natural water cycles / Depletion of groundwater for irrigation purposes	Groundwater aquifer	○ Avoid conflicting water use through proper segmentation of water availability through the use of dedicated storages for crops, etc farming purposes; ○ Pipe-borne water should be provided in the long term to all crop farmers;
3		Soil quality degradation	Soil, fauna, water bodies	○ Farmers will be encouraged to adopt integrated weed and pest management practices for weed and pest control such as use of certified and disease tolerant seed varieties, use of early maturing seed varieties, proper land preparation, early planting, following recommended planting space between rows and plants, timely/early weeding, suitable water management practices and the use of agrochemicals where necessary. This will minimize the rate of agrochemical use; ○ The Zamfara SAPZ programme will encourage the use of diammonium phosphate fertilizer (DAP) as a nitrogen source to slow down acidification caused by fertilizers such as ammonium sulphate; ○ Farmers will adopt minimum tillage during planting seasons to reduce the susceptibility of the soil to erosion and also hard pan formation associated with continuous ploughing at the same depth; ○ After harvesting, crop residue comprising process residue (straw, husks, skins, trimmings, cobs and bran of cereals) and field residue (stalks and stubble/stems, leaves of crops) will be tilled into the soil to improve the soil structure and soil organic matter content; ○ Farmers will utilise cover crops at erosion prone areas; ○ The Zamfara SAPZ programme will, preferentially, advise and train farmers on selective pesticides with low Environmental Impact Quotient (EIQ) where appropriate, rather than broad-spectrum products, to minimize impacts on non-target species.

4		Surface and ground water pollution	Water, aquatic life	○ The contractor will immediately collect any excess excavated soils to minimize the potential for erosion into water bodies and such excess or unusable materials will be used to fill existing borrow pits; ○ The contractor will ensure appropriate spill control measures are provided at the vehicle maintenance area and fuel storage areas to reduce the potential impact from spills.eg. sand buckets, cemented platforms, etc. These will include provision of bunds to contain spills, installation and servicing of fuel dispensers; ○ Workers will be trained on how to contain and manage spills; ○ Heaps of excavated soils suitable for reuse during construction will be utilized in the shortest possible time to minimise exposure. Where the material is unsuitable for backfilling, it may be used to fill borrow pits or it will be disposed at an approved dump site.
5		Air pollution due to increased mechanized farming, vehicular movement and increased burning of biomass of cleared forest post-harvest waste	Air, workers, public	○ The farm manager will incorporate the Air Quality Management Plan into standard operations. The plan will include the following: ○ dust from vehicular movement; ○ dust from burning of biomass; ○ exhaust emission from vehicles and machinery; ○ VOCs from fuel storage and dispensing areas; ○ noise from operation of machinery; ○ monitoring; ○ Regular maintenance of machinery/equipment in accordance with manufacturer specifications to ensure minimum levels of emission from the terminal operations.
6		Improper disposal of agricultural waste, fertilizer and chemical containers	Soil, water bodies	○ Residents should be advised to use appropriate waste dump sites and to stop indiscriminate waste dumping; ○ Official waste dump sites should be established and waste management operators should be contacted on the prompt clearing of waste deposited.
7		Pest and rodent infestation of matured crop	Matured crop, farmers, public	○ Develop a training programme for farmers especially on integrated pest management; ○ Field sanitation should be adequately maintained.
8		Noise and vibration;	Air, workers, neighbouring communities	○ Abate noise by regular maintenance of machineries; ○ Use manual labour as much as possible; ○ Restriction of activities to daytime; ○ Workers within the vicinity of high-level noise to be provided with adequate PPE; ○ No idling of machinery if not in use, they should be switched off; ○ Control speed and noise of construction machinery; ○ Insulate noisy machines and activities to minimize noise impact to neighbouring communities.

9	Impacts on water quality	Community members downstream users, soil	○ The Zamfara SAPZ programme and farmers will ensure that any pesticides used are manufactured, formulated, packaged, labelled, handled, stored, disposed of, and applied according to the FAO's International Code of Conduct on Pesticide Management; ○ The Zamfara SAPZ programme and farmers will ensure that pesticides that fall under the World Health Organization's (WHO) Recommended Classification of Pesticides by Hazard Classes 1a (extremely hazardous) and 1b (highly hazardous) are not purchased, stored or used; ○ The use of agrochemicals including, antibiotics herbicide and pesticides will be reduced as much as possible on farms; ○ Where possible, mechanical weed and pest control will be considered.
10	Fire risk	Farmers, public property, workers	○ Burning of wastes will not be utilised as a farm management practice; ○ Zamfara SAPZ programme prohibits burning of wastes as a farm management practice and will ensure all programmes it supports comply with this directive; ○ The Zamfara SAPZ programme will educate all farmers and workers on potential causes of fire on the proposed site e.g., smoking, cooking and burning; ○ All farmers and workers will be trained on fire prevention and control. ○ The Zamfara SAPZ programme and farmers will ensure all equipment and machinery are regularly serviced and maintained.
	Social Impacts		
11	Land Use Rights	Farmers, Neighbouring communities	○ The Zamfara SAPZ programme will ensure that no loss of farmland is allowed.
12	Increasing demand for lands for farming;	Farmers, Neighbouring communities	○ The Zamfara SAPZ programme will ensure that no loss of farmland is allowed.
13	Loss of fallow and other agricultural land	Farmers	○ The Zamfara SAPZ programme will ensure that no loss of farmland is allowed.
14	Elimination of smallholder farmers	Farmers	○ The Zamfara SAPZ programme will ensure that no loss of farmland is allowed.
15	Occupational health & safety	Workers	○ The farm manager should have a comprehensive health and safety policy; ○ Ensure there is compliance to various health and safety regulations; ○ Carry out regular risk assessments of the workplace; ○ Establish a standard code of practice for the programme workers including drivers and suppliers so as to promote safety of the public during the operation; ○ Install fully equipped first aid kits at strategic points at the

				working areas; o Ensure there is adequate sanitation facilities to be installed on sites; o Warning signs/bumps to be erected and/or placed at risky points; o There should be insurance covers for the workers under the workman's compensation Act; o Provide adequate emergency procedures for the facility staff; o Arrange regular emergency drills for staff o Install at strategic points enough fire-fighting equipment; o Appropriate PPEs such as gloves, nose masks, coveralls, goggles, safety boots, etc. will be provided for staff and farmers; o The use of PPEs will be enforced especially during the handling of agrochemicals such as during spraying of weedicides; o Safety procedures, particularly with the operation of machines and the handling and use of agrochemicals will be enforced by the SAPZ programme and sanctions applied when not adhered to; o Farm stores at different sections should be built to encourage farmers purchase approved chemicals and PPEs.
16		Increased spate of GBV due to the need and participation of more women	Farmers, women	o Commitment / policy to cooperate with law enforcement agencies investigating perpetrators of gender-based violence; o Ensure a copy of the code of conduct is presented to all workers and signed by each worker; o Ensure workers are trained on the content of the code of conduct in English and local language; o Provide cultural sensitisation training to improve awareness and sensitivity of workers to local cultures, traditions and lifestyles; o Prohibit child and forced labour; o Establish and implement the GBV-GRM. o Engage competent security personnel; o Develop a clear SAPZ programme specific internal "Reporting and Response Protocol" to guide relevant stakeholders in case of GBV/SEA incidents; o Strengthen operational processes of SAPZ GBV/SEA programme in Zamfara States; o Identify development partners and cultivating pragmatic partnership on GBV/SEA prevention measures and referral services; o Provide financial support implementation of the GBV/SEA actions described herein, including training and awareness building for various stakeholders.

17		Conflicts over land and water use and plot allocation;	Farmers, Neighbouring communities	○ Sensitize farmers on the new efficient farming techniques so that they can be fully involved in the transition process; ○ Stakeholder consultation and involvement in decision making at all levels.
18		Sanitation issues and public health;	Soil, Water, Workers	○ The farm managers will provide sanitation facilities at the programme site for use by the farmers; ○ The workers will be educated against "free range" defecation; ○ The farm managers will provide adequate waste bins at the programme site to minimise indiscriminate disposal of plastic and polythene material, cans and food waste by workers; ○ These bins will be frequently emptied at approved dump sites to prevent littering with cans and bottles which could collect water and breed mosquitoes.
19		Impacts on Communities	Neighbouring communities	○ In order to ensure peaceful coexistence and prevent the incidence of conflicts, the Zamfara SAPZ programme together with Farm clusters leaders will continue to extensively consult the programme communities throughout the programme implementation to ensure their free, prior informed consent for programme developments.
20		Sustainability of the farming venture	Farmers	○ Well trained and experienced personnel will be employed by the Zamfara SAPZ programme to oversee the operations and effectiveness of the programme; ○ Efficient use of resources such as water, agrochemicals, etc. will be adopted by the Zamfara SAPZ programme and farmers to minimize economic losses; ○ The Zamfara SAPZ programme will ensure regular maintenance of The Farm implements and machineries for higher efficiency; ○ Training will be regularly provided by the Zamfara SAPZ programme for farmers on improved agronomic practices; ○ The Zamfara SAPZ programme will ensure that farmers are provided with improved and certified seed varieties to enhance productivity; ○ The Zamfara SAPZ programme will ensure adequate machinery and inputs are available to ensure the agricultural activities is maintained and implemented successfully; ○ Proper marketing strategies will be put in place for farmers to be able to sell produce and reduce loss of revenue; ○ Drainage channels and canals will be regularly desilted and cleared of weeds to allow free flow of water; ○ The Zamfara SAPZ programme and value chain clusters will prepare an emergency response plan to cater for the flood and water pollution.

	Agro-Processing activities ○ Crop processing ○ Dealing with waste, ○ Treatment technologies for wastes from processing	○ Environmental Impacts		
21		Noise and vibration	Air, workers, public	○ Provide workers with dust mask, ○ Milling plants will be sited away from residential areas; ○ Abate noise by regular maintenance of machineries; ○ Use manual labour as much as possible; ○ Restriction of activities to daytime; ○ Workers within the vicinity of high-level noise to be provided with adequate PPE; ○ No idling of machinery if not in use, they should be switched off; ○ Control speed and noise of construction machinery; ○ Insulate noisy machines and activities to minimize noise impact to neighbouring communities.
22		Impact on air quality	Air, workers, public	○ Milling plants will be sited away from residential areas; ○ Provide dust masks to workers; ○ Abate dust by suppressants; ○ Control speed of working machinery.
23 **24**		Fire Risk	Farmers, public property, workers	○ Burning of wastes will not be utilised as a farm management practice; ○ The Zamfara SAPZ programme prohibits burning of wastes as a farm management practice and will ensure all programmes it supports comply with this directive ○ The Zamfara SAPZ programme will educate all farmers and workers on potential causes of fire on the proposed site e.g., smoking, cooking and burning; ○ All farmers and workers will be trained on fire prevention and control; ○ The Zamfara SAPZ programme and farmers will ensure all equipment and machinery are regularly serviced and maintained;
		○ Social Impacts		
25		Sustainability of the processing plant	Farmers, Workers	○ Well trained and experienced personnel will be employed by the Zamfara SAPZ programme to oversee the operations and effectiveness of the processing plant; ○ Efficient use of resources to be adopted by the Zamfara SAPZ programme and farmers to minimize economic losses; ○ The Zamfara SAPZ programme will ensure regular maintenance of the machineries for higher efficiency; ○ The Zamfara SAPZ programme will ensure adequate machinery and inputs are available to ensure the agricultural activities is maintained and implemented successfully; ○ Proper marketing strategies will be put in place for farmers to be able to sell produce and reduce loss of revenue; ○ Drainage channels and canals will be regularly desilted and cleared of weeds to allow free flow of water; ○ The Zamfara SAPZ programme and value chain clusters will

				prepare an emergency response plan to cater for flood and water pollution.
26	Occupational health & safety	Processing plant workers	○ The plant operator should have a comprehensive health and safety policy; ○ Ensure there is compliance to various health and safety regulations; ○ Carry out regular risk assessments of the workplace; ○ Establish a standard code of practice for the programme workers including drivers and suppliers so as to promote safety of the public during the operation; ○ Install fully equipped first aid kits at strategic points at the working areas; ○ Ensure there is adequate sanitation facilities to be installed on sites; ○ Warning signs/bumps to be erected and/or placed at risky points; ○ There will be insurance covers for the workers under the workman's compensation Act; ○ Provide adequate emergency procedures for the facility staff; ○ Arrange regular emergency drills for staff and install at strategic points enough firefighting equipment; ○ Appropriate PPEs such as gloves, nose masks, coveralls, goggles, safety boots, etc. will be provided for staff and farmers; ○ The use of PPEs will be enforced especially during the handling of agrochemicals such as during spraying of weedicides; ○ Safety procedures, particularly with the operation of machines and the handling and use of agrochemicals will be enforced by the SAPZ programme and sanctions applied when not adhered to; ○ Farm stores at different sections should be built to encourage farmers purchase approved chemicals and PPEs.
27	Sanitation issues and public health	Land, water bodies	○ The farm managers will provide toilet facilities at the programme site for use by the farmers. ○ The workers will be educated against "free range" defecation; ○ The farm managers will provide adequate waste bins at the programme site to minimise indiscriminate disposal of plastic and polythene material, cans and food waste by workers. These bins will be frequently emptied at approved dump sites to prevent littering with cans and bottles which could collect water and breed mosquitoes.
28	Pest/rodent infestation and contamination of stored produce, etc	Stored crop	○ Develop a training programme for farmers especially on integrated pest management; ○ Field sanitation should be adequately maintained;

29		Post-harvest losses	Farmers	○ The farm managers will adopt an integrated pest management system to control insects and rodent infestation. This will include: ○ Good housekeeping practices such as regular cleaning inside storage rooms and proper packing of produce for ease of inspection; ○ Keeping the surroundings of storage rooms clean and free from weeds; ○ Prevention of insects and rodents from entering storage rooms by regularly inspecting all doors, walls, windows and roof for any openings and repairing them; ○ Use of biological control, such as cats, to keep mice and other rodents from the storage rooms; ○ Use of rodent traps; ○ Chemical control/fumigation through the use of approved agrochemicals to control pests and rodents; the Zamfara SAPZ programme will ensure harvested crop, etc is properly dried to about 13-14% moisture content to make them suitable for storage. ○ All storage rooms at the programme area will have proper ventilation and will be regularly inspected for defects e.g., roof leakages; ○ The Farm managers will ensure the storage room and the surrounding environment is always kept clean and free from weeds; ○ Bags of crops, etc will be properly arranged on pallets and the pallets will be arranged in rows with adequate spacing in between to ensure ease of cleaning the storage room and inspection of produce for rodents and insects; ○ The Zamfara SAPZ programme will ensure new produce from the farm/mill are not mixed with old produce in the storage room by storing the new produce at a different section in the storage room; ○ The aggregation centres managers will adopt “first in first out” practices to ensure that old produce is always sold first; ○ Any infested produce will be immediately removed and destroyed to prevent infestation of other produce; ○ Chemical treatment/fumigation, by using only EPA approved agrochemicals, will be used by The Farm manager to control pest/rodents and diseases where necessary
	Processing	Infrastructure	○ Environmental Impacts	

30	development/Construction and/or upgrading of Agro-Industrial Hub infrastructure Transmission and distribution of electricity, Water supply system, Access Roads Site clearing and/or levelling, Compacting, Use of heavy equipment and hazardous materials Material Extraction, Slope stability/Excavation, cutting, and filling Hazardous materials storage and disposal, Waste management, Construction camp and crew set up	Air quality deterioration	Project affected communities, construction workers, farmers	○ Dust emissions from trucks, will be controlled and minimized by the use of designated routes in order to minimize impacts to residents, construction workers, port workers/users and institutions along the transport route. ○ Provide dust masks to workers; ○ Sprinkle water on the soil during excavation and land filling; ○ Control speed of working machinery; ○ The proposed road construction and road upgrade works will be done using mitigation and control techniques, such as standard dust suppression measures e.g. dampening of unpaved surfaces; ○ Ensure vehicular speed limits of 30mph over any unpaved landscape to minimise dust generation. Material dumping will be regulated to reduce dust emissions; ○ Owners / operators of construction equipment and vehicles will implement the manufacturer recommended engine maintenance programmes to minimize the emission of fumes into the environment; ○ The Contractor will monitor dust and remedial action will be taken whenever dust generating activities take place; ○ Dust-related grievances will be investigated and managed as part of the Grievance Redress Mechanism;
31		Vibration and noise nuisance	Workers/ Local communities and road users	○ The Contractor will employ standard noise abatement measures and engineering best practices to ensure that the impact of these issues is minimized and reduced to acceptable limits. ○ The Contractor will ensure that earthworks and other construction activities will be phased out or controlled to reduce noise generation during construction. ○ All equipment shall be operated and maintained in accordance with appropriate industry and equipment standards including specifications for noise levels and manufacturer's specifications (including regular checks and maintenance); ○ Machines in intermittent use shall be shut down in the intervening periods between works or throttled down to a minimum.
32		Loss of vegetation and impacts on flora and fauna	Flora and fauna, within access road and other infrastructure RoW	○ The construction works contractor will sensitize its machine operators to carry out vegetation clearance in sections and limit vegetation clearance to portions of the land to be developed. This is to allow fauna to migrate to adjoining bushes; ○ Insulate noisy machines and activities during construction to minimize noise impact to neighbouring communities ○ Unnecessary hooting is to be avoided as much as possible ○ Limit construction activities to designated areas; ○ Movement of crews and equipment within the rights-of-way and over routes provided for access to the work shall be performed in

				a manner to minimize damage to vegetation and fauna within the programme area. o Clearing of vegetation in sections by the contractor(s) will ensure only areas of the land to be developed at a particular time are exposed to agents of erosion. This will also ensure the cleared areas of the land are not left bare over long periods as development at the cleared areas will be carried out immediately. This will minimize erosion and sediment transport from the programme site.
		Surface and groundwater contamination/ impact on aquatic organisms	Streams, and Rivers	o The Contractor(s) will immediately collect any excess excavated soils to minimize the potential for erosion into water bodies and such excess or unusable materials will be used to fill existing borrow pits; o The Contractor will ensure appropriate spill control measures are provided at the vehicle maintenance area and fuel storage areas to reduce the potential impact from spills.eg. sand buckets, cemented platforms, etc. These will include provision of bunds to contain spills, installation and servicing of fuel dispensers; o Workers will be trained on how to contain and manage spills; o Heaps of excavated soils suitable for reuse during construction will be utilized in the shortest possible time to minimize exposure; o Where the material is unsuitable for backfilling, it may be used to fill borrow pits or it will be disposed at an approved dump site.
		o Social Impacts		
33		Obstruction of access ways to communities	Community members	o The Contractor(s) will provide safe alternative access routes for access ways that are obstructed/destroyed during construction works; o The Contractor(s) will erect sign posts at vantage points to guide community members through safe alternative access ways during construction works.
		Influx of workers and migrants	Workers, public, neighbouring communities	o The Zamfara SAPZ programme will implement a stakeholder engagement plan that will include: o Informing stakeholders of increases in workforce and potential for influx; o Engaging with local government/traditional authorities on issues, risks and opportunities regarding labour influx; o Engage local communities to understand their concerns, raise awareness of risks and opportunities, and identify solutions to issues relating to labour influx; o Developing feedback on grievance redress mechanism to collect any feedback or complaints related to labour influx associated with the programme;

			○ The Zamfara SAPZ programme will also ensure the contractor(s), together with opinion leaders, traditional leaders, sensitise migrant workers on societal norms, taboos and other cultural practices in the area; ○ The Contractor will be mandated to submit for the approval of the Supervising Engineer a labour influx management plan which will include a social and cultural orientation plan.
34		Public Safety	○ The Contractor(s) will guard all excavations and trenches including borrow areas, canals and drains with caution tapes and safety nets; ○ The Contractor(s) will use warning signs at vantage points to indicate ongoing construction works ○ The Contractor(s) will enforce proper security at the programme site during construction works to limit entry of unauthorised persons to the programme site; ○ The Contractor will ensure that all haulage trucks comply with the approved speed limit of 50 km/hr within the communities along the haulage road ○ The Contractor should ensure that there are traffic wardens along haulage routes to assist pedestrians in crossing; ○ Movement of crews and equipment within the rights-of-way and over routes provided for access to the work shall be performed in a manner to minimize damage to land, crops or property.
		Road impacts & traffic issues Road network, communities	○ Announcement and notification of work by the contractor. The communities must be informed at least seven days before start of work ○ Warning signs shall be provided at the junction on entering the programme area ○ Transport of materials (such as quarry products and concrete) will as much as possible be carried out during off-peak traffic hours to minimize the impact on traffic. ○ Speed limits of between 20-30 km/hour will be enforced along the route for all trucks; ○ Trucks transporting quarry products and other friable materials to the site will be covered ○ All temporary traffic controls will be done in consultation with, FRSC and the traffic Police; ○ The contractor shall ensure that all the vehicles to be used for the programme and especially in transporting equipment and materials will be serviced regularly and all the drivers to be engaged/ assigned would be required to hold the requisite driver's license as prescribed by the Licensing Authority. ○ In the event of an unfortunate incident of any truck failure, such truck will be towed within 24 hours;

				○ The contractor will repair and maintain damaged sections of the road network due to construction activities ○ No vehicle shall be parked at unauthorized places to reduce the risk of accidents.
35		Occupational health & safety	Processing plant workers	○ The Contractor(s) will be mandated to adopt a Health & Safety Policy to guide the land preparation and construction activities; ○ The Contractor will ensure that only qualified machine operators with requisite skills and experience be employed to operate the machines; ○ The Contractor will ensure regular maintenance and servicing of its bulldozers, excavators and tractors as well as other machinery to ensure they are in good condition; ○ Good conditioned and well-maintained equipment will reduce frequent breakdowns, noise nuisance and smoke emissions which could affect the operator's and other workers' health and safety; ○ The Contractor will regularly carry out training on standard operational procedures; ○ Health & safety training will also be provided for machine operators and workers'; ○ The Contractor will provide first aid training for its workers and provide first aid kits at the programme site during land preparation and construction activities to treat minor ailments. However, major cases will be referred to the nearest hospital or health post; ○ The Contractor will also provide and enforce the use of appropriate Personal Protective Equipment (PPE) such as safety boots, reflective jackets, hand gloves, earplugs and nose masks; ○ Sanctions will be implemented where workers do not use the PPEs provided; ○ Contractor will organise weekly toolbox meetings for workers and brief them on EHS issues and what to do to safeguard the environment and avoid accidents or injuries.
36		Waste generation and disposal	Soil, water bodies	○ The Contractor will ensure efficient use of construction materials to minimize the waste to be generated; ○ Excavated soil material will, as much as possible, be reused in construction; ○ The contractor(s) waste management plan should include disposal of excavated material and cleared vegetation, which cannot be re-used. This will be subject to approval by the engineering consultant; ○ The Contractor(s) will provide bins on site for collection and disposal of plastic waste and polythene materials such as

			lubricant containers, drinking water sachets and carrier bags which will be regularly emptied at approved dump site; o Workers will be sensitized to comply with the Waste Management Plan; o The contractor must promote waste avoidance; reduction; reuse and recycling as applicable; o Disposal of waste material shall be by proper waste disposal methods including burying, where burial of such materials is approved by the Engineer, or by removal from the construction area; o The contractor(s) will allow the neighbouring communities to collect the tree and shrub stems for use as poles, fuelwood and fencing material; o As much as possible, the twigs and leaves will be spread and ploughed into soil or allowed to decompose.
37		Sanitation issues and public health	Land, water bodies o The Contractor will provide temporary sanitation facilities at the programme site for use by the construction workers. o The workers will be educated against "free range" defecation; o The Contractor will provide adequate waste bins at the programme site to minimize indiscriminate disposal of plastic and polythene material, cans and food waste by workers. o These bins will be frequently emptied at approved dump sites to prevent littering with cans and bottles which could collect water and breed mosquitoes.

Table 6.2: Mitigation Measures for Significant Potential Adverse Impacts

S/N	Proposed Project Activities	Yargeda ATC		
		Environmental Impacts	Key Receptors	Evaluation
1	Enhanced Agricultural Production and Productivity in Proximity to Agro-Industrial Clusters	Deforestation in the process of land preparation for cropping	Flora, fauna	o Trees should be planted in the open farm access roads; o The landscape should be permitted to regrow based on application of some control mechanism to prevent wildlife intrusion into residential and administrative quarters.
2	Development and operation of agricultural fields, o Construction of small dams, dykes and weirs o Site clearing and/or levelling, o Compacting, o Use of heavy equipment	Alterations of local natural water cycles / Depletion of groundwater for irrigation purposes	Groundwater aquifer	o Avoid conflicting water use through proper segmentation of water availability through the use of dedicated storages for farming purposes; o Pipe-borne water should be provided in the long term to all farmers;
3		Soil quality degradation	Soil, fauna, water bodies	o Farmers will be encouraged to adopt integrated weed and pest management practices for weed and pest control such as use of certified and disease tolerant seed varieties, use of early

	and hazardous materials ○ Material Extraction, Slope stability/Excavation, cutting, and filling ○ Hazardous materials storage and disposal, ○ Waste management, ○ Construction camp and crew set up			maturing seed varieties, proper land preparation, early planting, following recommended planting space between rows and plants, timely/early weeding, suitable water management practices and the use of agrochemicals where necessary. This will minimize the rate of agrochemical use; ○ The Zamfara SAPZ programme will encourage the use of diammonium phosphate fertilizer (DAP) as a nitrogen source to slow down acidification caused by fertilizers such as ammonium sulphate; ○ Farmers will adopt minimum tillage during planting seasons to reduce the susceptibility of the soil to erosion and also hard pan formation associated with continuous ploughing at the same depth; ○ After harvesting, crop residue comprising process residue (straw, husks, skins, trimmings, cobs and bran of cereals) and field residue (stalks and stubble/stems, leaves of crops) will be tilled into the soil to improve the soil structure and soil organic matter content; ○ Farmers will utilise cover crops at erosion prone areas; ○ The Zamfara SAPZ programme will, preferentially, advise and train farmers on selective pesticides with low Environmental Impact Quotient (EIQ) where appropriate, rather than broad-spectrum products, to minimize impacts on non-target species.
4		Surface and ground water pollution	Water, aquatic life	○ The contractor will immediately collect any excess excavated soils to minimize the potential for erosion into water bodies and such excess or unusable materials will be used to fill existing borrow pits; ○ The contractor will ensure appropriate spill control measures are provided at the vehicle maintenance area and fuel storage areas to reduce the potential impact from spills.eg. sand buckets, cemented platforms, etc. These will include provision of bunds to contain spills, installation and servicing of fuel dispensers; ○ Workers will be trained on how to contain and manage spills; ○ Heaps of excavated soils suitable for reuse during construction will be utilized in the shortest possible time to minimise exposure. Where the material is unsuitable for backfilling, it may be used to fill borrow pits or it will be disposed at an approved dump site.

5		Air pollution due to increased mechanized farming, vehicular movement and increased burning of biomass of cleared forest post-harvest waste	Air, workers, public	○ The farm manager will incorporate the Air Quality Management Plan into standard operations. The plan will include the following: ○ dust from vehicular movement; ○ dust from burning of biomass; ○ exhaust emission from vehicles and machinery; ○ VOCs from fuel storage and dispensing areas; ○ noise from operation of machinery; ○ monitoring; ○ Regular maintenance of machinery/equipment in accordance with manufacturer specifications to ensure minimum levels of emission from the terminal operations.
6		Improper disposal of agricultural waste, fertilizer and chemical containers	Soil, water bodies	○ Residents should be advised to use appropriate waste dump sites and to stop indiscriminate waste dumping; ○ Official waste dump sites should be established and waste management operators should be contacted on the prompt clearing of waste deposited.
7		Pest and rodent infestation of matured crop	Matured crop, farmers, public	○ Develop a training programme for farmers especially on integrated pest management; ○ Field sanitation should be adequately maintained.
8		Noise and vibration;	Air, workers, neighbouring communities	○ Abate noise by regular maintenance of machineries; ○ Use manual labour as much as possible; ○ Restriction of activities to daytime; ○ Workers within the vicinity of high-level noise to be provided with adequate PPE; ○ No idling of machinery if not in use, they should be switched off; ○ Control speed and noise of construction machinery; ○ Insulate noisy machines and activities to minimize noise impact to neighbouring communities.

9	Impacts on water quality	Community members downstream users, soil	○ The Zamfara SAPZ programme and farmers will ensure that any pesticides used are manufactured, formulated, packaged, labelled, handled, stored, disposed of, and applied according to the FAO's International Code of Conduct on Pesticide Management; ○ The Zamfara SAPZ programme and farmers will ensure that pesticides that fall under the World Health Organization's (WHO) Recommended Classification of Pesticides by Hazard Classes 1a (extremely hazardous) and 1b (highly hazardous) are not purchased, stored or used; ○ The use of agrochemicals including, antibiotics herbicide and pesticides will be reduced as much as possible on proposed site; ○ Where possible, mechanical weed and pest control will be considered.
10	Fire risk	Farmers, public property, workers	○ Burning of wastes will not be utilised as a farm management practice; ○ Zamfara SAPZ programme prohibits burning of wastes as a farm management practice and will ensure all programmes it supports comply with this directive; ○ The Zamfara SAPZ programme will educate all farmers and workers on potential causes of fire on the proposed site e.g., smoking, cooking and burning; ○ All farmers and workers will be trained on fire prevention and control. ○ The Zamfara SAPZ programme and farmers will ensure all equipment and machinery are regularly serviced and maintained.
	Social Impacts			
11	Land Use Rights	Farmers, Neighbouring communities	○ The Zamfara SAPZ programme will ensure that no loss of farmland is allowed.	
12	Increasing demand for lands for farming;	Farmers, Neighbouring communities	○ The Zamfara SAPZ programme will ensure that no loss of farmland is allowed.	

13		Loss of fallow and other agricultural land	Farmers	○ The Zamfara SAPZ programme will ensure that no loss of farmland is allowed.
14		Elimination of smallholder farmers	Farmers	○ The Zamfara SAPZ programme will ensure that no loss of farmland is allowed.
15		Occupational health & safety	Workers	○ The farm manager should have a comprehensive health and safety policy; ○ Ensure there is compliance to various health and safety regulations; ○ Carry out regular risk assessments of the workplace; ○ Establish a standard code of practice for the programme workers including drivers and suppliers so as to promote safety of the public during the operation; ○ Install fully equipped first aid kits at strategic points at the working areas; ○ Ensure there is adequate sanitation facilities to be installed on sites; ○ Warning signs/bumps to be erected and/or placed at risky points; ○ There should be insurance covers for the workers under the workman's compensation Act; ○ Provide adequate emergency procedures for the facility staff; ○ Arrange regular emergency drills for staff ○ Install at strategic points enough fire-fighting equipment; ○ Appropriate PPEs such as gloves, nose masks, coveralls, goggles, safety boots, etc. will be provided for staff and farmers; ○ The use of PPEs will be enforced especially during the handling of agrochemicals such as during spraying of weedicides; ○ Safety procedures, particularly with the operation of machines and the handling and use of agrochemicals will be enforced by the SAPZ programme and sanctions applied when not adhered to; ○ Farm stores at different sections should be built to encourage farmers purchase approved chemicals and PPEs.
16		Increased spate of GBV due to the need	Farmers, women	○ Commitment / policy to cooperate with law enforcement agencies investigating perpetrators of gender-based violence;

		and participation of more women		○ Ensure a copy of the code of conduct is presented to all workers and signed by each worker; ○ Ensure workers are trained on the content of the code of conduct in English and local language; ○ Provide cultural sensitisation training to improve awareness and sensitivity of workers to local cultures, traditions and lifestyles; ○ Prohibit child and forced labour; ○ Establish and implement the GBV-GRM. ○ Engage competent security personnel; ○ Develop a clear SAPZ programme specific internal "Reporting and Response Protocol" to guide relevant stakeholders in case of GBV/SEA incidents; ○ Strengthen operational processes of SAPZ GBV/SEA programme in Zamfara State; ○ Identify development partners and cultivating pragmatic partnership on GBV/SEA prevention measures and referral services; ○ Provide financial support implementation of the GBV/SEA actions described herein, including training and awareness building for various stakeholders.
17		Conflicts over land and water use and plot allocation;	Farmers, Neighbouring communities	○ Sensitize farmers on the new efficient farming techniques so that they can be fully involved in the transition process; ○ Stakeholder consultation and involvement in decision making at all levels.
18		Sanitation issues and public health;	Soil, Water, Workers	○ The farm managers will provide sanitation facilities at the programme site for use by the farmers; ○ The workers will be educated against "free range" defecation; ○ The farm managers will provide adequate waste bins at the programme site to minimise indiscriminate disposal of plastic and polythene material, cans and food waste by workers; ○ These bins will be frequently emptied at approved dump sites to prevent littering with cans and bottles which could collect water and breed mosquitoes.

19		Impacts on Communities	Neighbouring communities	○ In order to ensure peaceful coexistence and prevent the incidence of conflicts, the Zamfara SAPZ programme together with Farm clusters leaders will continue to extensively consult the programme communities throughout the programme implementation to ensure their free, prior informed consent for programme developments.
20		Sustainability of the farming venture	Farmers	○ Well trained and experienced personnel will be employed by the Zamfara SAPZ programme to oversee the operations and effectiveness of the programme; ○ Efficient use of resources such as water, agrochemicals, etc. will be adopted by the Zamfara SAPZ programme and farmers to minimize economic losses; ○ The Zamfara SAPZ programme will ensure regular maintenance of The Farm implements and machineries for higher efficiency; ○ Training will be regularly provided by the Zamfara SAPZ programme for farmers on improved agronomic practices; ○ The Zamfara SAPZ programme will ensure that farmers are provided with improved and certified seed varieties to enhance productivity; ○ The Zamfara SAPZ programme will ensure adequate machinery and inputs are available to ensure the agricultural activities is maintained and implemented successfully; ○ Proper marketing strategies will be put in place for farmers to be able to sell produce and reduce loss of revenue; ○ Drainage channels and canals will be regularly desilted and cleared of weeds to allow free flow of water; ○ The Zamfara SAPZ programme and value chain clusters will prepare an emergency response plan to cater for the flood and water pollution.
	Agro-Processing activities	○ Environmental Impacts		
21	Crop processing Dealing with waste, Treatment technologies for wastes from processing	Noise and vibration	Air, workers, public	○ Provide workers with dust mask, ○ Milling plants will be sited away from residential areas; ○ Abate noise by regular maintenance of machineries; ○ Use manual labour as much as possible; ○ Restriction of activities to daytime; ○ Workers within the vicinity of high-level noise to be provided with adequate PPE; ○ No idling of machinery if not in use, they should be switched

				off; ○ Control speed and noise of construction machinery; ○ Insulate noisy machines and activities to minimize noise impact to neighbouring communities.
22		Impact on air quality	Air, workers, public	○ Milling plants will be sited away from residential areas; ○ Provide dust masks to workers; ○ Abate dust by suppressants; ○ Control speed of working machinery.
23		Fire Risk	Farmers, public property, workers	○ Burning of wastes will not be utilised as a farm management practice; ○ The Zamfara SAPZ programme prohibits burning of wastes as a farm management practice and will ensure all programmes it supports comply with this directive ○ The Zamfara SAPZ programme will educate all farmers and workers on potential causes of fire on the proposed site e.g., smoking, cooking and burning; ○ All farmers and workers will be trained on fire prevention and control; ○ The Zamfara SAPZ programme and farmers will ensure all equipment and machinery are regularly serviced and maintained;
24				
		○ Social Impacts		
25		Sustainability of the processing plant	Farmers, Workers	○ Well trained and experienced personnel will be employed by the Zamfara SAPZ programme to oversee the operations and effectiveness of the processing plant; ○ Efficient use of resources to be adopted by the Zamfara SAPZ programme and farmers to minimize economic losses; ○ The Zamfara SAPZ programme will ensure regular maintenance of the machineries for higher efficiency; ○ The Zamfara SAPZ programme will ensure adequate machinery and inputs are available to ensure the agricultural activities is maintained and implemented successfully; ○ Proper marketing strategies will be put in place for farmers to be able to sell produce and reduce loss of revenue; ○ Drainage channels and canals will be regularly desilted and cleared of weeds to allow free flow of water; ○ The Zamfara SAPZ programme and value chain clusters will prepare an emergency response plan to cater for flood and water pollution.

26		Occupational health & safety	Processing plant workers	○ The plant operator should have a comprehensive health and safety policy; ○ Ensure there is compliance to various health and safety regulations; ○ Carry out regular risk assessments of the workplace; ○ Establish a standard code of practice for the programme workers including drivers and suppliers so as to promote safety of the public during the operation; ○ Install fully equipped first aid kits at strategic points at the working areas; ○ Ensure there is adequate sanitation facilities to be installed on sites; ○ Warning signs/bumps to be erected and/or placed at risky points; ○ There will be insurance covers for the workers under the workman's compensation Act; ○ Provide adequate emergency procedures for the facility staff; ○ Arrange regular emergency drills for staff and install at strategic points enough firefighting equipment; ○ Appropriate PPEs such as gloves, nose masks, coveralls, goggles, safety boots, etc. will be provided for staff and farmers; ○ The use of PPEs will be enforced especially during the handling of agrochemicals such as during spraying of weedicides; ○ Safety procedures, particularly with the operation of machines and the handling and use of agrochemicals will be enforced by the SAPZ programme and sanctions applied when not adhered to; ○ Farm stores at different sections should be built to encourage farmers purchase approved chemicals and PPEs.

27	Sanitation issues and public health	Land, water bodies	○ The farm managers will provide toilet facilities at the programme site for use by the farmers. ○ The workers will be educated against "free range" defecation; ○ The farm managers will provide adequate waste bins at the programme site to minimise indiscriminate disposal of plastic and polythene material, cans and food waste by workers. These bins will be frequently emptied at approved dump sites to prevent littering with cans and bottles which could collect water and breed mosquitoes.
28	Pest/rodent infestation and contamination of stored	Stored , farmers, public	○ Develop a training programme for farmers especially on integrated pest management; ○ Field sanitation should be adequately maintained;
29	Post-harvest losses	Farmers	○ The farm managers will adopt an integrated pest management system to control insects and rodent infestation. This will include: ○ Good housekeeping practices such as regular cleaning inside storage rooms and proper packing of produce for ease of inspection; ○ Keeping the surroundings of storage rooms clean and free from weeds; ○ Prevention of insects and rodents from entering storage rooms by regularly inspecting all doors, walls, windows and roof for any openings and repairing them; ○ Use of biological control, such as cats, to keep mice and other rodents from the storage rooms; ○ Use of rodent traps; ○ Chemical control/fumigation through the use of approved agrochemicals to control pests and rodents; the Zamfara SAPZ programme will ensure harvested is properly dried to about 13-14% moisture content to make them suitable for storage. ○ All storage rooms at the programme area will have proper ventilation and will be regularly inspected for defects e.g., roof leakages; ○ The Farm managers will ensure the storage room and the surrounding environment is always kept clean and free from weeds;

		○ Bags of will be properly arranged on pallets and the pallets will be arranged in rows with adequate spacing in between to ensure ease of cleaning the storage room and inspection of produce for rodents and insects; ○ The Zamfara SAPZ programme will ensure new produce from the farm/mill are not mixed with old produce in the storage room by storing the new produce at a different section in the storage room; ○ The aggregation centres managers will adopt "first in first out" practices to ensure that old produce is always sold first; ○ Any infested produce will be immediately removed and destroyed to prevent infestation of other produce; ○ Chemical treatment/fumigation, by using only EPA approved agrochemicals, will be used by The Farm manager to control pest/rodents and diseases where necessary
• Processing Infrastructure development/Construction and/or upgrading of Agro-Industrial Hub	○ Environmental Impacts	

30	infrastructure • Transmission and distribution of electricity, • Water supply system, • Access Roads • Site clearing and/or levelling, • Compacting, • Use of heavy equipment and hazardous materials • Material Extraction, Slope stability/Excavation, cutting, and filling • Hazardous materials storage and disposal, • Waste management, • Construction camp and crew set up	Air quality deterioration	Project affected communities, construction workers, farmers	○ Dust emissions from trucks, will be controlled and minimized by the use of designated routes in order to minimize impacts to residents, construction workers, port workers/users and institutions along the transport route. ○ Provide dust masks to workers; ○ Sprinkle water on the soil during excavation and land filling; ○ Control speed of working machinery; ○ The proposed road construction and road upgrade works will be done using mitigation and control techniques, such as standard dust suppression measures e.g. dampening of unpaved surfaces; ○ Ensure vehicular speed limits of 30mph over any unpaved landscape to minimise dust generation. Material dumping will be regulated to reduce dust emissions; ○ Owners / operators of construction equipment and vehicles will implement the manufacturer recommended engine maintenance programmes to minimize the emission of fumes into the environment; ○ The Contractor will monitor dust and remedial action will be taken whenever dust generating activities take place; ○ Dust-related grievances will be investigated and managed as part of the Grievance Redress Mechanism;
31		Vibration and noise nuisance	Workers/ Local communities and road users	○ The Contractor will employ standard noise abatement measures and engineering best practices to ensure that the impact of these issues is minimized and reduced to acceptable limits. ○ The Contractor will ensure that earthworks and other construction activities will be phased out or controlled to reduce noise generation during construction. ○ All equipment shall be operated and maintained in accordance with appropriate industry and equipment standards including specifications for noise levels and manufacturer's specifications (including regular checks and maintenance); ○ Machines in intermittent use shall be shut down in the intervening periods between works or throttled down to a minimum.

32		Loss of vegetation and impacts on flora and fauna	Flora and fauna, within access road and other infrastructure RoW	○ The construction works contractor will sensitize its machine operators to carry out vegetation clearance in sections and limit vegetation clearance to portions of the land to be developed. This is to allow fauna to migrate to adjoining bushes; ○ Insulate noisy machines and activities during construction to minimize noise impact to neighbouring communities ○ Unnecessary hooting is to be avoided as much as possible ○ Limit construction activities to designated areas; ○ Movement of crews and equipment within the rights-of-way and over routes provided for access to the work shall be performed in a manner to minimize damage to vegetation and fauna within the programme area. ○ Clearing of vegetation in sections by the contractor(s) will ensure only areas of the land to be developed at a particular time are exposed to agents of erosion. This will also ensure the cleared areas of the land are not left bare over long periods as development at the cleared areas will be carried out immediately. This will minimize erosion and sediment transport from the programme site.

		Surface and groundwater contamination/ impact on aquatic organisms	Streams, and Rivers	○ The Contractor(s) will immediately collect any excess excavated soils to minimize the potential for erosion into water bodies and such excess or unusable materials will be used to fill existing borrow pits; ○ The Contractor will ensure appropriate spill control measures are provided at the vehicle maintenance area and fuel storage areas to reduce the potential impact from spills.eg. sand buckets, cemented platforms, etc. These will include provision of bunds to contain spills, installation and servicing of fuel dispensers; ○ Workers will be trained on how to contain and manage spills; ○ Heaps of excavated soils suitable for reuse during construction will be utilized in the shortest possible time to minimize exposure; ○ Where the material is unsuitable for backfilling, it may be used to fill borrow pits or it will be disposed at an approved dump site.
		○ Social Impacts		
33		Obstruction of access ways to communities	Community members	○ The Contractor(s) will provide safe alternative access routes for access ways that are obstructed/destroyed during construction works; ○ The Contractor(s) will erect sign posts at vantage points to guide community members through safe alternative access ways during construction works.

		Influx of workers and migrants	Workers, public, neighbouring communities	○ The Zamfara SAPZ programme will implement a stakeholder engagement plan that will include: ○ Informing stakeholders of increases in workforce and potential for influx; ○ Engaging with local government/traditional authorities on issues, risks and opportunities regarding labour influx; ○ Engage local communities to understand their concerns, raise awareness of risks and opportunities, and identify solutions to issues relating to labour influx; ○ Developing feedback on grievance redress mechanism to collect any feedback or complaints related to labour influx associated with the programme; ○ The Zamfara SAPZ programme will also ensure the contractor(s), together with opinion leaders, traditional leaders, sensitise migrant workers on societal norms, taboos and other cultural practices in the area; ○ The Contractor will be mandated to submit for the approval of the Supervising Engineer a labour influx management plan which will include a social and cultural orientation plan.
34		Public Safety		○ The Contractor(s) will guard all excavations and trenches including borrow areas, canals and drains with caution tapes and safety nets; ○ The Contractor(s) will use warning signs at vantage points to indicate ongoing construction works ○ The Contractor(s) will enforce proper security at the programme site during construction works to limit entry of unauthorised persons to the programme site; ○ The Contractor will ensure that all haulage trucks comply with the approved speed limit of 50 km/hr within the communities along the haulage road ○ The Contractor should ensure that there are traffic wardens along haulage routes to assist pedestrians in crossing; ○ Movement of crews and equipment within the rights-of-way and over routes provided for access to the work shall be performed in a manner to minimize damage to land, crops or property.

		Road impacts & traffic issues	Road network, communities	○ Announcement and notification of work by the contractor. The communities must be informed at least seven days before start of work ○ Warning signs shall be provided at the junction on entering the programme area ○ Transport of materials (such as quarry products and concrete) will as much as possible be carried out during off-peak traffic hours to minimize the impact on traffic. ○ Speed limits of between 20-30 km/hour will be enforced along the route for all trucks; ○ Trucks transporting quarry products and other friable materials to the site will be covered ○ All temporary traffic controls will be done in consultation with, FRSC and the traffic Police; ○ The contractor shall ensure that all the vehicles to be used for the programme and especially in transporting equipment and materials will be serviced regularly and all the drivers to be engaged/ assigned would be required to hold the requisite driver's license as prescribed by the Licensing Authority. ○ In the event of an unfortunate incident of any truck failure, such truck will be towed within 24 hours; ○ The contractor will repair and maintain damaged sections of the road network due to construction activities ○ No vehicle shall be parked at unauthorized places to reduce the risk of accidents.
35		Occupational health & safety	Processing plant workers	○ The Contractor(s) will be mandated to adopt a Health & Safety Policy to guide the land preparation and construction activities; ○ The Contractor will ensure that only qualified machine operators with requisite skills and experience be employed to operate the machines; ○ The Contractor will ensure regular maintenance and servicing of its bulldozers, excavators and tractors as well as other machinery to ensure they are in good condition; ○ Good conditioned and well-maintained equipment will reduce frequent breakdowns, noise nuisance and smoke emissions which could affect the operator's and other workers' health and safety; ○ The Contractor will regularly carry out training on standard operational procedures;

				○ Health & safety training will also be provided for machine operators and workers'; ○ The Contractor will provide first aid training for its workers and provide first aid kits at the programme site during land preparation and construction activities to treat minor ailments. However, major cases will be referred to the nearest hospital or health post; ○ The Contractor will also provide and enforce the use of appropriate Personal Protective Equipment (PPE) such as safety boots, reflective jackets, hand gloves, earplugs and nose masks; ○ Sanctions will be implemented where workers do not use the PPEs provided; ○ Contractor will organise weekly toolbox meetings for workers and brief them on EHS issues and what to do to safeguard the environment and avoid accidents or injuries.
36		Waste generation and disposal	Soil, water bodies	○ The Contractor will ensure efficient use of construction materials to minimize the waste to be generated; ○ Excavated soil material will, as much as possible, be reused in construction; ○ The contractor(s) waste management plan should include disposal of excavated material and cleared vegetation, which cannot be re-used. This will be subject to approval by the engineering consultant; ○ The Contractor(s) will provide bins on site for collection and disposal of plastic waste and polythene materials such as lubricant containers, drinking water sachets and carrier bags which will be regularly emptied at approved dump site; ○ Workers will be sensitized to comply with the Waste Management Plan; ○ The contractor must promote waste avoidance; reduction; reuse and recycling as applicable; ○ Disposal of waste material shall be by proper waste disposal methods including burying, where burial of such materials is approved by the Engineer, or by removal from the construction area; ○ The contractor(s) will allow the neighbouring communities to collect the tree and shrub stems for use as poles, fuelwood and fencing material; ○ As much as possible, the twigs and leaves will be spread and

				ploughed into soil or allowed to decompose.
37		Sanitation issues and public health	Land, water bodies	○ The Contractor will provide temporary sanitation facilities at the programme site for use by the construction workers. ○ The workers will be educated against "free range" defecation; ○ The Contractor will provide adequate waste bins at the programme site to minimize indiscriminate disposal of plastic and polythene material, cans and food waste by workers. ○ These bins will be frequently emptied at approved dump sites to prevent littering with cans and bottles which could collect water and breed mosquitoes.

Table 6.3: Mitigation Measures for Significant Potential Adverse Impacts – Gummil ATC

S/N	Proposed Project Activities	Gummil ATC		
		Environmental Impacts	Key Receptors	Evaluation
1	Enhanced Agricultural Production and Productivity in Proximity to Agro-Industrial Clusters	Deforestation in the process of land preparation for cropping	Flora, fauna	○ Trees should be planted in the open farm access roads; ○ The landscape should be permitted to regrow based on application of some control mechanism to prevent wildlife intrusion into residential and administrative quarters.
2	Development and operation of agricultural fields, Construction of small dams, dykes and weirs Site clearing and/or levelling, Compacting, Use of heavy equipment and hazardous materials Material Extraction, Slope stability/Excavation, cutting, and filling Hazardous materials storage and disposal, Waste management, Construction camp and crew set up	Alterations of local natural water cycles / Depletion of groundwater for irrigation purposes	Groundwater aquifer	○ Avoid conflicting water use through proper segmentation of water availability through the use of dedicated storages for farming purposes; ○ Pipe-borne water should be provided in the long term to all farmers;
3		Soil quality degradation	Soil, fauna, water bodies	○ Farmers will be encouraged to adopt integrated weed and pest management practices for weed and pest control such as use of certified and disease tolerant seed varieties, use of early maturing seed varieties, proper land preparation, early planting, following recommended planting space between rows and plants, timely/early weeding, suitable water management practices and the use of agrochemicals where necessary. This will minimize the rate of agrochemical use; ○ The Zamfara SAPZ programme will encourage the use of diammonium phosphate fertilizer (DAP) as a nitrogen source to slow down acidification caused by fertilizers such as ammonium sulphate; ○ Farmers will adopt minimum tillage during planting seasons to reduce the susceptibility of the soil to erosion and also hard pan formation associated with continuous ploughing at the same depth;

				○ After harvesting, crop residue comprising process residue (straw, husks, skins, trimmings, cobs and bran of cereals) and field residue (stalks and stubble/stems, leaves of crops) will be tilled into the soil to improve the soil structure and soil organic matter content; ○ Farmers will utilise cover crops at erosion prone areas; ○ The Zamfara SAPZ programme will, preferentially, advise and train farmers on selective pesticides with low Environmental Impact Quotient (EIQ) where appropriate, rather than broad-spectrum products, to minimize impacts on non-target species.
4		Surface and ground water pollution	Water, aquatic life	○ The contractor will immediately collect any excess excavated soils to minimize the potential for erosion into water bodies and such excess or unusable materials will be used to fill existing borrow pits; ○ The contractor will ensure appropriate spill control measures are provided at the vehicle maintenance area and fuel storage areas to reduce the potential impact from spills.eg. sand buckets, cemented platforms, etc. These will include provision of bunds to contain spills, installation and servicing of fuel dispensers; ○ Workers will be trained on how to contain and manage spills; ○ Heaps of excavated soils suitable for reuse during construction will be utilized in the shortest possible time to minimise exposure. Where the material is unsuitable for backfilling, it may be used to fill borrow pits or it will be disposed at an approved dump site.
5		Air pollution due to increased mechanized farming, vehicular movement and increased burning of biomass of cleared forest post-harvest waste	Air, workers, public	○ The farm manager will incorporate the Air Quality Management Plan into standard operations. The plan will include the following: ○ dust from vehicular movement; ○ dust from burning of biomass; ○ exhaust emission from vehicles and machinery; ○ VOCs from fuel storage and dispensing areas; ○ noise from operation of machinery; ○ monitoring; ○ Regular maintenance of machinery/equipment in accordance with manufacturer specifications to ensure minimum levels of emission from the terminal operations.
6		Improper disposal of agricultural waste, fertilizer and chemical containers	Soil, water bodies	○ Residents should be advised to use appropriate waste dump sites and to stop indiscriminate waste dumping; ○ Official waste dump sites should be established and waste management operators should be contacted on the prompt clearing of waste deposited.
7		Pest and rodent infestation of matured crop	Matured crop, farmers, public	○ Develop a training programme for farmers especially on integrated pest management; ○ Field sanitation should be adequately maintained.

8	Noise and vibration;	Air, workers, neighbouring communities	○ Abate noise by regular maintenance of machineries; ○ Use manual labour as much as possible; ○ Restriction of activities to daytime; ○ Workers within the vicinity of high-level noise to be provided with adequate PPE; ○ No idling of machinery if not in use, they should be switched off; ○ Control speed and noise of construction machinery; ○ Insulate noisy machines and activities to minimize noise impact to neighbouring communities.
9	Impacts on water quality	Community members downstream users, soil	○ The Zamfara SAPZ programme and farmers will ensure that any pesticides used are manufactured, formulated, packaged, labelled, handled, stored, disposed of, and applied according to the FAO's International Code of Conduct on Pesticide Management; ○ The Zamfara SAPZ programme and farmers will ensure that pesticides that fall under the World Health Organization's (WHO) Recommended Classification of Pesticides by Hazard Classes 1a (extremely hazardous) and 1b (highly hazardous) are not purchased, stored or used; ○ The use of agrochemicals including, antibiotics herbicide and pesticides will be reduced as much as possible on proposed site; ○ Where possible, mechanical weed and pest control will be considered.
10	Fire risk	Farmers, public property, workers	○ Burning of wastes will not be utilised as a farm management practice; ○ Zamfara SAPZ programme prohibits burning of wastes as a farm management practice and will ensure all programmes it supports comply with this directive; ○ The Zamfara SAPZ programme will educate all farmers and workers on potential causes of fire on the proposed site e.g., smoking, cooking and burning; ○ All farmers and workers will be trained on fire prevention and control. ○ The Zamfara SAPZ programme and farmers will ensure all equipment and machinery are regularly serviced and maintained.
	Social Impacts		○
11	Land Use Rights	Farmers, Neighbouring communities	○ The Zamfara SAPZ programme will ensure that no loss of farmland is allowed.
12	Increasing demand for lands for farming;	Farmers, Neighbouring communities	○ The Zamfara SAPZ programme will ensure that no loss of farmland is allowed.

13		Loss of fallow and other agricultural land	Farmers	○ The Zamfara SAPZ programme will ensure that no loss of farmland is allowed.
14		Elimination of smallholder farmers	Farmers	○ The Zamfara SAPZ programme will ensure that no loss of farmland is allowed.
15		Occupational health & safety	Workers	• The farmmanager should have a comprehensive health and safety policy; • Ensure there is compliance to various health and safety regulations; • Carry out regular risk assessments of the workplace; • Establish a standard code of practice for the programme workers including drivers and suppliers so as to promote safety of the public during the operation; • Install fully equipped first aid kits at strategic points at the working areas; • Ensure there is adequate sanitation facilities to be installed on sites; • Warning signs/bumps to be erected and/or placed at risky points; • There should be insurance covers for the workers under the workman's compensation Act; • Provide adequate emergency procedures for the facility staff; • Arrange regular emergency drills for staff • Install at strategic points enough fire-fighting equipment; • Appropriate PPEs such as gloves, nose masks, coveralls, goggles, safety boots, etc. will be provided for staff and farmers; • The use of PPEs will be enforced especially during the handling of agrochemicals such as during spraying of weedicides; • Safety procedures, particularly with the operation of machines and the handling and use of agrochemicals will be enforced by the SAPZ programme and sanctions applied when not adhered to; • Farm stores at different sections should be built to encourage farmers purchase approved chemicals and PPEs.
16		Increased spate of GBV due to the need and participation of more women	Farmers, women	• Commitment / policy to cooperate with law enforcement agencies investigating perpetrators of gender-based violence; • Ensure a copy of the code of conduct is presented to all workers and signed by each worker; • Ensure workers are trained on the content of the code of conduct in English and local language; • Provide cultural sensitisation training to improve awareness and sensitivity of workers to local cultures, traditions and lifestyles; • Prohibit child and forced labour; • Establish and implement the GBV-GRM. • Engage competent security personnel;

			• Develop a clear SAPZ programme specific internal "Reporting and Response Protocol" to guide relevant stakeholders in case of GBV/SEA incidents; • Strengthen operational processes of SAPZ GBV/SEA programme in Zamfara States ; • Identify development partners and cultivating pragmatic partnership on GBV/SEA prevention measures and referral services; • Provide financial support implementation of the GBV/SEA actions described herein, including training and awareness building for various stakeholders.
17	Conflicts over land and water use and plot allocation;	Farmers, Neighbouring communities	• Sensitize farmers on the new efficient farming techniques so that they can be fully involved in the transition process; • Stakeholder consultation and involvement in decision making at all levels.
18	Sanitation issues and public health;	Soil, Water, Workers	• The farm managers will provide sanitation facilities at the programme site for use by the farmers; • The workers will be educated against "free range" defecation; • The Farm managers will provide adequate waste bins at the programme site to minimise indiscriminate disposal of plastic and polythene material, cans and food waste by workers; • These bins will be frequently emptied at approved dump sites to prevent littering with cans and bottles which could collect water and breed mosquitoes.
19	Impacts on Communities	Neighbouring communities	In order to ensure peaceful coexistence and prevent the incidence of conflicts, the Zamfara SAPZ programme together with Farm clusters leaders will continue to extensively consult the programme communities throughout the programme implementation to ensure their free, prior informed consent for programme developments.
20	Sustainability of the farming venture	Farmers	• Well trained and experienced personnel will be employed by the Zamfara SAPZ programme to oversee the operations and effectiveness of the programme; • Efficient use of resources such as water, agrochemicals, etc. will be adopted by the Zamfara SAPZ programme and farmers to minimize economic losses; • The Zamfara SAPZ programme will ensure regular maintenance of The Farm implements and machineries for higher efficiency; • Training will be regularly provided by the Zamfara SAPZ programme for farmers on improved agronomic practices; • The Zamfara SAPZ programme will ensure that farmers are provided with improved and certified seed varieties to enhance productivity; • The Zamfara SAPZ programme will ensure adequate machinery and

				inputs are available to ensure the agricultural activities is maintained and implemented successfully; • Proper marketing strategies will be put in place for farmers to be able to sell produce and reduce loss of revenue; • Drainage channels and canals will be regularly desilted and cleared of weeds to allow free flow of water; • The Zamfara SAPZ programme and value chain clusters will prepare an emergency response plan to cater for the flood and water pollution.
	Agro-Processing activities	Environmental Impacts		
21	Crop processing Dealing with waste, Treatment technologies for wastes from processing	Noise and vibration	Air, workers, public	○ Provide workers with dust mask, ○ Milling plants will be sited away from residential areas; ○ Abate noise by regular maintenance of machineries; ○ Use manual labour as much as possible; ○ Restriction of activities to daytime; ○ Workers within the vicinity of high-level noise to be provided with adequate PPE; ○ No idling of machinery if not in use, they should be switched off; ○ Control speed and noise of construction machinery; ○ Insulate noisy machines and activities to minimize noise impact to neighbouring communities.
22		Impact on air quality	Air, workers, public	○ Milling plants will be sited away from residential areas; ○ Provide dust masks to workers; ○ Abate dust by suppressants; ○ Control speed of working machinery.
23		Fire Risk	Farmers, public property, workers	○ Burning of wastes will not be utilised as a farm management practice; ○ The Zamfara SAPZ programme prohibits burning of wastes as a farm management practice and will ensure all programmes it supports comply with this directive ○ The Zamfara SAPZ programme will educate all farmers and workers on potential causes of fire on the proposed site e.g., smoking, cooking and burning; ○ All farmers and workers will be trained on fire prevention and control; ○ The Zamfara SAPZ programme and farmers will ensure all equipment and machinery are regularly serviced and maintained;
24				
		Social Impacts		
25		Sustainability of the processing plant	Farmers, Workers	○ Well trained and experienced personnel will be employed by the Zamfara SAPZ programme to oversee the operations and effectiveness of the processing plant; ○ Efficient use of resources to be adopted by the Zamfara SAPZ programme and farmers to minimize economic losses; ○ The Zamfara SAPZ programme will ensure regular maintenance of the machineries for higher efficiency; ○ The Zamfara SAPZ programme will ensure adequate machinery and inputs are available to ensure the agricultural activities is maintained and

				implemented successfully; ○ Proper marketing strategies will be put in place for farmers to be able to sell produce and reduce loss of revenue; ○ Drainage channels and canals will be regularly desilted and cleared of weeds to allow free flow of water; ○ The Zamfara SAPZ programme and value chain clusters will prepare an emergency response plan to cater for flood and water pollution.
26		Occupational health & safety	Processing plant workers	○ The plant operator should have a comprehensive health and safety policy; ○ Ensure there is compliance to various health and safety regulations; ○ Carry out regular risk assessments of the workplace; ○ Establish a standard code of practice for the programme workers including drivers and suppliers so as to promote safety of the public during the operation; ○ Install fully equipped first aid kits at strategic points at the working areas; ○ Ensure there is adequate sanitation facilities to be installed on sites; ○ Warning signs/bumps to be erected and/or placed at risky points; ○ There will be insurance covers for the workers under the workman's compensation Act; ○ Provide adequate emergency procedures for the facility staff; ○ Arrange regular emergency drills for staff and install at strategic points enough firefighting equipment; ○ Appropriate PPEs such as gloves, nose masks, coveralls, goggles, safety boots, etc. will be provided for staff and farmers; ○ The use of PPEs will be enforced especially during the handling of agrochemicals such as during spraying of weedicides; ○ Safety procedures, particularly with the operation of machines and the handling and use of agrochemicals will be enforced by the SAPZ programme and sanctions applied when not adhered to; ○ Farm stores at different sections should be built to encourage farmers purchase approved chemicals and PPEs.
27		Sanitation issues and public health	Land, water bodies	○ The farm managers will provide toilet facilities at the programme site for use by the farmers. ○ The workers will be educated against "free range" defecation; ○ The farm managers will provide adequate waste bins at the programme site to minimise indiscriminate disposal of plastic and polythene material, cans and food waste by workers. These bins will be frequently emptied at approved dump sites to prevent littering with cans and bottles which could collect water and breed mosquitoes.

28	Pest/rodent infestation and contamination of stored produce	Stored produce, farmers, public	○ Develop a training programme for farmers especially on integrated pest management; ○ Field sanitation should be adequately maintained;
29	Post-harvest losses	Farmers	○ The farmmanagers will adopt an integrated pest management system to control insects and rodent infestation. This will include: ○ Good housekeeping practices such as regular cleaning inside storage rooms and proper packing of produce for ease of inspection; ○ Keeping the surroundings of storage rooms clean and free from weeds; ○ Prevention of insects and rodents from entering storage rooms by regularly inspecting all doors, walls, windows and roof for any openings and repairing them; ○ Use of biological control, such as cats, to keep mice and other rodents from the storage rooms; ○ Use of rodent traps; ○ Chemical control/fumigation through the use of approved agrochemicals to control pests and rodents; the Zamfara SAPZ programme will ensure harvested produce is properly dried to about 13-14% moisture content to make them suitable for storage. ○ All storage rooms at the programme area will have proper ventilation and will be regularly inspected for defects e.g., roof leakages; ○ The farm managers will ensure the storage room and the surrounding environment is always kept clean and free from weeds; ○ Bags of produce will be properly arranged on pallets and the pallets will be arranged in rows with adequate spacing in between to ensure ease of cleaning the storage room and inspection of produce for rodents and insects; ○ The Zamfara SAPZ programme will ensure new produce from the farm/mill are not mixed with old produce in the storage room by storing the new produce at a different section in the storage room; ○ The aggregation centres managers will adopt “first in first out” practices to ensure that old produce is always sold first; ○ Any infested produce will be immediately removed and destroyed to prevent infestation of other produce; ○ Chemical treatment/fumigation, by using only EPA approved agrochemicals, will be used by The farm manager to control pest/rodents and diseases where necessary

	Processing Infrastructure development/Construction and/or upgrading of Agro-Industrial Hub infrastructure Transmission and distribution of electricity, Water supply system, Access Roads Site clearing and/or levelling, Compacting, Use of heavy equipment and hazardous materials Material Extraction, Slope stability/Excavation, cutting, and filling Hazardous materials storage and disposal, Waste management, Construction camp and crew set up	○ Environmental Impacts		
30		Air quality deterioration	Project affected communities, construction workers, farmers	○ Dust emissions from trucks, will be controlled and minimized by the use of designated routes in order to minimize impacts to residents, construction workers, port workers/users and institutions along the transport route. ○ Provide dust masks to workers; ○ Sprinkle water on the soil during excavation and land filling; ○ Control speed of working machinery; ○ The proposed road construction and road upgrade works will be done using mitigation and control techniques, such as standard dust suppression measures e.g. dampening of unpaved surfaces; ○ Ensure vehicular speed limits of 30mph over any unpaved landscape to minimise dust generation. Material dumping will be regulated to reduce dust emissions; ○ Owners / operators of construction equipment and vehicles will implement the manufacturer recommended engine maintenance programmes to minimize the emission of fumes into the environment; ○ The Contractor will monitor dust and remedial action will be taken whenever dust generating activities take place; ○ Dust-related grievances will be investigated and managed as part of the Grievance Redress Mechanism;
31		Vibration and noise nuisance	Workers/ Local communities and road users	○ The Contractor will employ standard noise abatement measures and engineering best practices to ensure that the impact of these issues is minimized and reduced to acceptable limits. ○ The Contractor will ensure that earthworks and other construction activities will be phased out or controlled to reduce noise generation during construction. ○ All equipment shall be operated and maintained in accordance with appropriate industry and equipment standards including specifications for noise levels and manufacturer's specifications (including regular

				checks and maintenance); ○ Machines in intermittent use shall be shut down in the intervening periods between works or throttled down to a minimum.
32		Loss of vegetation and impacts on flora and fauna	Flora and fauna, within access road and other infrastructure RoW	○ The construction works contractor will sensitize its machine operators to carry out vegetation clearance in sections and limit vegetation clearance to portions of the land to be developed. This is to allow fauna to migrate to adjoining bushes; ○ Insulate noisy machines and activities during construction to minimize noise impact to neighbouring communities ○ Unnecessary hooting is to be avoided as much as possible ○ Limit construction activities to designated areas; ○ Movement of crews and equipment within the rights-of-way and over routes provided for access to the work shall be performed in a manner to minimize damage to vegetation and fauna within the programme area. ○ Clearing of vegetation in sections by the contractor(s) will ensure only areas of the land to be developed at a particular time are exposed to agents of erosion. This will also ensure the cleared areas of the land are not left bare over long periods as development at the cleared areas will be carried out immediately. This will minimize erosion and sediment transport from the programme site.
		Surface and groundwater contamination/ impact on aquatic organisms	Streams, and Rivers	○ The Contractor(s) will immediately collect any excess excavated soils to minimize the potential for erosion into water bodies and such excess or unusable materials will be used to fill existing borrow pits; ○ The Contractor will ensure appropriate spill control measures are provided at the vehicle maintenance area and fuel storage areas to reduce the potential impact from spills.eg. sand buckets, cemented platforms, etc. These will include provision of bunds to contain spills, installation and servicing of fuel dispensers; ○ Workers will be trained on how to contain and manage spills; ○ Heaps of excavated soils suitable for reuse during construction will be utilized in the shortest possible time to minimize exposure; ○ Where the material is unsuitable for backfilling, it may be used to fill borrow pits or it will be disposed at an approved dump site.
		○ Social Impacts		
33		Obstruction of access ways to communities	Community members	○ The Contractor(s) will provide safe alternative access routes for access ways that are obstructed/destroyed during construction works; ○ The Contractor(s) will erect sign posts at vantage points to guide community members through safe alternative access ways during construction works.
		Influx of workers and migrants	Workers, public, neighbouring communities	○ The Zamfara SAPZ programme will implement a stakeholder engagement plan that will include: ○ Informing stakeholders of increases in workforce and potential for

			influx; ○ Engaging with local government/traditional authorities on issues, risks and opportunities regarding labour influx; ○ Engage local communities to understand their concerns, raise awareness of risks and opportunities, and identify solutions to issues relating to labour influx; ○ Developing feedback on grievance redress mechanism to collect any feedback or complaints related to labour influx associated with the programme; ○ The Zamfara SAPZ programme will also ensure the contractor(s), together with opinion leaders, traditional leaders, sensitise migrant workers on societal norms, taboos and other cultural practices in the area; ○ The Contractor will be mandated to submit for the approval of the Supervising Engineer a labour influx management plan which will include a social and cultural orientation plan.
34		Public Safety	○ The Contractor(s) will guard all excavations and trenches including borrow areas, canals and drains with caution tapes and safety nets; ○ The Contractor(s) will use warning signs at vantage points to indicate ongoing construction works ○ The Contractor(s) will enforce proper security at the programme site during construction works to limit entry of unauthorised persons to the programme site; ○ The Contractor will ensure that all haulage trucks comply with the approved speed limit of 50 km/hr within the communities along the haulage road ○ The Contractor should ensure that there are traffic wardens along haulage routes to assist pedestrians in crossing; ○ Movement of crews and equipment within the rights-of-way and over routes provided for access to the work shall be performed in a manner to minimize damage to land, crops or property.

		Road impacts & traffic issues	Road network, communities	○ Announcement and notification of work by the contractor. The communities must be informed at least seven days before start of work ○ Warning signs shall be provided at the junction on entering the programme area ○ Transport of materials (such as quarry products and concrete) will as much as possible be carried out during off-peak traffic hours to minimize the impact on traffic. ○ Speed limits of between 20-30 km/hour will be enforced along the route for all trucks; ○ Trucks transporting quarry products and other friable materials to the site will be covered ○ All temporary traffic controls will be done in consultation with , FRSC and the traffic Police; ○ The contractor shall ensure that all the vehicles to be used for the programme and especially in transporting equipment and materials will be serviced regularly and all the drivers to be engaged/ assigned would be required to hold the requisite driver's license as prescribed by the Licensing Authority. ○ In the event of an unfortunate incident of any truck failure, such truck will be towed within 24 hours; ○ The contractor will repair and maintain damaged sections of the road network due to construction activities ○ No vehicle shall be parked at unauthorized places to reduce the risk of accidents.
35		Occupational health & safety	Processing plant workers	○ The Contractor(s) will be mandated to adopt a Health & Safety Policy to guide the land preparation and construction activities; ○ The Contractor will ensure that only qualified machine operators with requisite skills and experience be employed to operate the machines; ○ The Contractor will ensure regular maintenance and servicing of its bulldozers, excavators and tractors as well as other machinery to ensure they are in good condition; ○ Good conditioned and well-maintained equipment will reduce frequent breakdowns, noise nuisance and smoke emissions which could affect the operator's and other workers' health and safety; ○ The Contractor will regularly carry out training on standard operational procedures; ○ Health & safety training will also be provided for machine operators and workers'; ○ The Contractor will provide first aid training for its workers and provide first aid kits at the programme site during land preparation and construction activities to treat minor ailments. However, major cases will be referred to the nearest hospital or health post; ○ The Contractor will also provide and enforce the use of appropriate Personal Protective Equipment (PPE) such as safety boots, reflective jackets, hand gloves, earplugs and nose masks;

				○ Sanctions will be implemented where workers do not use the PPEs provided; ○ Contractor will organise weekly toolbox meetings for workers and brief them on EHS issues and what to do to safeguard the environment and avoid accidents or injuries.
36		Waste generation and disposal	Soil, water bodies	○ The Contractor will ensure efficient use of construction materials to minimize the waste to be generated; ○ Excavated soil material will, as much as possible, be reused in construction; ○ The contractor(s) waste management plan should include disposal of excavated material and cleared vegetation, which cannot be re-used. This will be subject to approval by the engineering consultant; ○ The Contractor(s) will provide bins on site for collection and disposal of plastic waste and polythene materials such as lubricant containers, drinking water sachets and carrier bags which will be regularly emptied at approved dump site; ○ Workers will be sensitized to comply with the Waste Management Plan; ○ The contractor must promote waste avoidance; reduction; reuse and recycling as applicable; ○ Disposal of waste material shall be by proper waste disposal methods including burying, where burial of such materials is approved by the Engineer, or by removal from the construction area; ○ The contractor(s) will allow the neighbouring communities to collect the tree and shrub stems for use as poles, fuelwood and fencing material; ○ As much as possible, the twigs and leaves will be spread and ploughed into soil or allowed to decompose.
37		Sanitation issues and public health	Land, water bodies	○ The Contractor will provide temporary sanitation facilities at the programme site for use by the construction workers. ○ The workers will be educated against “free range” defecation; ○ The Contractor will provide adequate waste bins at the programme site to minimize indiscriminate disposal of plastic and polythene material, cans and food waste by workers. ○ These bins will be frequently emptied at approved dump sites to prevent littering with cans and bottles which could collect water and breed mosquitoes.

Table 6.4: Mitigation Measures for Significant Potential Adverse Impacts - Bani ga hannu ATC

S/N	Proposed Project Activities	Bani ga hannu ATC		
		Environmental Impacts	Key Receptors	Evaluation
1	• Enhanced Agricultural Production and Productivity in Proximity to Agro-Industrial Clusters • Development and operation of agricultural fields, • Construction of small dams, dykes and weirs	Deforestation in the process of land preparation for cropping	Flora, fauna	○ Trees should be planted in the open farm access roads; ○ The landscape should be permitted to regrow based on application of some control mechanism to prevent wildlife intrusion into residential and administrative quarters.
2		Alterations of local natural water cycles / Depletion of groundwater for irrigation purposes	Groundwater aquifer	○ Avoid conflicting water use through proper segmentation of water availability through the use of dedicated storages for farming purposes; ○ Pipe-borne water should be provided in the long term to all farmers;
3	• Site clearing and/or levelling, • Compacting, • Use of heavy equipment and hazardous materials • Material Extraction, Slope stability/Excavation, cutting, and filling • Hazardous materials storage and disposal, • Waste management, • Construction camp and crew set up	Soil quality degradation	Soil, fauna, water bodies	○ The farmers will be encouraged to adopt integrated weed and pest management practices for weed and pest control such as use of certified and disease tolerant seed varieties, use of early maturing seed varieties, proper land preparation, early planting, following recommended planting space between rows and plants, timely/early weeding, suitable water management practices and the use of agrochemicals where necessary. This will minimize the rate of agrochemical use; ○ The Zamfara SAPZ programme will encourage the use of diammonium phosphate fertilizer (DAP) as a nitrogen source to slow down acidification caused by fertilizers such as ammonium sulphate; ○ The Farmers will adopt minimum tillage during planting seasons to reduce the susceptibility of the soil to erosion and also hard pan formation associated with continuous ploughing at the same depth; ○ After harvesting, crop residue comprising process residue (straw, husks, skins, trimmings, cobs and bran of cereals) and field residue (stalks and stubble/stems, leaves of crops) will be tilled into the soil to improve the soil structure and soil organic matter content; ○ Farmers will utilise cover crops at erosion prone areas; ○ The Zamfara SAPZ programme will, preferentially, advise and train farmers on selective pesticides with low Environmental Impact Quotient (EIQ) where appropriate, rather than broad-spectrum products, to minimize impacts on non-target species.

4		Surface and ground water pollution	Water, aquatic life	○ The Contractor(s) will promptly collect any excess excavated soils to minimize the potential for erosion into water bodies and such excess or unusable materials will be used to fill existing borrow pits; ○ The Contractor will ensure appropriate spill control measures are provided at the vehicle maintenance area and fuel storage areas to reduce the potential impact from spills.eg. sand buckets, cemented platforms, etc. These will include provision of bunds to contain spills, installation and servicing of fuel dispensers; ○ Workers will be trained on how to contain and manage spills; ○ Heaps of excavated soils suitable for reuse during construction will be utilized in the shortest possible time to minimise exposure. Where the material is unsuitable for backfilling, it may be used to fill borrow pits or it will be disposed at an approved dump site.
5		Air pollution due to increased mechanized farming, vehicular movement and increased burning of biomass of cleared forest post-harvest waste	Air, workers, public	○ The Farm manager will incorporate the Air Quality Management Plan into standard operations. The plan will include the following: ○ dust from vehicular movement; ○ dust from burning of biomass; ○ exhaust emission from vehicles and machinery; ○ VOCs from fuel storage and dispensing areas; ○ noise from operation of machinery; ○ monitoring; ○ Regular maintenance of machinery/equipment in accordance with manufacturer specifications to ensure minimum levels of emission from the terminal operations.
6		Improper disposal of agricultural waste, fertilizer and chemical containers	Soil, water bodies	○ Residents should be advised to use appropriate waste dump sites and to stop indiscriminate waste dumping; ○ Official waste dump sites should be established and waste management operators should be contacted on the prompt clearing of waste deposited.
7		Pest and rodent infestation of matured crop	Matured crop, farmers, public	○ Develop a training programme for farmers especially on integrated pest management; ○ Field sanitation should be adequately maintained.
8		Noise and vibration;	Air, workers, neighbouring communities	○ Abate noise by regular maintenance of machineries; ○ Use manual labour as much as possible; ○ Restriction of activities to daytime; ○ Workers within the vicinity of high-level noise to be provided with adequate PPE; ○ No idling of machinery if not in use, they should be switched off; ○ Control speed and noise of construction machinery; ○ Insulate noisy machines and activities to minimize noise impact to neighbouring communities.

9	Impacts on water quality	Community members downstream users, soil	○ The Zamfara SAPZ programme and farmers will ensure that any pesticides used are manufactured, formulated, packaged, labelled, handled, stored, disposed of, and applied according to the FAO's International Code of Conduct on Pesticide Management; ○ The Zamfara SAPZ programme and farmers will ensure that pesticides that fall under the World Health Organization's (WHO) Recommended Classification of Pesticides by Hazard Classes 1a (extremely hazardous) and 1b (highly hazardous) are not purchased, stored or used; ○ The use of agrochemicals including, antibiotics herbicide and pesticides will be reduced as much as possible on proposed site; ○ Where possible, mechanical weed and pest control will be considered.
10	Fire risk	Farmers, public property, workers	○ Burning of wastes will not be utilised as a farm management practice; ○ Zamfara SAPZ programme prohibits burning wastes as a farm management practice and will ensure all programmes it supports comply with this directive; ○ The Zamfara SAPZ programme will educate all farmers and workers on potential causes of fire on the proposed site e.g., smoking, cooking and burning; ○ All farmers and workers will be trained on fire prevention and control. ○ The Zamfara SAPZ programme and farmers will ensure all equipment and machinery are regularly serviced and maintained.
	Social Impacts		
11	Land Use Rights	Farmers, Neighbouring communities	○ The Zamfara SAPZ programme will ensure that no loss of farmland is allowed.
12	Increasing demand for lands for farming;	Farmers, Neighbouring communities	○ The Zamfara SAPZ programme will ensure that no loss of farmland is allowed.
13	Loss of fallow and other agricultural land	Farmers	○ The Zamfara SAPZ programme will ensure that no loss of farmland is allowed.
14	Elimination of smallholder farmers	Farmers	○ The Zamfara SAPZ programme will ensure that no loss of farmland is allowed.

15		Occupational health & safety	Workers	○ The Farm manager should have a comprehensive health and safety policy; ○ Ensure there is compliance to various health and safety regulations; ○ Carry out regular risk assessments of the workplace; ○ Establish a standard code of practice for the programme workers including drivers and suppliers so as to promote safety of the public during the operation; ○ Install fully equipped first aid kits at strategic points at the working areas; ○ Ensure there is adequate sanitation facilities to be installed on sites; ○ Warning signs/bumps to be erected and/or placed at risky points; ○ There should be insurance covers for the workers under the workman's compensation Act; ○ Provide adequate emergency procedures for the facility staff; ○ Arrange regular emergency drills for staff ○ Install at strategic points enough firefighting equipment; ○ Appropriate PPEs such as gloves, nose masks, coveralls, goggles, safety boots, etc. will be provided for staff and farmers; ○ The use of PPEs will be enforced especially during the handling of agrochemicals such as during spraying of weedicides; ○ Safety procedures, particularly with the operation of machines and the handling and use of agrochemicals will be enforced by the SAPZ programme and sanctions applied when not adhered to; ○ Farm stores at different sections should be built to encourage farmers purchase approved chemicals and PPEs.
16		Increased spate of GBV due to the need and participation of more women	Farmers, women	○ Commitment / policy to cooperate with law enforcement agencies investigating perpetrators of gender-based violence; ○ Ensure a copy of the code of conduct is presented to all workers and signed by each worker; ○ Ensure workers are trained on the content of the code of conduct in English and local language; ○ Provide cultural sensitisation training to improve awareness and sensitivity of workers to local cultures, traditions and lifestyles; ○ Prohibit child and forced labour; ○ Establish and implement the GBV-GRM. ○ Engage competent security personnel; ○ Develop a clear SAPZ programme specific internal "Reporting and Response Protocol" to guide relevant stakeholders in case of GBV/SEA incidents; ○ Strengthen operational processes of SAPZ programme States programme area on GBV/SEA; ○ Identify development partners and cultivating pragmatic partnership on GBV/SEA prevention measures and referral services; ○ Provide financial support implementation of the GBV/SEA actions described herein, including training and awareness building for various stakeholders.
17		Conflicts over land and water use and plot	Farmers, Neighbouring	○ Sensitize the farmer on the new efficient farming techniques so that they can be fully involved in the transition process;

		allocation;	communities	○ Stakeholder consultation and involvement in decision making at all levels.
18		Sanitation issues and public health;	Soil, Water, Workers	○ The Farm managers will provide sanitation facilities at the programme site for use by the farmers; ○ The workers will be educated against "free range" defecation; ○ The farm managers will provide adequate waste bins at the programme site to minimise indiscriminate disposal of plastic and polythene material, cans and food waste by workers; ○ These wastes bins will be frequently emptied at approved dump sites to prevent littering with cans and bottles which could collect water and breed mosquitoes.
19		Impacts on Communities	Neighbouring communities	○ In order to ensure peaceful coexistence and prevent the incidence of conflicts, the Zamfara SAPZ programme together with Farm clusters leaders will continue to extensively consult the programme communities throughout the programme implementation to ensure their free, prior informed consent for programme developments.
20		Sustainability of the farming venture	Farmers	○ Well trained and experienced personnel will be employed by the Zamfara SAPZ programme to oversee the operations and effectiveness of the programme; ○ Efficient use of resources such as water, agrochemicals, etc. will be adopted by the Zamfara SAPZ programme and farmers to minimize economic losses; ○ The Zamfara SAPZ programme will ensure regular maintenance of the farm implements and machineries for higher efficiency; ○ Training will be regularly provided by the Zamfara SAPZ programme for farmers on improved agronomic practices; ○ The Zamfara SAPZ programme will ensure that farmers are provided with improved and certified seed varieties to enhance productivity; ○ The Zamfara SAPZ programme will ensure adequate machinery and inputs are available to ensure the agricultural activities is maintained and implemented successfully; ○ Proper marketing strategies will be put in place for farmers to be able to sell produce and reduce loss of revenue; ○ Drainage channels and canals will be regularly desilted and cleared of weeds to allow free flow of water; ○ The Zamfara SAPZ programme and value chain clusters will prepare an emergency response plan to cater for the flood and water pollution.
	Agro-Processing activities Crop processing Dealing with waste, Treatment technologies for wastes from processing	○ Environmental Impacts		
21		Noise and vibration	Air, workers, public	○ Provide workers with dust mask, ○ Milling plants will be sited away from residential areas; ○ Abate noise by regular maintenance of machineries; ○ Use manual labour as much as possible; ○ Restriction of activities to daytime; ○ Workers within the vicinity of high-level noise to be provided with adequate PPE; ○ No idling of machinery if not in use, they should be switched off;

				○ Control speed and noise of construction machinery; ○ Insulate noisy machines and activities to minimize noise impact to neighbouring communities.
22		Impact on air quality	Air, workers, public	○ Milling plants will be sited away from residential areas; ○ Provide dust masks to workers; ○ Abate dust by suppressants; ○ Control speed of working machinery.
		Fire Risk	Farmers, public property, workers	○ Burning wastes will not be utilised as a farm management practice; ○ The Zamfara SAPZ programme prohibits burning wastes as a farm management practice and will ensure all programmes it supports comply with this directive ○ The Zamfara SAPZ programme will educate all farmers and workers on potential causes of fire on the proposed site e.g., smoking, cooking and burning; ○ All farmers and workers will be trained on fire prevention and control; ○ The Zamfara SAPZ programme and farmers will ensure all equipment and machinery are regularly serviced and maintained;
24		○ Social Impacts		
25		Sustainability of the processing plant	Farmers, Workers	○ Well trained and experienced personnel will be employed by the Zamfara SAPZ programme to oversee the operations and effectiveness of the processing plant; ○ Efficient use of resources be adopted by the Zamfara SAPZ programme and farmers to minimize economic losses; ○ The Zamfara SAPZ programme will ensure regular maintenance of the machineries for higher efficiency; ○ Zamfara SAPZ programme will ensure adequate machinery and inputs are available to ensure the agricultural activities is maintained and implemented successfully; ○ Proper marketing strategies will be put in place for farmers to be able to sell produce and reduce loss of revenue; ○ Drainage channels and canals will be regularly desilted and cleared of weeds to allow free flow of water; ○ The Zamfara SAPZ programme and value chain clusters will prepare an emergency response plan to cater for the flood and water pollution.

26	Occupational health & safety	Processing plant workers	○ The plant operator should have a comprehensive health and safety policy; ○ Ensure there is compliance to various health and safety regulations; ○ Carry out regular risk assessments of the workplace; ○ Establish a standard code of practice for the programme workers including drivers and suppliers so as to promote safety of the public during the operation; ○ Install fully equipped first aid kits at strategic points at the working areas; ○ Ensure there is adequate sanitation facilities to be installed on sites; ○ Warning signs/bumps to be erected and/or placed at risky points; ○ There should be insurance covers for the workers under the workman's compensation Act; ○ Provide adequate emergency procedures for the facility staff; ○ Arrange regular emergency drills for staff -Install at strategic points enough firefighting equipment; ○ Appropriate PPEs such as gloves, nose masks, coveralls, goggles, safety boots, etc. will be provided for staff and farmers; ○ The use of PPEs will be enforced especially during the handling of agrochemicals such as during spraying of weedicides; ○ Safety procedures, particularly with the operation of machines and the handling and use of agrochemicals will be enforced by the SAPZ programme and sanctions applied when not adhered to; ○ Farm stores at different sections should be built to encourage farmers purchase approved chemicals and PPEs.
27	Sanitation issues and public health	Land, water bodies	○ The farm managers will provide sanitation facilities at the programme site for use by the farmers. ○ The workers will be educated against "free range" defecation; ○ The farm managers will provide adequate waste bins at the programme site to minimize indiscriminate disposal of plastic and polythene material, cans and food waste by workers. These bins will be frequently emptied at approved dump sites to prevent littering with cans and bottles which could collect water and breed mosquitoes.
28	Pest/rodent infestation and contamination of stored Produce	Stored Produce, farmers, public	○ Develop a training programme for farmers especially on integrated pest management; ○ Field sanitation should be adequately maintained;

29	Post-harvest losses	Farmers	○ The farm managers will adopt an integrated pest management system to control insects and rodent infestation. This will include: ○ Good housekeeping practices such as regular cleaning inside storage rooms and proper packing of produce for ease of inspection; ○ Keeping the surroundings of storage rooms clean and free from weeds; ○ Prevention of insects and rodents from entering storage rooms by regularly inspecting all doors, walls, windows and roof for any openings and repairing them; ○ Use of biological control, such as cats, to keep mice and other rodents from the storage rooms; ○ Use of rodent traps; ○ Chemical control/fumigation through the use of approved agrochemicals to control pests and rodents; ○ all storage rooms at the programme area will have proper ventilation and will be regularly inspected for defects e.g., roof leakages; ○ The Farm managers will ensure the storage room and the surrounding environment is always kept clean and free from weeds; ○ bags of Produce tuber and processed Produce will be properly arranged on pallets and the pallets will be arranged in rows with adequate spacing in between to ensure ease of cleaning the storage room and inspection of produce for rodents and insects; ○ The Zamfara SAPZ programme will ensure new produce from the farm/mill are not mixed with old produce in the storage room by storing the new produce at a different section in the storage room; ○ The aggregation centres managers will adopt "first in first out" practices to ensure that old produce is always sold first; ○ Any infested produce will be immediately removed and destroyed to prevent infestation of other produce; ○ Chemical treatment/fumigation, by using only EPA approved agrochemicals, will be used by The Farmmanager to control pest/rodents and diseases where necessary
• Processing	○ Environmental Impacts		

30	Infrastructure development/Construction and/or upgrading of Agro-Industrial Hub infrastructure • Transmission and distribution of electricity, • Water supply system, • Access Roads • Site clearing and/or levelling, • Compacting, • Use of heavy equipment and hazardous materials • Material Extraction, Slope stability/Excavation, cutting, and filling • Hazardous materials storage and disposal, • Waste management, • Construction camp and crew set up	Air quality deterioration	Project affected communities, construction workers, farmers	○ Dust emissions from trucks, will be controlled and minimized by the use of designated routes in order to minimize impacts to residents, construction workers, port workers/users and institutions along the transport route. ○ Provide dust masks to workers; ○ Sprinkle water on the soil during excavation and land filling; ○ Control speed of working machinery; ○ The proposed road construction and road upgrade works will be done using mitigation and control techniques, such as standard dust suppression measures e.g. dampening of unpaved surfaces; ○ Ensure vehicular speed limits of 30mph over any unpaved landscape to minimise dust generation. Material dumping will be regulated to reduce dust emissions; ○ Owners / operators of construction equipment and vehicles will implement the manufacturer recommended engine maintenance programmes to minimize the emission of fumes into the environment; ○ The Contractor will monitor dust and remedial action will be taken whenever dust generating activities take place; ○ Dust-related grievances will be investigated and managed as part of the Grievance Redress Mechanism;
31		Vibration and noise nuisance	Workers/ Local communities and road users	○ The Contractor should employ standard noise abatement measures and engineering best practices to ensure that the impact of these issues is minimized and reduced to acceptable limits. ○ The Contractor should ensure that earthworks and other construction activities will be phased out or controlled to reduce noise generation during construction. ○ All equipment shall be operated and maintained in accordance with appropriate industry and equipment standards including specifications for noise levels and manufacturer's specifications (including regular checks and maintenance); ○ Machines in intermittent use shall be shut down in the intervening periods between works or throttled down to a minimum.

32		Loss of vegetation and impacts on flora and fauna	Flora and fauna, within access road and other infrastructure RoW	○ The construction works contractor will sensitize its machine operators to carry out vegetation clearance in sections and limit vegetation clearance to portions of the land to be developed. This is to allow fauna to migrate to adjoining bushes; ○ Insulate noisy machines and activities during construction to minimize noise impact to neighbouring communities ○ Unnecessary hooting is to be avoided as much as possible ○ Limit construction activities to designated areas; ○ Movement of crews and equipment within the rights of-way and over routes provided for access to the work shall be performed in a manner to minimize damage to vegetation and fauna within the programme area. ○ Clearing of vegetation in sections by the contractor(s) will ensure only areas of the land to be developed at a particular time are exposed to agents of erosion. This will also ensure the cleared areas of the land are not left bare over long periods as development at the cleared areas will be carried out immediately. This will minimize erosion and sediment transport from the programme site.
		Surface and groundwater contamination/ impact on aquatic organisms	Streams, and Rivers	○ The Contractor(s) will immediately collect any excess excavated soils to minimize the potential for erosion into water bodies and such excess or unusable materials will be used to fill existing borrow pits; ○ The Contractor will ensure appropriate spill control measures are provided at the vehicle maintenance area and fuel storage areas to reduce the potential impact from spills.eg. sand buckets, cemented platforms, etc. These will include provision of bunds to contain spills, installation and servicing of fuel dispensers; ○ Workers will be trained on how to contain and manage spills; ○ Heaps of excavated soils suitable for reuse during construction will be utilized in the shortest possible time to minimize exposure; ○ Where the material is unsuitable for backfilling, it may be used to fill borrow pits or it will be disposed at an approved dump site.
		○ Social Impacts		
33		Obstruction of access ways to communities	Community members	○ The Contractor(s) will provide safe alternative access routes for access ways that are obstructed/destroyed during construction works; ○ The Contractor(s) will erect sign posts at vantage points to guide community members through safe alternative access ways during construction works.
		Influx of workers and migrants	Workers, public, neighbouring communities	○ The Zamfara SAPZ programme will implement a stakeholder engagement plan that will include: ○ Informing stakeholders of increases in workforce and potential for influx; ○ Engaging with local government/traditional authorities on issues, risks and opportunities regarding labour influx; ○ Engaging local communities to understand their concerns, raise awareness of risks and opportunities, and identify solutions to issues relating to labour influx; ○ Developing a feedback and grievance redress mechanism to collect any feedback or complaints related to labour influx associated with the programme;

				○ The Zamfara SAPZ programme will also ensure the contractor(s), together with opinion leaders, traditional leaders, sensitise migrant workers on societal norms, taboos and other cultural practices in the area; ○ The contractor will be mandated to submit for the approval of the Supervising Engineer a labour influx management plan which will include a social and cultural orientation plan.
34		Public safety		○ The Contractor(s) will guard all excavations and trenches including borrow areas, canals and drains with caution tapes and safety nets; ○ The Contractor(s) will use warning signs at vantage points to indicate ongoing construction works ○ The Contractor(s) will enforce proper security at the programme site during construction works to limit entry of unauthorised persons to the programme site; ○ The Contractor will ensure that all haulage trucks comply with the approved speed limit of 50 km/hr within the communities along the haulage road ○ The Contractor should ensure that there are traffic wardens along haulage routes to assist pedestrians in crossing; ○ Movement of crews and equipment within the rights-of-way and over routes provided for access to the work shall be performed in a manner to minimize damage to land, crops or property.
		Road impacts & traffic issues	Road network, communities	○ Announcement and notification of work by the contractor. The communities must be informed at least seven days before start of work ○ Warning signs shall be provided at the junction on entering the programme area ○ Transport of materials (such as quarry products and concrete) will as much as possible be carried out during off-peak traffic hours to minimise the impact on traffic. ○ Speed limits of between 20-30 km/hour will be enforced along the route for all trucks; ○ Trucks transporting quarry products and other friable materials to the site will be covered ○ All temporary traffic controls will be done in consultation with, FRSC and the traffic Police; ○ The contractor will ensure that all the vehicles to be used for the programme and especially in transporting equipment and materials will be serviced regularly and all the drivers to be engaged/ assigned would be required to hold the requisite driver's license as prescribed by the s Licensing Authority. ○ In the event of an unfortunate incident of any truck failure, such truck will be towed within 24 hours; ○ The contractor will repair and maintain damaged sections of the road network due to construction activities ○ No vehicle shall be parked at unauthorised places to reduce the risk of accidents.

35	Occupational health & safety	Processing plant workers	○ The Contractor(s) will be mandated to adopt a Health & Safety Policy to guide the land preparation and construction activities; ○ The Contractor will ensure that only qualified machine operators with requisite skills and experience be employed to operate the machines; ○ The Contractor will ensure regular maintenance and servicing of its bulldozers, excavators and tractors as well as other machinery to ensure they are in good condition; ○ Good conditioned and well-maintained equipment will reduce frequent breakdowns, noise nuisance and smoke emissions which could affect the operator's and other workers' health and safety; ○ The Contractor will regularly carry out training on standard operational procedures; ○ Health & safety training will also be provided for machine operators and workers'; ○ The Contractor will provide first aid training for its workers and provide first aid kits at the programme site during land preparation and construction activities to treat minor ailments. However, major cases will be referred to the nearest hospital or health post; ○ The Contractor will also provide and enforce the use of appropriate Personal Protective Equipment (PPE) such as safety boots, reflective jackets, hand gloves, earplugs and nose masks; ○ Sanctions will be implemented where workers do not use the PPEs provided; ○ Contractor will organise weekly toolbox meetings for workers and brief them on EHS issues and what to do to safeguard the environment and avoid accidents or injuries.
36	Waste generation and disposal	Soil, water bodies	○ The Contractor will ensure efficient use of construction materials to minimize the waste to be generated; ○ Excavated soil material will, as much as possible, be reused in construction; ○ The Contractor(s) waste management plan should include disposal of excavated material and cleared vegetation, which cannot be re-used. This will be subject to approval by the engineering consultant; ○ The Contractor(s) will provide bins on site for collection and disposal of plastic waste and polythene materials such as lubricant containers, drinking water sachets and carrier bags which will be regularly emptied at approved dump site; ○ Workers will be sensitized to comply with the Waste Management Plan; ○ The Contractor will promote waste avoidance; reduction; reuse and recycling as applicable; ○ Disposal of waste material shall be by burying, where burial of such materials is approved by the Engineer, or by removal from the construction area; ○ The Contractor(s) will allow the neighbouring communities to collect the tree and shrub stems for use as poles, fuelwood and fencing material; ○ As much as possible, the twigs and leaves will be spread and ploughed into soil or allowed to decompose.

37		Sanitation issues and public health	Land, water bodies	○ The contractor will provide temporary sanitation facilities at the programme site for use by the construction workers. ○ The workers will be educated against "free range" defecation; ○ The contractor will provide adequate waste bins at the programme site to minimise indiscriminate disposal of plastic and polythene material, cans and food waste by workers. ○ These wastes bins will be frequently emptied at approved dump sites to prevent littering with cans and bottles which could collect water and breed mosquitoes.

Table 6.5: Mitigation Measures for Significant Potential Adverse Impacts - Maru ATC

S/N	Proposed Project Activities	Maru ATC		
		Environmental Impacts	Key Receptors	Proposed Mitigation Measures
1	Enhanced Agricultural Production and Productivity in Proximity to Agro-Industrial Clusters	Increased Crop production and escalation of waste problem	Air, Water and land	○ Conversion of Crop production to biofuel; ○ Conversion of Crop production for use as farm manure; ○ Regular cleaning of the environment and tidiness of the surroundings; ○ Waste bins for Crop production should be placed at pivotal points within the facility for collection of Crop production waste; ○ Ensure timely disposal of Crop production waste and general environmental cleaning.
2		General waste management issues	Air, Water and land	○ The farm managers and farmers will provide adequate waste bins on the farm for the collection of plastic and polythene material such as drinking water sachets for proper disposal at approved dump sites; ○ Farmers will provide separate labelled bins on site for collection of agrochemical containers, foil seals, lids and fertilizer sacks for return to the suppliers for recycling/proper disposal, as per FAO guidelines; ○ Farmers will also be trained on handling empty agrochemical bottles/containers, triple-washing and puncturing prior to being stored in the separate labelled bins for returning to the suppliers. This will ensure they cannot be reused; ○ Farmers will ensure that bins containing used agrochemical containers are stored safely and are securely under cover prior to their safe disposal; they will not be used for other purposes.
3		Water pollution and negative effect on surrounding ecosystem;	Water aquatic life and humans	○ Minimization of waste water must be the principle governing programme activities ○ All grey water run-off or discharges should be contained and properly channelled away from water sources -Water containing cement, lime or concrete should not be discharged on site; ○ Wash areas should be placed in areas where there is no infiltration of waste water into the groundwater resources; ○ Pollution incidences on site should be acted upon speedily.
5		Impacts on water quality	Community members	○ The use of agrochemicals including, antibiotics herbicide and pesticides will be reduced as much as possible on proposed site;

			downstream users	○ Where possible, mechanical weed and pest control will be considered.
6		Depletion of groundwater due to increased extraction for Crop production management	Groundwater aquifer	○ Use metering methods to abstract water; ○ Develop a water monitoring strategy and a rota for water distribution; ○ Develop means of storing rainwater through proper rainwater harvesting modes; ○ Release pond wastewater into nearby wastewater drains with adequate dilution and dispersal capability; ○ Use shorter retention time in water ponds i.e. more frequent exchange and flushing of pond water; ○ Dilute pond water prior to release; ○ Consider using pond bottom sludge as agricultural fertilizer if properly decomposed and nontoxic.
		○ Social Impacts		
7		Sustainability of the Crop production farming venture	Water, Land, Public, Workers, farmers	○ Well trained and experienced personnel will be employed by the Zamfara SAPZ programme to oversee the operations and effectiveness of the programme; ○ Efficient use of resources such as water, agrochemicals, etc. will be adopted by the Zamfara SAPZ programme and farmers to minimize economic losses; ○ The Zamfara SAPZ programme will ensure regular maintenance of The Farm implements and machineries for higher efficiency ○ Training will be regularly provided by the Zamfara SAPZ programme for farmers on improved agronomic practices; ○ The Zamfara SAPZ programme will ensure that farmers are provided with improved and certified seed varieties to enhance productivity; ○ The Zamfara SAPZ programme will ensure adequate machinery and inputs are available to ensure the agricultural activities are maintained and implemented successfully; ○ Proper marketing strategies will be put in place for farmers to be able to sell produce and reduce loss of revenue; ○ Drainage channels and canals will be regularly desilted and cleared of weeds to allow free flow of water; ○ The Zamfara SAPZ programme and value chain clusters will prepare an emergency response plan to cater for the flood and water pollution.
8		Lack of space for proper rearing of crop production and farm	Farmers	○ Regular cleaning of the environment and tidiness of the surroundings; ○ Waste bins for Crop production should be placed at pivotal points within the facility for collection of Crop production waste; ○ Ensure timely disposal of waste in the cage and general environmental cleaning; ○ Control the number of crop production within a cage to curb overcrowding issues; ○ Crop production should be immunized based on their level of development.

9	Conflict with neighbours due to air pollution and improper disposal of waste	Air, Land, water bodies	○ Stakeholder consultation and involvement in decision making at all levels; ○ Regular cleaning of the environment and tidiness of the surroundings; ○ Waste bins for Crop production should be placed at pivotal points within the facility for collection of Crop production waste; ○ Ensure timely disposal of Crop production waste and general environmental cleaning.
10	Occupational health and safety;	Farmers	○ The farm manager will be mandated to adopt a Health & Safety Policy to guide the land preparation and construction activities; ○ The manager will ensure that only qualified machine operators with requisite skills and experience be employed to operate the machines; ○ The farm manager will ensure regular maintenance and servicing of its bulldozers, excavators and tractors as well as other machinery to ensure they are in good condition. ○ The farm manager will ensure that farm equipment is in good condition and is well-maintained to reduce frequent breakdowns, noise nuisance and smoke emissions which could affect the operator's and other workers' health and safety; ○ The farm manager will regularly carry out training on standard operational procedures. Health & safety training will also be provided for machine operators and workers; ○ The manager must provide first aid training for its workers and provide first aid kits at the programme site during land preparation and construction activities to treat minor ailments. However, major cases will be referred to the nearest hospital or health post; ○ The manager will also provide and enforce the use of appropriate Personal Protective Equipment (PPE) such as safety boots, reflective jackets, hand gloves, earplugs and nose masks. Sanctions will be implemented where workers do not use the PPEs provided; ○ The manager will organise weekly toolbox meetings for workers and brief them on EHS issues and what to do to safeguard the environment and avoid accidents or injuries.
11	Sanitation issues and public health;	Air, Land, water bodies	○ The manager will provide temporary sanitation facilities at the programme site for use by the construction workers; ○ The workers will be educated against "free range" defecation; ○ The manager will provide adequate waste bins at the programme site to minimize indiscriminate disposal of plastic and polythene material, cans and food waste by workers; ○ These bins will be frequently emptied at approved dump sites to prevent littering with cans and bottles which could collect water and breed mosquitoes.

12		Increased spate of GBV due to the need and participation of more women	Farmers, women	○ Commitment / policy to cooperate with law enforcement agencies investigating perpetrators of gender-based violence; ○ Ensure a copy of the code of conduct is presented to all workers and signed by each worker; ○ Ensure workers are trained on the content of the code of conduct in English and local language; ○ Provide cultural sensitisation training to improve awareness and sensitivity of workers to local cultures, traditions and lifestyles; ○ Prohibit child and forced labour; ○ Establish and implement the GBV-GRM.; ○ Engage competent security personnel; ○ Develop a clear SAPZ programme specific internal "Reporting and Response Protocol" to guide relevant stakeholders in case of GBV/SEA incidents; ○ Strengthen operational processes of SAPZ GBV/SEA programme in Zamfara State; ○ Identify development partners and cultivating pragmatic partnership on GBV/SEA prevention measures and referral services; ○ Provide financial support implementation of the GBV/SEA actions described herein, including training and awareness building for various stakeholders.
		Labour Influx leading to the transmission of diseases	Farmers, neighbouring communities	○ The Zamfara SAPZ programme will ensure the contractor(s), together with opinion leaders and traditional leaders, sensitise migrant workers on societal norms, taboos and other cultural practices in the area; ○ The Contractor shall submit for the approval of the Supervising Engineer a labour influx plan; ○ Implement awareness creation of eminent social evils such as COVID 19, HIV/AIDS and other STDs; ○ Organizing community sensitization drives on the prevention and management of the HIV/AIDS; ○ Liaising with the local NGOs and CBOs for the training and education on the right prevention mechanisms; ○ Contraceptives should be provided at acceptable locations;
	Agro-Processing activities Dealing with waste, Treatment technologies for wastes from processing	○ Environmental Impacts		
13		Impact on air quality	Air, workers, public	○ Provide dust masks to workers; ○ Control speed of working machinery.
14		Noise pollution	Air, workers, public	○ Abate noise by regular maintenance of machineries; ○ Use manual labour as much as possible; ○ Restriction of activities to daytime; ○ Workers within the vicinity of high-level noise to be provided with adequate PPE; ○ No idling of machinery if not in use, they should be switched off; ○ Control speed and noise of construction machinery; ○ Insulate noisy machines and activities to minimize noise impact to neighbouring communities.

15	Waste management	Soil, water bodies	○ Wastewater and waste products generated from Crop processing must be properly disposed. ○ Minimization of waste water must be the principle governing programme activities ○ All grey water run-off or discharges should be contained and properly channelled away from water sources. ○ Thefarmmanagers and farmers will provide adequate bins on The Farm for the collection of plastic and polythene material such as drinking water sachets for proper disposal at approved dump sites; ○ The farmers will provide separate labelled bins on site for collection of agrochemical containers, foil seals, lids and fertilizer sacks for return to the suppliers for recycling/proper disposal, as per FAO guidelines; ○ Farmers will also be trained on handling empty agrochemical bottles/containers, triple-washing and puncturing prior to being stored in the separate labelled bins for returning to the suppliers. This will ensure they cannot be reused; ○ Farmers will ensure that bins containing used agrochemical containers are stored safely and are securely under cover prior to their safe disposal; they will not be used for other purposes
16	Fire Risk	Farmers, public property, workers	○ Burning will not be employed as a farm management practice; ○ The Zamfara SAPZ programme prohibits burning as a farm management practice and will ensure all programmes it supports comply with this directive; ○ The Zamfara SAPZ programme will educate all farmers and workers on potential causes of fire on the proposed site e.g., smoking, cooking and burning; ○ All farmers and workers will be trained on fire prevention and control; ○ The Zamfara SAPZ programme and farmers will ensure all equipment and machinery are regularly serviced and maintained.
	○ Social Impacts		
17	Sustainability of the Crop processing plant	Farmers, Workers	○ Well-trained and experienced personnel will be employed by the Zamfara SAPZ programme to oversee the operations and effectiveness of the processing plant; ○ Efficient use of resources will be adopted by the Zamfara SAPZ programme and farmers to minimize economic losses; ○ The Zamfara SAPZ programme will ensure regular maintenance of the machineries for higher efficiency ○ The Zamfara SAPZ programme will ensure adequate machinery and inputs are available to ensure the agricultural activities is maintained and implemented successfully; ○ Proper marketing strategies will be put in place for farmers to be able to sell produce and reduce loss of revenue. ○ Drainage channels and canals will be regularly desilted and cleared of weeds to allow free flow of water; ○ The Zamfara SAPZ programme and value chain clusters will prepare an emergency response plan to cater for the flood and water pollution;
18	Occupational health & safety	Processing plant workers	○ The plant operator should have a comprehensive health and safety policy; ○ Ensure there is compliance to various health and safety regulations; ○ Carry out regular risk assessments of the workplace;

				○ Establish a standard code of practice for the programme workers including drivers and suppliers so as to promote safety of the public during the operation; ○ Install fully equipped first aid kits at strategic points at the working areas; ○ Ensure there is adequate sanitation facilities to be installed on sites; ○ Warning signs/bumps to be erected and/or placed at risky points; ○ There should be insurance covers for the workers under the workman's compensation Act; ○ Provide adequate emergency procedures for the facility staff; ○ Arrange regular emergency drills for staff and Install enough firefighting equipment at strategic points; ○ Appropriate PPEs such as gloves, nose masks, coveralls, goggles, safety boots, etc. will be provided for staff and farmers; ○ The use of PPEs will be enforced especially during the handling of agrochemicals such as during spraying of weedicides; ○ Safety procedures, particularly with the operation of machines and the handling and use of agrochemicals will be enforced by the SAPZ programme and sanctions applied when not adhered to; ○ Farm stores at different sections should be built to encourage farmers purchase approved chemicals and PPEs;
19		Post-harvest losses	Farmers	○ The farm managers will adopt an integrated pest management system to control insects and rodent infestation; ○ This will include: ○ good housekeeping practices such as regular cleaning inside storage rooms and proper packing of produce for ease of inspection; ○ keeping the surroundings of storage rooms clean and free from weeds; ○ preventing insects and rodents from entering storage rooms by regularly inspecting all doors, walls, windows and roof for any openings and repairing them; ○ use of biological control, such as cats, to keep mice and rodents from the storage rooms; ○ use of rodent traps; ○ Chemical control/fumigation through the use of approved agrochemicals to control pests and rodents; ○ Zamfara SAPZ programme will ensure the processed Crop production are frozen to standard; ○ All aggregation centre will have proper ventilation and will be regularly inspected for defects e.g. roof leakages; ○ The farm managers will adopt "first in first out" practices to ensure that old produce is always sold first; ○ Any infested Crop production will be immediately removed and destroyed to prevent infestation of other produce.

20		Waste generation and disposal	Soil, water bodies	○ The farm managers and farmers will provide adequate bins on the farm for the collection of plastic and polythene material such as drinking water sachets for proper disposal at approved dump sites; ○ The farmers will provide separate labelled bins on site for collection of agrochemical containers, foil seals, lids and fertilizer sacks for return to the suppliers for recycling/proper disposal, as per FAO guidelines; ○ Farmers will also be trained on handling empty agrochemical bottles/containers, triple-washing and puncturing prior to being stored in the separate labelled bins for returning to the suppliers. This will ensure they cannot be reused; ○ Farmers will ensure that bins containing used agrochemical containers are stored safely and are securely under cover prior to their safe disposal; they will not be used for other purposes
21		Sanitation issues and public health	Land, water bodies	○ The farm managers will provide sanitation facilities at the programme site for use by the farmers; ○ The workers will be educated against "free range" defecation; ○ The farm managers will provide adequate waste bins at the programme site to minimise indiscriminate disposal of plastic and polythene material, cans and food waste by workers; ○ These bins will be frequently emptied at approved dump sites to prevent littering with cans and bottles which could collect water and breed mosquitoes.
22		Pest/rodent infestation and contamination of stored Crop production	Stored Crop production, farmers, public	○ Develop a training programme for farmers especially on integrated pest management; ○ Field sanitation should be adequately maintained.
	Processing Infrastructure development/Construction and/or upgrading of Agro-Industrial Hub infrastructure Transmission and distribution of electricity, Water supply system, Access Roads Site clearing and/or levelling, Compacting, Use of heavy equipment and hazardous materials Material Extraction, Slope stability/Excavation, cutting, and filling Hazardous materials storage and disposal, Waste management,	Environmental Impacts		○
23		Air quality deterioration	Project affected communities, construction workers, farmers	○ Suppress dust emissions by appropriate methods such as spraying water on soil; ○ Ensure vehicles are in good working condition; ○ Ensure exhaust fumes from vehicles conform to applicable National standards and specifications.
24		Vibration and noise nuisance		○ Abate noise by regular maintenance of machineries; ○ Use manual labour as much as possible; ○ Restriction of activities to daytime; ○ Workers within the vicinity of high-level noise to be provided with adequate PPE; ○ No idling of machinery if not in use, they should be switched off; ○ Control speed and noise of construction machinery; ○ Insulate noisy machines and activities to minimize noise impact to neighbouring communities.
25		Loss of vegetation and impacts on flora and fauna	Flora and fauna, within access road and other infrastructure RoW.	• The construction works contractor will sensitize its machine operators to carry out vegetation clearance in sections and limit vegetation clearance to portions of the land to be developed; • This is to allow fauna to migrate to adjoining bushes; • Limit construction activities to designated areas; • Movement of crews and equipment within the rights-of-way and over routes

	Construction camp and crew set up			provided for access to the work shall be performed in a manner to minimize damage to vegetation and fauna within the programme area; • The clearing of vegetation in sections by the contractor(s) will ensure only areas of the land to be developed at a particular time are exposed to agents of erosion; • This will also ensure the cleared areas of the land are not left bare over long periods as development at the cleared areas will be carried out immediately; • This will minimize erosion and sediment transport from the programme site.
26		Surface water contamination/ impact on aquatic organisms	Streams, and Rivers	○ The Contractor(s) will immediately collect any excess excavated soils to minimize the potential for erosion into water bodies and such excess or unusable materials will be used to fill existing borrow pits; ○ The contractor will ensure appropriate spill control measures are provided at the vehicle maintenance area and fuel storage areas to reduce the potential impact from spills.eg. sand buckets, cemented platforms, etc. These will include provision of bunds to contain spills, installation and servicing of fuel dispensers; ○ Workers will be trained on how to contain and manage spills; ○ Heaps of excavated soils suitable for reuse during construction will be utilized in the shortest possible time to minimize exposure; ○ Where the material is unsuitable for backfilling, it may be used to fill borrow pits or it will be disposed at an approved dump site.
		Social Impacts		○
27		Risk of flooding	Farmers, Neighbouring communities,	○ Desilting of drainage channels; ○ Enlighten the populace on proper disposal of domestic waste; ○ Enhance proper handling and disposal of wastes (especially contaminated soil or water, concrete, demolition materials, oils, grease, lubricants, metals, etc.).
		Increase in Crime and insecurity issues	Neighbouring communities,	○ Engage competent security personnel; ○ Provide adequate training of security personnel; ○ Disclose site security arrangements to the Police and host communities.
28		Sanitation Issues	Neighbouring communities,	○ The Contractor will provide temporary sanitation facilities at the programme site for use by the construction workers. ○ The workers will be educated against “free range” defecation; ○ The Contractor will provide adequate waste bins at the programme site to minimize indiscriminate disposal of plastic and polythene material, cans and food waste by workers. ○ These bins will be frequently emptied at approved dump sites to prevent littering with cans and bottles which could collect water and breed mosquitoes.

29		Interference from local community causing disruptions to work	Farmers	○ Engage members of communities in stakeholder consultation throughout the Lifecycle of the programme; ○ Involve local community and opinion leaders in planning process; ○ To minimize the number of foreign workers being brought to the site, the contractor will be required to hire skilled/unskilled labour from local people if they wish to be hired.
		Labour influx and risk of disease transmission and disrespect to cultural norms	Neighbouring communities, contractor	○ The Zamfara SAPZ programme will ensure the contractor(s), together with opinion leaders and traditional leaders, sensitise migrant workers on societal norms, taboos and other cultural practices in the area; ○ The Contractor shall be required to submit for the approval of the Supervising Engineer a labour influx management plan which will include a social and cultural orientation plan.
30		Occupational health, safety and labour issues	Construction workers,	○ The Contractor(s) will be required to adopt a Health & Safety Policy to guide the land preparation and construction activities; ○ The Contractor will ensure that only qualified machine operators with requisite skills and experience be employed to operate the machines; ○ The Contractor will ensure regular maintenance and servicing of its bulldozers, excavators and tractors as well as other machinery to ensure they are in good condition; ○ Good conditioned and well-maintained equipment will reduce frequent breakdowns, noise nuisance and smoke emissions which could affect the operator's and other workers' health and safety; ○ The Contractor will regularly carry out training on standard operational procedures. Health & safety training will also be provided for machine operators and workers; ○ The Contractor will provide first aid training for its workers and provide first aid kits at the programme site during land preparation and construction activities to treat minor ailments. However, major cases will be referred to the nearest hospital or health post; ○ The Contractor will also provide and enforce the use of appropriate Personal Protective Equipment (PPE) such as safety boots, reflective jackets, hand gloves, earplugs and nose masks. Sanctions will be implemented where workers do not use the PPEs provided; ○ The Contractor will organise weekly toolbox meetings for workers and brief them on EHS issues and what to do to safeguard the environment and avoid accidents or injuries.

		Road rehabilitation and traffic impact	commercial and private vehicles	○ Announcement and notification of work by the contractor. The communities must be informed at least seven days before start of work ○ Warning signs shall be provided at the junction on entering the programme area ○ Transport of materials (such as quarry products and concrete) will as much as possible be carried out during off-peak traffic hours to minimise the impact on traffic. ○ Speed limits of between 20-30 km/hour will be enforced along the route for all trucks; ○ Trucks transporting quarry products and other friable materials to the site will be covered; ○ All temporary traffic controls will be done in consultation with, FRSC and the traffic Police; ○ The Contractor shall ensure that all the vehicles to be used for the programme and especially in transporting equipment and materials will be serviced regularly and all the drivers to be engaged/ assigned would be required to hold the requisite driver's license as prescribed by the Licensing Authority; ○ In an unfortunate incident of any truck failure, such trucks will be towed within 24 hours; ○ The Contractor will repair and maintain damaged sections of the road network due to construction activities. ○ No vehicle shall be parked at unauthorised places to reduce the risk of accidents.
31		Impact on cultural heritage	Neighbouring communities	○ Involve local community and opinion leaders in the programme planning process; ○ Develop an induction programme including a code of conduct for all workers; ○ Provide cultural sensitization training to improve awareness and sensitivity of workers to local cultures, traditions and lifestyles. (Implement the PCRMP); ○ Minimize disruption as a result of the relocation and removal of sacred sites; ○ Where possible, design or re-design programme components to avoid or minimize impacts to known physical-cultural heritage resources based on input from cultural heritage specialists; ○ Avoidance of shrines determined to be very important to the local community; ○ If shrines considered important to the local community cannot be avoided, consultation with the local community will occur to offer compensation for the loss of the cultural resource or to inquire about the possibility of relocating the resource; ○ Sensitize all workers on the restriction around Shrine; ○ Educational, awareness-raising and information programmes aimed at the general public in particular construction workers from other communities; ○ Identify and define the various elements of this intangible cultural heritage with the participation of communities and relevant non-governmental organizations; ○ Consultation with chief priest and community elders on the required compensation; ○ Adopt a general policy of respect aimed at promoting the function of these intangible cultural heritages and at integrating the safeguarding of such heritage into programme planning programmes. The impact on cultural artefacts will be further examined through the RAP study.

6.4 Climate Change and Green Growth

The SAPZ Programme has been screened and classified as a Category 2 operation in line with the Bank's Climate Safeguards Operation. This means that the Programme may be vulnerable to climate risks and, thus, will require the consideration of climate trends and identification of climate risk management, adaptation and or mitigation measures to be integrated in each component.

Capacity building programmes (Training of Trainers- ToT) on climate resilient agricultural extension services is embedded in the Component 2 to generate green jobs in the Programme's area of influence; while policies and projects that encourage climate smart agricultural adoption (especially agro-forestry and multiple cropping) and promote sustainable practices and technologies will be incentivized. To mitigate against all implementation challenges, an Agriculture Value Chain Expert / Climate Change Safeguards Officer will be included in the PSIUs in all the SAPZ States. Main climate change related risks in Programme area can be summarized as flooding, dry spells and drought.

For the Agro-industrial Hubs and the Agricultural Transformation Centres, resilience and adaptation measures in the preparatory/construction phase will include:

- Ensuring the development of climate-resilient enabling infrastructure and management: this can be achieved by ensuring the procurement of improved fuel efficiency of farm machinery, manage climate risk by improved design of key Programme assets to increase climate resilience and reduce climate hazard.
- The private sector participants in the programme will make provision for managing climate change risks to their operations through contingency budgets. Where possible, they will ensure high value vulnerable assets, and spread climate risk by diversification.
- Increase institutional capacity for responding to climate related damage. This is applicable to both the State, private sector and PIU.
- All recommended climate risk management measures and green growth opportunities will be included in the Programme is ESMS, ESMPs and ESIAs as applicable.

CHAPTER SEVEN

ENVIRONMENTAL AND SOCIAL MANAGEMENT AND MONITORING PLAN (ESMMP)

This chapter enlists and discusses the framework for the mitigation measures taken to address all the adverse impacts identified in chapter six. It also discusses the fundamentals of the environmental and social management plan. Furthermore, it outlines the institutional responsibilities and accountabilities that will ensure that all the provisions are implemented under strict supervision. In addition, the cost implication of monitoring all the identified areas was also outlined. More importantly, the mitigation measures outlined in this report are structured to curtail the potential adverse environmental and social impacts itemized in the previous chapters.

7.1 Description of the Proposed Environmental and Social Management and Monitoring Plan

For the proposed programme activities and their potential impacts, the management and monitoring mechanisms for both the programme implementation and mitigation measures to various impacts have been proffered. This can be found in annex VII.

7.2 Institutional Arrangements, Responsibilities and Accountabilities

The roles and responsibilities of the executor of the programme and adequate institutional arrangements are vital to the efficient execution of the environmental and social safeguard measures outlined in this ESMMP. Thus, details of the institutional arrangements and the roles and responsibilities of the diverse institutions in the implementation of the ESMMP are discussed and summarised in Table 7.1.

Table 7.1: Roles and Responsibility of Institutions in the implementation and monitoring of the ESMMP

S/N	Category	Roles & Responsibilities
1	Federal Ministry of Environment	Lead role - provision of advice on screening, scoping, review of draft ESMP report (in liaison with the Zamfara State Ministry of Environment), receiving comments from stakeholders, public hearing of the project proposals and social liability investigations, monitoring and evaluation process and criteria.
2	Zamfara State Ministry of Environment & Nat. Res.	• Environmental monitoring and compliance overseer at the State level; • Site assessment and monitoring of ESMP implementation. • Monitors ESMMP implementation particularly waste management and pollution control aspects
4	Federal Ministry of Agriculture and Food Security	Provision of overall leadership and direction to other MDAs by engaging all the critical stakeholders to support, cooperate with and participate in established policy direction for the SAPZ.
5	Zamfara State Ministry of Agriculture	Provision of all necessary information and support

6	Safeguard Unit	Environmental Safeguards: • Collate environmental baseline data on relevant environmental characteristics of the selected project sites. • Analyse potential community/individual sub-projects and their environmental impacts. • Ensure that project activities are implemented in accordance with best practices and guidelines set out in the ESMMP. • Identify and liaise with all stakeholders involved in environment related issues in the project; and be responsible for the overall monitoring of mitigation measures and the impacts of the project during implementation. • Social Safeguards: • Develop, coordinate and ensures the implementation of the social aspects of the ESMMP. • Identify and liaise with all stakeholders involved in social related issues in the project. • Conduct impact evaluation and beneficiary's assessment; and • Establish partnerships & liaise with organizations, CBOs and CSOs.
7	Other State MDAs	• Ensure monitoring of mitigation measures and the impacts of the project during implementation as it relates to gender and health issues respectively. • Establish partnerships & liaise with organizations relevant NGOs as well as CBOs and CSOs.
8	E&S Consultant	• Development of ESMP • Training of relevant AAU Staff, regulators, MDAs and contractor on ESMP implementation and monitoring. • Implementation of ESMP
9	Contractors	• Compliance with BOQ specification in procurement of material and construction; • Implement ESMP during project implementation; • Ensure all contractors and workers sign the Code of Conduct (CoC) and are routinely trained on the contents of the CoC; • Prepare C-ESMP for approval of FMEnv.; • Implement C-ESMP during project implementation; • Ensure that all construction personnel and subcontractors are trained on the content of the C-ESMP and are made aware of the required measures for environmental and social compliance and performance; • Prepare OHS manual and abide by labour laws as set out in the agreement; • Provide adequate basic amenities and PPEs to workers and ensure that the PPEs are worn by workers during works; • Prepare and maintain records and all required reporting data as stipulated by the ESMP, for submission to the Supervising Consultant.
10	LGAs	• Provision of oversight function across project within its jurisdiction for ESMP compliance; • Monitoring of activities related to public health, sanitation, waste management amongst others.
11	Host Communities	• Promote environmental awareness; • Review environmental and social performance report made available by project developer; • Provide comments, advice and/or complaints on issues of nonconformity; • Attend public meetings organized by the project developer to disseminate information and receive feedback.
12	NGOs/CSOs	• Assisting in their respective ways to ensure effective response actions, conducting scientific research alongside government groups to evolve and devise sustainable environmental strategies and techniques.

13	AfDB	• Provision of support to the Ministry of Environment in the area of safeguards due diligence. • Recommend additional measures for strengthening management framework and implementation performance; • Implementation support missions and ensuring that the SAPZ and its subprojects comply with the E&S conditions of the loan agreement with the AfDB
14	General Public	• Identify issues that could derail the project and support project impacts and mitigation measures.

7.3 Grievance Redress Mechanism (GRM)

The existing grievance redress mechanism in the project environment which empowers the Community Head and leadership to arbitrate over grievances will be enhanced using the AfDB approach. The AfDB's approach to resolving grievances on project interventions is described below:

7.3.1 AfDB Grievance Redress Mechanism Approach

The AfDB defines project GRM as a systematic process for receiving, evaluating and facilitating resolution of affected people's project-related concerns, complaints and grievances about the borrower's/client's social and environmental performance on a project. AfDB requires its clients to be aware of and respond to stakeholders' concerns that are related to the project in a timely manner. For this purpose, the programme will establish an effective grievance redress mechanism, process, or procedure to receive and facilitate resolution of stakeholders' concerns and grievances, in particular, about the client's E&S performance.

In OS1, as part of the ESAP, the Bank requires the borrower/client to establish a "credible, independent and empowered local grievance and redress mechanism to receive, facilitate and follow up on the resolution of the affected people's grievances and concerns regarding the E&S performance of the project. The local grievance redress mechanism needs to be sufficiently independent, empowered and accessible to the stakeholders at all times during project cycle and all responses to grievances shall be recorded and included in project supervision formats and reports." Some Bank's intervention may inevitably have the potential to impact the local population's well-being. The aim of a project GRM is, therefore, to enable people fearing or suffering adverse impacts to be able to be heard and assisted. People potentially or actually affected by a Bank-funded project need a trusted way to voice and resolve project related concerns and the project needs an effective way to address affected people's concerns. The GRM provides a structured and managed way of allowing the concerns of affected people to be heard and addressed, including by the borrower's/client's project management staff and in certain circumstances, by Bank staff.

The main advantages of establishing and maintaining an appropriate GRM linked to the Bank-funded project are:

- Helping maintain good development conditions in the field, conducive to harmonious, sustainable development;
- Minimising the risk of violent or otherwise destructive behaviours, and the associated economic and social costs;
- Helping to protect the most vulnerable local groups and individuals;

- Alleviating the risk of dispute or conflict escalation, such as cases being brought to the Bank's Independent Review Mechanism.

The process by which the GRM is designed should be integrated into the overall approach to the project preparation as prescribed in the Bank's ISS. The Bank ISS through its (IESIA) Guidelines Notes provides guidance on development and Implementation of GRM. It should also be included in the concrete actions required in the ESMP for Category 1 projects and, on a case-by-case basis, for Category 2 projects that exhibit specific potential social tensions, in particular risks of mismanagement of compensation/resettlement schemes or the presence of particularly vulnerable groups in the project's area of influence.

7.3.2 GRM at project level

The GRM in the Programme will be established under the guidance provided in the Bank's ISS through its IESIA Guidelines Notes. The first step is to determine the primary goal of the GRM which would generally be aimed to resolve specific grievances in a manner that meets both project management and community needs, but with important local variations. The scope of the grievances that may legitimately be brought forward by the communities and/or individuals affected shall be defined in advance. That scope will generally cover most, if not all, of the issues raised in a typical E&S Assessment: natural resources, pollution, cultural property, land acquisition, the income of resettled/displaced populations, the welfare of vulnerable groups, etc.

The second step is to design the GRM by:

- Preparing a preliminary design;
- Selecting ways and means to receive, register, assess and respond to grievances;
- Select grievance resolution approaches;
- Design a means to track and monitor grievances;
- Develop the grievance redress mechanism infrastructure;
- Review and refine the design.

At the project level, the design of GRM may be done with the assistance of the specialized Independent Consulting Team as part of the ESMP implementation. The GRM shall be designed based on the following principles:

- Involvement of individuals of mixed levels and functions from the entity (e.g., operations, environmental affairs, community relations, legal affairs, contractors). Staffing the design team from just one function such as community relations or human resources is unwise;
- The inclusion of a balanced group of representatives from the community, representing the range of constituencies and demographics that will be using the grievance redress mechanism, while keeping the team small enough to be responsive;

- GRM relying upon clear terms of reference and a work plan that outlines team goals, roles, and responsibilities, level of decision-making authority, reporting lines, tasks, time frame, and products;
- Making use of multiple channels (e.g., face to face, phone conversation, mail, text or e-mail, message on a dedicated website), sensitive to cultural customs and traditional methods that may influence or impede the expression of grievances;
- The existence of a central point of contact that will receive complaints and log them into a central register;
- Existence and operation of designated complaint resolution staff;
- Processes for acknowledging the receipt of a grievance and informing the complainant about the time frame in which a response can be expected.

7.3.3 Appointing members of Grievance Redress Committees (GRC)

The Programme will involve the formulation of a Grievance Redress Committee (GRC) at the project level, i.e., GRM staff for handling grievances. Generally, all project staff, the management staff of agencies involved in the project, and government administrators will take on grievance handling as a responsibility. The GRC members shall be qualified, experienced, and competent personnel who can win respect and confidence of the affected communities. It is also important to maintain a gender balance in constituting the GRC members. The criteria for selecting members of the GRCs shall include the following:

- Knowledge of the project, its objectives, and outcomes;
- Technical knowledge and expertise to understand project design and requirements;
- Understanding of the social, economic, and cultural environments and the dynamics of the communities;
- Capacity to absorb the issues dealt with and to contribute actively to decision-making processes;
- Social recognition and standing; and
- equitable representation of males and females.

Specifically, for the SAPZ implementation, the GRC at the project level shall constitute among other members:

- Director, Agric Department (Zamfara State Ministry of Agric.);
- Representatives from the 14 LGA (1 each);
- Village Heads;
- A Representative of Farmers Group;
- A Representative of Community Women;
- Youth Leader;
- a member from a recognized Non-Government Organization;

- SAPZ Liaison Officer from Zamfara State Ministry of Agric. (Secretary).

The GRC shall have the right to request the project technical staff and officers from relevant State or non-State institutions to attend the meetings and provide information. A complainant has the right to appear in person, to be accompanied by a community member, and/or to request to be represented by a community elder. GRCs shall be established at the project level to assure accessibility to Project Affected Persons.

7.3.4 Procedures, complaints channels and time frame for Grievance Redress Mechanism (GRM)

As there is no ideal model or one-size-fits-all approach to grievance resolution, the best solutions to conflicts are generally achieved through localized mechanisms that take into consideration the specific issues, cultural context, local customs, and project conditions and scale. The process by which a complaint will be accepted or rejected needs be carefully designed to maximize interactivity and cultural sensitivity. The acceptance/rejection of a complaint will go through a discussion stage where the plaintiff and the GRM staff interact on the grounds and motives of the complaint, after which the plaintiff will clearly and transparently be told whether or not the complaint is eligible and will be processed. The acceptance/rejection of the complaint shall be based on objective criteria that are posted by the GRC, including a written copy displayed in the public access area of the GRM in an appropriate language.

The processing of the complaint, if accepted should go through various phases:

- Filing of the complaint and labelling with an identification code communicated immediately to the plaintiff;
- Assessment of the complaint (including severity of the risk/impact);
- Formulation of the response;
- Selection of the grievance resolution approach is a key. There are four general approaches to choose from:
- The project's management proposes a solution;
- The community and the project's management decide together;
- The project's management and the community defer to a third party to decide;
- The project's management and the community utilize traditional or customary practices to reach a solution.

AfDB's ISS recommends the application of a "Decide together" approach that is usually the most accessible, natural and unthreatening ways for communities and a project's management to resolve differences. With the potential to resolve perhaps the majority of all grievances, "decide together" should be the centrepiece of any grievance mechanism's resolution options. In its simplest form, a grievance redress mechanism can be broken down into the following primary components:

- Receive and register a complaint;
- Screen and validate the complaint (based on the nature and type of a complaint);
- Formulate a response;

- Select a resolution approach, based on consultation with affected person/group;
- Implement the approach;
- Settle the issues;
- Track and evaluate results;
- Learn from the experience and communicate back to all parties involved.

The time for the Grievance Redress Committees to meet shall be agreed upon and documented, depending on the nature and severity of the complaint. A number of mechanisms will be available to aggrieved parties to seek redress. These shall include institutions specific (internal) to a project and set up from its inception or others that might have emerged over time in response to the needs identified while the project evolved. Other institutions which are already established within a country's judicial, administrative, and/or political systems and those existing outside a project shall also be used. These may include: government bureaucracy; judicial institutions; and political institutions such as Local Government Authorities, etc. In addition, the Bank itself sometimes may provide a forum for grievance redress. GRMs shall include avenues for resolving conflicts between affected persons or other stakeholders and can provide information sought by the public on the project. The channels of presenting complaints could include the presentation of complaints via third parties (e.g., village elites/traditional leaders, community-based organizations, lawyers, non-government organizations [NGOs], etc.); face-to-face meetings; facsimile, telephone, and email communications; written complaints; etc.

The projects to be implemented under this intervention will have diverse E&S contexts. It is therefore expected that as part of the implementation of these projects, the projects shall develop GRM which will foster simpler means of addressing complaints. If the complainant is not satisfied, the complainants will have to appeal to the Zamfara State SAPZ Project Implementation Unit.

7.3.5 The AfDB's Independent Review Mechanism (IRM)

The AfDB has also established its own accountability mechanism, the Independent Review Mechanism (IRM). The IRM seeks to assess whether a Bank approved project complies with the relevant AfDB's ISS. The IRM makes itself accessible to any group (a minimum of 2 persons living in the project's area of influence) actually or potentially negatively affected by a Bank-funded project. The IRM reports to the Bank's Board of Directors and is thus independent of Bank management.

The IRM was established by the Bank to achieve more transparency. It is also a costly mechanism to trigger. The establishment of local GRMs can help to alleviate the need for plaintiffs to resort to the IRM, while problem-solving can be more rapidly and cost-effectively done locally. The cultural context in which GRMs operate also helps to defuse complaints and to find appropriate and commensurate solutions

7.4 Training Programmes

Training is essential for ensuring that the ESMMP is implemented efficiently and effectively. It is therefore imperative that the Zamfara Ministry of Environment & Nat. Res., Ministry of Agriculture and Natural Resources and other institutions and

persons that have roles to play in the implementation of the ESMMP are equipped with appropriate education, training or experience.

It was revealed that most institutions with roles in the ESMMP are not very conversant with AfDB ISS as well as with some components of the ESMMP implementation with regards to gender-based issues, labour influx, climate change and grievance redress mechanisms. Consequently, the training programme presented in Table 7.2 have been proposed to enhance the capacities of those that will be involved in ESMMP implementation.

Table 7.2: Institutional Capacity Strengthening Plan

Capacity Building Activity	Proposed Topics	Objectives	Target Audience	Duration	Cost (Naira)
Module 1: AfDB's ISS and Nigeria Extant Laws on Environmental Protection	○ Introduction to E&S policies and laws in Nigeria ○ AfDB's ISS & OS ○ Operational Safeguards triggered by project activities. ○ The roles and responsibilities of regulators and the AfDB during project implementation	To enhance awareness of AfDB's OS and applicable national regulatory requirements for project activities	○ Zamfara State Min of Agric ○ Zamfara State Min of Env & Nat Res. ○ Zamfara State Sanitation and Env Protection Agency, ○ Zamfara State Min of Works, ○ Contractors, ○ FMEnv., ○ Representatives of 14 LGAs	1-day	1,000,000
Module 2: Training on Environmental and Social Management Plan (ESMP) Implementation	○ Overview of ESMMP ○ Potential Impacts of Project ○ Pollution & Control Measures ○ Environmental Management ○ Labour influx, GBV, Code of ○ Conduct, vulnerable people inclusion ○ Environmental ○ Performance Monitoring ○ Environmental Reporting	To enhance competence in environmental sustainability and regulatory practice	○ Zamfara State Min of Agric ○ Zamfara State Min of Env & Nat Res. ○ Zamfara State Sanitation and Env Protection Agency, ○ Zamfara State Min of Works, ○ Contractors, ○ FMEnv, ○ Representatives of 14 LGAs	1-day	1,000,000
Module 3: Climate Smart Agriculture	○ Introduction to climate change ○ Climate-smart strategies for crop production ○ Climate-smart crop production	To mainstream climate change adaptation strategies to enhance project sustainability.	○ Zamfara State Min of Agric ○ Zamfara State Min of Env. & Nat Res. ○ Zamfara State	1-day	1,000,000

	production systems o Creation of an enabling environment for climate-smart crop and crop production production		Sanitation and Env Protection Agency, o Zamfara State Min of Works, o Contractors, o FMEnv, o Representatives of 14 LGAs		
Module 4: Agricultural Waste Management	o Agricultural waste management o Agricultural waste recycling strategies o Composting o Biogas Production o Vermicomposting	To develop & implement eco-friendly and modern methods of crop production waste recycling to prevent environmental degradation and enhance profitability	o Zamfara State Min of Agric o Zamfara State Min of Env & Nat Res. o Zamfara State Sanitation and Env Protection Agency, o Zamfara State Min of Works, o Contractors, o FMEnv, o Representatives of 14 LGAs	1-day	1,000,000
Module 5: Training on Construction HSE	o Introduction to Construction HSE o Overview of Health and Safety Hazards in Construction o Incidents: Causation, Investigation & Reporting o Excavation Safety o First Aid, Defensive Driving etc. o Project/Site Specific OHS o Construction Site Inspection o Personal Protective Equipment	To ensure completion of project with zero fatalities, zero Lost Time Injuries (LTI) or occupational illness by promoting safe & healthy working conditions for workers and monitoring officers	o Zamfara State Min of Agric o Zamfara State Min of Env. & Nat Res. o Zamfara State Sanitation and Env Protection Agency, o Zamfara State Min of Works, o Representatives of 14 LGAs o Contractors, o FMEnv,	1-day	1,000,000
Total				5 days	5,000,000

7.5 Monitoring and Reporting

7.5.1 Monitoring Activities

The monitoring plan (Internal and External Monitoring) for the ESMP is presented in Table 7.3. Monitoring results shall be documented with preventive/corrective actions to be implemented.

Table 7.3: Internal and External Monitoring

Monitoring	Action	Responsibility	When	Deliverables
Internal Monitoring	Regular site visits to ensure that the mitigation measures and actions specified in the monitoring plan and as bound by the contract is satisfactorily implemented.	Environmental Safeguard Specialist from Zamfara State Implementing Unit. National Safeguards Unit	During Preconstruction, Construction and Operation Phases	Monitoring Reports and documentation
	Site visit for monitoring and inspection to ensure contractor adhere strictly to the engineering designs and specifications for the project	Supervision Consultants	During Construction Phase	Observations and Monitoring Reports to be compiled and presented to the Zamfara State Implementing Unit.
External Monitoring	Regular site visits to ensure project is implemented in an environmentally & socially sustainable manner using the monitoring indicators specified in the monitoring plan and other national and international environmental & social requirements	FMEnv, LGAs, Representatives of affected communities, and other relevant MDAs.	During Preconstruction, Construction and Operation Phases	Inspect monitoring reports from Safeguard units and provide feedback on observations. Enforce corrective actions where necessary.

7.5.2 Reporting Procedures

The Zamfara State Implementing Unit shall implement a system of continuous reporting between all parties involved in the ESIA implementation to ensure receipt of timely feedback and to take rapid corrective actions if there are issues of non-conformance.

7.6 Record Keeping and Control

The Contractor is under obligation to keep records providing evidence of ongoing mitigation activities. Such records may include site monitoring plan, HSE Policy, Site Specific HSE Plan, Waste Management Plan, Traffic Control Plan, Emergency response and preparedness procedures, site instructions, training records, complaints records, incident report, Inspection, maintenance and equipment calibration records. These documents should be made available to the Safeguard Unit upon request.

The Safeguard Unit is also required to keep records to provide evidence of monitoring activities and effectiveness of the monitoring plan. The Site Monitoring Plan identifies problems/corrective actions therefore monitoring reports are to be kept by the Safeguard Unit and made available to relevant regulators upon request. In addition, all significant communications with the FMEnv, Nigerian Society of Mining Engineers (NSME) and other relevant authorities should be documented and kept. These documents are required to track performance in order to achieve and demonstrate compliance with the monitoring plan and applicable regulatory requirements

7.7 Contractual Measures

Most of the mitigation measures are the obligations of the Contractor, particularly during the pre-construction and construction phases of the project. Consequently, the Contractor will have to prepare their proposals taking into account the measures in

Table 7.4 as well as the detailed general environmental management conditions that will surface during civil works attached as Annex I.

Table 7.4: Contractual Measures

Action	Remarks
The measures as described in this ESIA shall be included in the tender documents with appropriate flexibility to adjust these measures to site circumstances, and that the potential contractor will have to prepare their proposals taking into account these measures.	The non-inclusion of these measures in the proposal will lead to a disqualification of the proponent; The contract with the successful bidder should contain these environmental and social management measures as firm conditions to be complied with.
Specifically, the measures should be translated into a suite of environmental specification that are written in the same language style and format as the rest of the contract document	This approach will ensure that the environmental and social controls integrate seamlessly into the tender document and are presented in a familiar form to the Contractor
Cost of mitigation measures be added to the cost of the contractual document	The contactor must take into account and put the cost for the environmental and social requirements specified in the ESIA.

7.8 ESIA Disclosures

After a review and clearance by the FMEnv/AfDB, the ESIA will be disclosed at the FMEnv, SME and the host LGA offices as well as at the AfDB website. The purpose of this disclosures will be to inform stakeholders about the programme activities, impacts, anticipated and proposed environmental management actions as well as to obtain the certificate of conformity from the Federal Ministry of Environment. Minimum disclosure requirements for disclosure are shown in the Table 7.5 below.

Table 7.5: Disclosure Procedure to comply with Nigerian regulations

Action	Remarks
Disclosure on 2 national newspapers	The project proponent will disclose the ESIA as required by the Nigeria EIA public notice and review procedures. This entails advert in 2 newspapers: one national and one local (State) newspaper
Disclosure at the Zamfara Ministry of Environment & Nat. Res.	The project proponent will display the ESIA as required by the Nigeria EIA public notice and review procedures
Disclosure at the Zamfara Ministry of Agriculture and Natural Resources	The project proponent will display the ESIA as required by the Nigeria EIA public notice and review procedures
Disclosure at the respective LGA offices	The purpose will be to inform stakeholders about the project activities; environmental and social impacts anticipated and proposed environmental and social mitigation measures.

7.9 Implementation Schedule

An implementation schedule gives a clear-cut direction on the timeline for the implementation of stipulated mitigation measures. It is anticipated that each of the Stated measures will be time-based for quality implementation and appropriate monitoring. Table 7.6 presents the schedule for the mitigation measures with respective time lapse.

Table 7.6: Tentative ESIA Implementation Schedule

S/N	Activity	Mitigation Timeline (Monthly)											
		1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	11th	12th
1	Clearance and Formal Disclosure of ESIA												
2	Inclusion of Environmental & Social Requirements in Bid Docs												
3	Allocating Budget for ESIA												
4	Appointing Support Staff for ESIA												
5	Review& Approval of Contractor's ESIA, Waste & HSE Plan												
6	Finalization of Designs, studies and other preliminary												
7	Environmental and Social Training												
8	Mobilization to site												
9	Site Clearing and preparation												
10	Implementation of Mitigation												
11	Monitoring & Reporting on ESIA Implementation												
12	Environmental and Social Auditing												

7.10 ESIA Costing and Cost Analysis

The cost analysis illustrated here is structured to ensure that each of the identified mitigation measures is successfully and expertly implemented. It is designed exclusively identified for each of the activities and value chains in the Zamfara SAPZ programme. Hence, it covers the productivity, Agro-Processing and Small

infrastructure activities mitigation measures. In addition, the cost analysis is designed to reflect a global spread across the Stated measures. Table 7.7 illustrates the synoptic details of the ESIA costing for the Zamfara SAPZ programme.

Table 7.7: Cost Analysis of the Proposed Project ESIA Implementation

S/N	ESIA Activities (Monitoring)	Cost Estimate (N)
1	Impact Mitigation Monitoring	13,308,375
	Institutional Capacity Reinforcement Programmeme	5,000,000
Total for Mitigation Monitoring		18,308,375
	10% Contingency	1,830,837.5
Grand Total		20,139,212.5

CHAPTER EIGHT

PUBLIC CONSULTATION

8.1 Stakeholders Consultations

Stakeholders' participation during programme planning, design and implementation is widely recognized as an integral part of environmental and social impact assessment for programmes. It is a two-way flow of information and dialogue between programme proponents and stakeholders, which is specifically aimed at developing ideas that can help shape programme design, resolve conflicts at an early stage, assist in implementing solutions and monitor ongoing activities. Stakeholders' consultation is, thus, a process and continues throughout programme implementation period to provide information to identified stakeholders.

8.1.1 Objectives of Stakeholder Consultations

The main objective of the consultations with stakeholders was to discuss the proposed programme environmental and social implications and to identify alternatives for consideration. Specifically, the consultations sought to achieve the following objectives:

- to provide information about the proposed programme;
- to provide opportunities for stakeholders to discuss their opinions and concerns;
- to effectively communicate key programme information such as construction timelines and work schedules to stakeholders, particularly programme affected communities and persons;
- to provide and discuss with stakeholders the alternatives considered to reduce anticipated impacts;
- to identify and verify significance of environmental, social and health impacts;
- to establish a mechanism for receiving and addressing grievances in a timely manner; and
- to inform the process of developing appropriate mitigation and management options.
- Establish stakeholders perceptions, and their solicit participation for achieved benefits from the AfDB supported SAPZ project

8.1.2 Stakeholders Consulted

Project Proponent/Relevant MDAs:

- Zamfara State Ministry of Agriculture;
- Zamfara State Ministry of Environment & Nat. Res.;
- Zamfara State Agriculture Development Project;
- Zamfara State Ministry of Works
- International Fund for Development;

- Zamfara Fertilizer Company

Potential Project Beneficiaries:

- All farmers across the 14 LGAs in the state
- All communities across the 14 LGAs in the state

8.1.3.1 Outcome of Stakeholder Consultations

The minutes of the technical session with the stakeholders from the Ministry of Agriculture and other relevant ministries and parastatals is summarized in Table 8.1. The list of stakeholders across the value chains consulted and their contributions/concerns is presented in Table 8.2. Photos taken during and after consultations with the various stakeholders/institutions are outlined in Plate 8.1, while the attendance list can be found in the annex.

Table 8.1: Minutes of the technical session

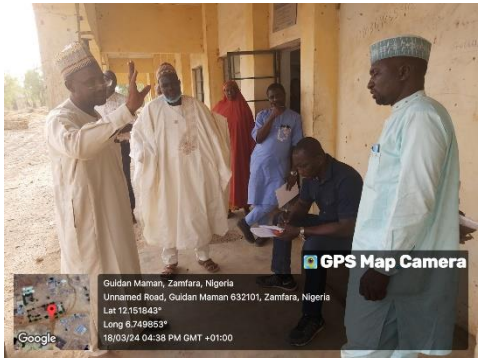
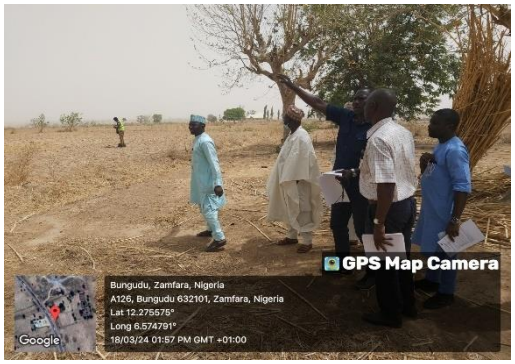
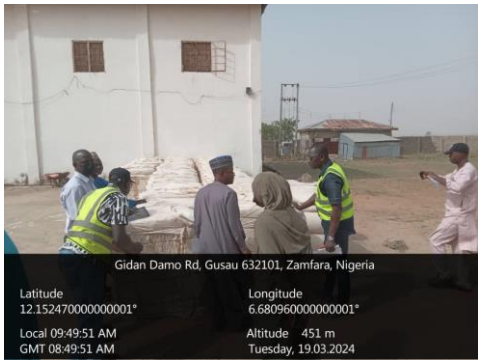
Date	**20/3/2024**
Venue	**THE FADAMA 3 Project Conference Room, Ministry Of Agriculture, Zamfara State**
In attendance	• Rep. Zamfara State Commissioner of Agriculture • Perm. Sec. Zamfara State Ministry of Agriculture • Chairman, Commodity Association • President, Zamfara state AFAM • Chairman, National cotton, maize, rice, soyabean, wheat farmers association representatives • Director, Zamfara state Planning & Statistics, • Representative of National identity corporation, • Director, Commodity & marketing board, • Chair-lady, women in agriculture, • Director of administration ministry of Agric, • Director, cotton production, • Head of Monitoring & evaluation • Consultancy Team
Language of Communication	English Hausa
ESIA Consultant Team Lead's Statement	• The team lead welcome everyone and stated that he is happy to have so many people around for the technical interaction as they will be helpful in providing some useful information that will make Zamfara to qualify for the SAPZ project. • He reiterated the objectives of the session which are to o identify and justify the priority value chains in the State o identify and justify the potential sites • He further said that in the course of the technical session that the major focus will be the comparative advantages Zamfara state has with regards to Agriculture. • He then urged everyone to contribute positively bearing in mind that the motive for the meeting is to make sure that Zamfara State qualifies for the SAPZ phase 2 project.
Consultant's presentation	The lead consultant gave a presentation about the proposed SAPZ project. Its highlights were; • Project overview (aims and objectives, component (ATC & AIH and their inter-relationship), relevance of infrastructure, advantages of the project, e.g. Job creation, information about phase 1 and proposed phase 2) • Funding arrangement. (AFDB, IFAD & Is DB) and loan amount. • Implementation Agencies, i.e. Federal Ministry of Agriculture and Federal Ministry of Finance. • Participating states for phase 1. (Cross-River, Imo, Kaduna, kano, Kwara, Ogun, Oyo & F.C.T)

	• A feasibility study is needed. The stakeholders' engagement meeting will deliberate on how to ensure that the state is qualified for selection for phase 2 of SAPZ by discussing her crops and produce that will support the hub sustainably. • Justification for adequate representation of critical stakeholders, including females, to secure necessary buy-in. (Representatives of Commissioner of Agric, permanent secretary, commodity association, (AFAM), National cotton, maize, rice, soyabean, wheat farmers association representatives, Director of Planning & Statistics, Representative of National identity corporation, Director of commodity & marketing board, chair-lady, women in agriculture, Director administration ministry of Agric, produce Director, Director cotton production, Head of Monitoring & evaluation etc. • The project's uniqueness (involvement of PPP as drivers and farmers as the primary source of raw materials). • The need for the state to provide an enabling environment to attract PPP to come in and invest, • Preparation of ESIA document to show that the project will not negatively impact the people. • Discuss risks that need to be noted, identify suitable locations for the project sites in the state, and the quantum of produce coming from such locations.
Reactions and Opinions	• Stakeholders were worried about past government failed promises on intervention-sometimes ago, government had organized similar stakeholders meeting with the intention to begin a new project to the state, unfortunately this does not happen. it made stakeholders to be weary to honor any government call. • The stakeholders reliably informed the meeting that the state has an existing organized farmers and private structure on ground, which would enhance the success of the project in the state. • Stakeholders were enjoined to continue to interface properly with the people mainstreaming the project in the state for proper guidance and correct information's from time to time. • There is need to disconnect SAPZ project from the past projects that had disappointed the people was emphasized. • The stakeholders re-assured the team of the state readiness to meet all eligibility criteria. • It was generally agreed that the coming of SAPZ in the state will leads to job creation that will tackle the problem of insecurity and fake agro-chemical dealers in the state.
Consultant's response and suggestions	• The ESIA TL thanked the stakeholders present for their contributions with a word of hope that the consultancy team will do their best to ensure that the State participate in the programme • He noted that all contributions will be documented and communicated to the SAPZ and necessary actions will be taken based on their contributions • He also noted that public consultation will be a continuous step throughout the life cycle of the programme and they may still be invited for consultations in the future
Closing Remarks	• The closing remark was given by Alh. ABDULAHI MUHAMMED AKUADA, Director CAPS Program. IFAD, Zamfara state. • The participants gave assurance of their cooperation and support to the programme. • The meeting was brought to a close after the photographic session.

Table 8.3: Stakeholders Consulted

Stakeholder/Institution/Location	Contact Person	Role	Contact No	Date	Concerns raised/information received
Project Implementers					
Zamfara State Ministry of Agriculture and				Jan-Mar 2024	Provided relevant information and documents on

Natural Resources					programme; Provided contact information, facilitated technical session. Facilitated stakeholder consultations and field investigations.
Zamfara Pilot Crop Production Development Program - YPLDP				Jan-Mar 2024	
Zamfara State Ministry of Environment & Nat. Res.			08069535952	Jan-Mar 2024	
Zamfara State Ministry of Works & Transport				Jan-Mar 2024	
Zamfara State Ministry of Youth			07037267075	Jan-Mar 2024	
Zamfara State Agriculture Development Project			08035949793	Jan-Mar 2024	
IFAD			08036478343	Jan-Mar 2024	
Zamfara state Agric Services				Jan-Mar 2024	
Zamfara State Fertilizer blending plant			08033824532	Jan-Mar 2024	
AFAM			07036037878	Jan-Mar 2024	

		 GPS Map Camera Guidan Maman, Zamfara, Nigeria Unnamed Road, Guidan Maman 632101, Zamfara, Nigeria Lat 12.151943° Long 6.749853° 18/03/24 04:38 PM GMT +01:00 Google
	 GPS Map Camera Bungudu, Zamfara, Nigeria A126, Bungudu 632101, Zamfara, Nigeria Lat 12.275676° Long 6.574791° 18/03/24 01:57 PM GMT +01:00 Google	 Gidan Damo Rd, Gusau 632101, Zamfara, Nigeria Latitude 12.152470000000001° Longitude 6.680960000000001° Local 09:49:51 AM GMT 08:49:51 AM Altitude 451 m Tuesday, 19.03.2024
		

ANNEXURE

ANNEX I: Questionnaire

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA)

QUESTIONNAIRE

ZAMFARA STATE SAPZ INTERVENTION PROGRAM

Dear Respondent,

Thank you for taking the time to complete the following survey. The purpose of this survey is to gain valuable insight on proposed intervention Zamfara State Special Agro-Industrial Processing Zones (SAPZ) program. This provides you the opportunity to contribute to the environmental and social components of the project implementation.

NOTE:

Please read each question carefully. Your answers are completely confidential and will be included only in summaries where individual answers cannot be identified. Unless otherwise instructed, please tick appropriate answer category that best describes your opinion. It will take approximately 20 minutes to complete this questionnaire.

SECTION A: Household data

1. Gender of Respondent: (a) Male (b) Female
2. Age: (a) Below 18 yrs (b) 18-45 yrs(c) 46-65 yrs(d) Above 66 yrs
3. Marital Status: (a) Single (b) Married (d) Divorced/Separated (e) Widowed
4. Occupation: (a) Famer (b) Daily Labourer (c) Trading & Shop Keeping (d) Artisans (e) Employed (salary) (f) Retired (g) Civil Servant (h) Unemployed (i) Others specify……
5. Residential Status: (a) Permanent Resident (b) Back Home (Returnee) (c) Non-Resident, Visiting
6. Ethnic Group: (a) Hausa-Fulani (b) Kanuri (c) Bade (d) Others ……
7. Religion: (a) Christianity (b) Islam (c) Traditional
8. Relationship to Household Head (HH): (a) Self (b) Spouse (c) Child (d) Parent (e) Other, specify…...
9. Size of the HH ……
10. How long have you been living in this area? (a) 0-2 yrs(b) 3-5 yrs(c) 6-9 yrs(d) 10 yrs and Above
11. Education: (a) NO formal education (b) Primary School (c) Secondary School (d) Tertiary (Excluding University) (e) University Graduate (f) University Post Graduate

SECTION B: Health Status

1. How do you manage your health conditions when sick? (a) Attend hospital/clinic(b) Buys drugs from nearby chemist (c) Traditional medicine (d) None(e) Others Specify…….
2. If you do attend hospital/clinic, when last did you visit one? (a) last six months (b) last one year (c) last five years (d) more than five years ago(e) Never visited one.
3. Please tick one or more of the under-mentioned ailment/sicknesses, you suffer from most accordingly?

Ailment		Ailment	
Whooping Cough		Rheumatism	
Tuberculosis		Rashes	
Asthma		Eczema	
Dysentery		Ringworm	
Diarrhoea		Eye pains	
Cholera		Cataract	
Pile		Glaucoma	
Hypertension		Typhoid fever	
Congestive health problem		Malaria	
Pneumonia		Sickle cell anaemia	
Sexually transmitted diseases		Epilepsy	

7. Do you think your health condition will be affected by the proposed intervention? (a) YES(b) NO

8. If yes, how? (a) Contamination of ground water (b) Contamination of surface water (c) Provide breading site for disease vectors(d) Noise/air pollution(e) Others, specify:……

9. Please suggest how this can be averted during construction and implementation…….

SECTION C. Standard of Living / Socio-Economic Activities

1.0 Assets

1.1 What sort of housing does your household live in?					
a. Construction material - Walls		Plastered mud	c. Number of rooms		1-2
		Cement blocks			3-4
		Other (specify)			Other (specify)
b. Construction material - roofing		Corrugated roofing	d. Other structures on plot		Animal Pen
		Aluminium			Granary
		Asbestos			Shops
		Tile			Kiosks
		Other (specify)			Other (specify)
e. Construction material - floor		Earthen			
		Concretes			
		Tiles			
		Other (specify)			
f. Toilet Facility		Pit latrine			
		Water closet			
		Toilet facility outside dwelling			
		Pier latrine			
		Other (specify)			
		None			
g. Tenure of housing		Owned			
		Rented			
		Occupied rent free			
		Other			
h.Tenure of land		Owned			
		Rented			
		Occupied rent free			
		Lease hold			
		Others specify			

1.2 Indicate household refuse disposal for solid waste? (Multiple options) (a) Depositing refuse at backyard of the house(b) Dumping in water body(c) Dumping in community refuse/garbage pit/dumpsite

(d) Burning after gathering together(e) Waste collector (f) Other specify……

2.0 Household Services

2.1 Rank in order of availability and usability the source(s) of lighting for the household? (please use 1, 2,...in hierarchical order with 1 indicating the most available and used source)

(a) PHCN	(b) Generator	(c) Lantern	(d) Candle	(e) Palm Oil Lamp	(f) Torchlight Battery	(g)Wood	(h) Kerosene	(i) Gas

2.2 Using the method in 2.1, indicate major source of energy for cooking?

(a) Fire Wood	(b) Coal	(c) Kerosene	(d) Electricity	(e) Animal dropping	(f) Gas	(g) Crop Residue/saw dust	Others

3.0 Sources of Water

	for drinking	for cooking	for bathing and washing
Well			
Borehole/Water pump			
Community tap			
Piped water outside dwelling			
River			
f. Rain harvesting			
g. Water vendor			
h. Tanked water			
Other (specify)			

4.0 Income

State your main income per month	N

4.1 Remittances

1. Does anyone in the family who lives elsewhere send money to you?	1	YES	2	NO
2. If yes, how much (per month)	N			

5. In your opinion, how has the standard of living of your household changed over the previous three years?

(a) Same (b) Better (c) Worse

6. Is the option in 5 propelled by the state of the environment? (a) YES (b) NO

7. If 6 is YES, do you think the proposed intervention will improve the situation?(a) YES (b) NO

8. If 7 is YES specify how the project will improve the situation ……

SECTION D: Gender-Based Violence/Sexual Exploitation and Abuse

1. Are there any provisions which restrict women's access to health and other social services? In particular which:

   (Please specify in the space provided for this purpose "yes" or "no")

   ( ) require the consent of a male relative/husband for a married woman's medical examination or treatment or access to contraceptives or abortion,

   ( ) require parental consent in case of adolescents' access to contraceptives or abortion;

   ( ) allow medical practitioners to refuse provision of a legal medical service on grounds of conscientious objection

   ( ) prohibit certain medical services, or require that they be authorized by a physician, even where no medical procedure is required; in particular:

   ( ) IUDs (intrauterine devices) or hormonal contraceptives

   ( ) Emergency contraceptives, including the morning-after pill,

   ( ) Sterilization on request;

   ( ) Early abortion (in first trimester of pregnancy) at the pregnant woman's request

   ( ) Medically assisted reproduction (e.g., in vitro fertilization)

2. Are the following acts criminalized?

   (Please specify in the space provided for this purpose "yes" or "no")

   ( ) transmission of HIV or other venereal diseases by women only

   ( ) female genital mutilation

   ( ) child marriage

   ( ) home births with an obstetrician or midwife

   ( ) abortion

3. Are the following acts criminalized?

   (Please specify in the space provided for this purpose "yes" or "no")

   ( ) adultery

   ( ) prostitution

   (If yes, who is criminally responsible – please circle the appropriate answer: the sex worker, the procurer and/or the customer)

   ( ) sexual orientation and gender identity (homosexuality, lesbianism, transgender, etc.)

   ( ) violations of modesty or indecent assault (e.g. not following dress code)

4. If yes, does it cover: (Please specify in the space provided for this purpose "yes" or "no")

( ) prevention of sexually transmitted diseases

( ) prevention of unwanted pregnancies

( ) promotion of a healthy lifestyle, including prevention of dietary disorders of teenage girls, including anorexia and bulimia

( ) psychological/psychiatric training on self-control of aggression, including sexual aggression

5. Are there any measures and programs undertaken in order to increase women's safety e.g. in public urban spaces, in public transportation, etc.?

YES() NO ()

6. Are there specific training programs for medical and legal professionals on the issue of gender-based discrimination in the area of health and safety?

YES() NO ()

7. Do they cover: (Please specify in the space provided for this purpose "yes" or "no")

( ) the issues connected with specific women's needs in area of health

( ) specific women's vulnerability to be victims of gender-based violence or specific crimes

( ) the nature of gender-based violence,

( ) its occurrences and symptoms

( ) methods of detection

( ) medical protocols

( ) influence of gender-based violence, in particular of sexual violence on the future behaviors of victims (post-traumatic stress symptoms etc.)

8. How do you ensure gender equity in the community?(a) Women are elected in public office (b) Females are given equal opportunity and access to education and employment (c) Quotas on genders are ensures in leadership of community-based organizations (d) Others specify……...

SECTION E: Resources/ Cultural Property

1. Please indicate the environmental problems which your settlement/community experiences? (a) Soil infertility (b) Poor drainage system (c) Bad Road (d) Bad lands (e) environmental degradation (f) Degraded land (i) Destruction of infrastructures (j) Others (specify) ……..

2. Please indicate the environmental problems which your settlement/community would likely experience and whose cause can be linked to the proposed intervention project during construction? (a) Soil infertility

(b) Poor drainage system (c) Bad Road (d) Low visibility (e) Erosion Problems (f) Flooding (g) Environmental degradation (h) Destruction of infrastructures (i) encroachment of land properties (j) Pollution (air, surface water, ground water, noise) (j) Others (specify) …….

3. Please indicate the environmental problems which your settlement/community would likely experience and whose cause can be linked to the proposed intervention project during operation? (a) Soil infertility

(b) Poor drainage system (c) Bad Road (d) Low visibility (e) Erosion Problems (f) Flooding

(g) Environmental degradation (h) Destruction of infrastructures (i) encroachment of land properties

(j) Pollution (air, surface water, ground water, noise) (k) Others (specify) …….

4. Do you think the proposed intervention project will affect any valued resource/cultural/archaeological property in your area? (a) YES (b) NO

5. If yes mention the name(s) of the valued resource/cultural/archaeological property ……

6. How will valued resource/cultural/archaeological property be affected? (a) Displacement of such valued cultural properties (b) Vandalisation of sacred items/locations (c) Possible theft of sacred/archaeological items (d) Others, specify: ……

SECTION F: Intervention Project Activities Impact Evaluation

Are you aware of the proposed intervention by SAPZ? (a) YES (b) NO

If yes, from which source (a) Community meetings (b) Media (TV, Radio, Newspaper, Internet)

(c) Others specify…….

Do you think the proposed intervention project can cause restiveness in your community?

(a) YES (b) NO

If 3 is yes how will the proposed intervention result in restiveness? (a) Disrespect of norms and cultureby contractors (b) loss of farmland / Property (c) Possible theft of sacred/archaeological items (d) local people not employed during construction (e) Others, specify: ……

5. How will the proposed intervention project impact on your livelihood and environment?

6. Can you name some of the animals and other habitat that may be affected by the proposed intervention project? ……

7. What do you expect from the activities of SAPZintervention? (a) employment of Locals during construction (b) compensation for those whose properties will be affected (c) capacity building for maintenance during implementation (d) community input into final engineering design (e) Others please specify……..

8. Are there any other issue(s) of concerned as regards theintervention project in your area, please state clearly?
……...……..

ANNEX II: GENERAL ENVIRONMENTAL MANAGEMENT CONDITIONS FOR CONSTRUCTION CONTRACTS/CIVIL WORKS

1. In addition to these general conditions, the Contractor shall comply with any specific Environmental and Social Management Plan (ESMP) for the works he is responsible for. The Contractor shall inform himself about such an ESMP, and prepare his work strategy and plan to fully take into account relevant provisions of that ESMP. If the Contractor fails to implement the approved ESMP after written instruction by the Supervising Engineer (SE) to fulfil his obligation within the requested time, the Owner reserves the right to arrange through the SE for execution of the missing action by a third party on account of the Contractor.

2. Notwithstanding the Contractor's obligation under the above clause, the Contractor shall implement all measures necessary to avoid undesirable adverse environmental and social impacts wherever possible, restore work sites to acceptable standards, and abide by any environmental performance requirements specified in an ESMP. In general, these measures shall include but not be limited to:

a) Minimize the effect of dust on the surrounding environment resulting from earth mixing sites, asphalt mixing sites, dispersing coal ashes, vibrating equipment, temporary access roads, etc. to ensure safety, health and the protection of workers and communities living in the vicinity of dust producing activities.

b) Ensure that noise levels emanating from machinery, vehicles and noisy construction activities (e.g., excavation, blasting) are kept at a minimum for the safety, health and protection of workers within the vicinity of high noise levels and nearby communities.

c) Ensure that existing water flow regimes in rivers, streams and other natural or irrigation channels is maintained and/or re-established where they are disrupted due to works being carried out.

d) Prevent bitumen, oils, lubricants and waste water used or produced during the execution of works from entering into rivers, streams, irrigation channels and other natural water bodies/reservoirs, and also ensure that stagnant water in uncovered borrow pits is treated in the best way to avoid creating possible breeding grounds for mosquitoes.

e) Prevent and minimize the impacts of quarrying, earth borrowing, piling and building of temporary construction camps and access roads on the biophysical environment including protected areas and arable lands; local communities and their settlements. In as much as possible restore/rehabilitate all sites to acceptable standards.

f) Upon discovery of ancient heritage, relics or anything that might or believed to be of archaeological or historical importance during the execution of works, immediately report such findings to the SE so that the appropriate authorities may be expeditiously contacted for fulfilment of the measures aimed at protecting such historical or archaeological resources.

g) Discourage construction workers from engaging in the exploitation of natural resources such as hunting, fishing, and collection of forest products or any other activity that might have a negative impact on the social and economic welfare of the local communities.

h) Implement soil erosion control measures in order to avoid surface run off and prevents siltation,

i) Ensure that garbage, sanitation and drinking water facilities are provided in construction worker scamps.

j) Ensure that, in as much as possible, local materials are used to avoid importation of foreign material and long-distance transportation.

k) Ensure public safety, and meet traffic safety requirements for the operation of work to avoid accidents.

3. The Contractor shall indicate the period within which he/she shall maintain status on site after completion of civil works to ensure that significant adverse impacts arising from such works have been appropriately addressed.

4. The Contractor shall adhere to the proposed activity implementation schedule and the monitoring plan / strategy to ensure effective feedback of monitoring information to project management so that impact management can be implemented properly, and if necessary, adapt to changing and unforeseen conditions.

5. Besides the regular inspection of the sites by the Supervising Engineer for adherence to the contract conditions and specifications, the Owner may appoint an Inspector to oversee the compliance with these environmental conditions and any proposed mitigation measures. State environmental authorities may carry out similar inspection duties. In all cases, as directed by the SE, the Contractor shall comply with directives from such inspectors to implement measures required to ensure the adequacy rehabilitation measures carried out on the bio-physical environment and compensation for socio-economic disruption resulting from implementation of any works.

6. All vessels (drums, containers, bags, etc.) containing oil/fuel/surfacing materials and other hazardous chemicals shall be bonded in order to contain spillage. All waste containers, litter and any other waste generated during the construction shall be collected and disposed-off at designated disposal sites in line with applicable government waste management regulations.

7. All drainage and effluent from storage areas, workshops and camp sites shall be captured and treated before being discharged into the drainage system in line with applicable government water pollution control regulations.

8. Used oil from maintenance shall be collected and disposed-off appropriately at designated sites or be reused or sold for re-use locally.

9. Entry of runoff to the site shall be restricted by constructing diversion channels or holding structures such as banks, drains, dams, etc. to reduce the potential of soil erosion and water pollution.

10. Construction waste shall not be left in stockpiles along the road, but removed and reused or disposed of on a daily basis.

11. If disposal sites for clean spoil are necessary, they shall be located in areas, approved by the SE, of low land use value and where they will not result in material being easily washed into drainage channels. Whenever possible, spoil materials should be placed in low-lying areas and should be compacted and planted with species indigenous to the locality.

12. The Contractor shall obtain appropriate licenses/permits from relevant authorities to operate quarries or borrow areas.

13. The location of quarries and borrow areas shall be subject to approval by relevant local and national authorities, including traditional authorities if the land on which the quarry or borrow areas fall in traditional land.

14. New extraction sites:

a) Shall not be located in the vicinity of settlement areas, cultural sites, wetlands or any other valued ecosystem component, or on high or steep ground or in areas of high scenic value, and shall not be located less than 1km from such areas.

b) Shall not be located adjacent to stream channels wherever possible to avoid siltation of river channels.

c) Where they are located near water sources, borrow pits and perimeter drains shall surround quarry sites.

d) Shall not be located in archaeological areas. Excavations in the vicinity of such areas shall proceed with great care and shall be done in the presence of government authorities having a mandate for their protection.

e) Shall not be located in forest reserves. However, where there are no other alternatives, permission shall be obtained from the appropriate authorities and an environmental impact study shall be conducted.

f) Shall be easily rehabilitated. Areas with minimal vegetation cover such as flat and bare ground, or areas covered with grass only or covered with shrubs less than 1.5m in height, are preferred.

g) Shall have clearly demarcated and marked boundaries to minimize vegetation clearing.

15. Vegetation clearing shall be restricted to the area required for safe operation of construction work. Vegetation clearing shall not be done more than two months in advance of operations.

16. Stockpile areas shall be located in areas where trees can act as buffers to prevent dust pollution. Perimeter drains shall be built around stockpile areas. Sediment and other pollutant traps shall be located at drainage exits from workings.

17. The Contractor shall deposit any excess material in accordance with the principles of these general conditions, and any applicable ESMP, in areas approved by local authorities and/or the SE.

18. Areas for depositing hazardous materials such as contaminated liquid and solid materials shall be approved by the SE and appropriate local and/or national authorities before the commencement of work. Use of existing, approved sites shall be preferred over the establishment of new sites.

19. To the extent practicable, the Contractor shall rehabilitate the site progressively so that the rate of rehabilitation is similar to the rate of construction.

20. Always remove and retain topsoil for subsequent rehabilitation. Soils shall not be stripped when they are wet as this can lead to soil compaction and loss of structure.

21. Topsoil shall not be stored in large heaps. Low mounds of no more than 1 to 2m high are recommended.

22. Re-vegetate stockpiles to protect the soil from erosion, discourage weeds and maintain an active population of beneficial soil microbes.

23. Locate stockpiles where they will not be disturbed by future construction activities.

24. To the extent practicable, reinState natural drainage patterns where they have been altered or impaired.

25. Remove toxic materials and dispose of them in designated sites. Backfill excavated areas with soils or overburden that is free of foreign material that could pollute groundwater and soil.

26. Identify potentially toxic overburden and screen with suitable material to prevent mobilization of toxins.

27. Ensure reshaped land is formed so as to be inherently stable, adequately drained and suitable for the desired long-term land use, and allow natural regeneration of vegetation.

28. Minimize the long-term visual impact by creating landforms that are compatible with the adjacent landscape.

29. Minimize erosion by wind and water both during and after the process of reinStatement.

30. Compacted surfaces shall be deep ripped to relieve compaction unless subsurface conditions dictate otherwise.

31. Re-vegetate with plant species that will control erosion, provide vegetative diversity and, through succession, contribute to a resilient ecosystem. The choice of plant species for rehabilitation shall be done in consultation with local research institutions, forest department and the local people. Water Resources Management

32. The Contractor shall at all costs avoid conflicting with water demands of local communities.

33. Abstraction of both surface and underground water shall only be done with the consultation of the local community and after obtaining a permit from the relevant Water Authority.

34. Abstraction of water from wetlands shall be avoided. Where necessary, authority has to be obtained from relevant authorities.

35. Temporary damming of streams and rivers shall be done in such a way avoids disrupting water supplies to communities downstream, and maintains the ecological balance of the river system.

36. No construction water containing spoils or site effluent, especially cement and oil, shall be allowed to flow into natural water drainage courses.

37. Wash water from washing out of equipment shall not be discharged into water courses or road drains.

38. Site spoils and temporary stockpiles shall be located away from the drainage system, and surface run off shall be directed away from stockpiles to prevent erosion.

39. Location of access roads/detours shall be done in consultation with the local community especially in important or sensitive environments. Access roads shall not traverse wetland areas.

40. Upon the completion of civil works, all access roads shall be ripped and rehabilitated.

41. Access roads shall be sprinkled with water at least five times a day in settled areas, and three times in unsettled areas, to suppress dust emissions.

42. Unusable materials and construction elements such as electro-mechanical equipment, pipes, accessories and demolished structures will be disposed of in a manner approved by the SE. The Contractor has to agree with the SE which elements are to be surrendered to the Client's premises, which will be recycled or reused, and which will be disposed of at approved landfill sites.

43. As far as possible, abandoned pipelines shall remain in place. Where for any reason no alternative alignment for the new pipeline is possible, the old pipes shall be safely removed and stored at a safe place to be agreed upon with the SE and the local authorities concerned.

44. AC-pipes as well as broken parts thereof have to be treated as hazardous material and disposed of as specified above.

45. Unsuitable and demolished elements shall be dismantled to a size fitting on ordinary trucks for transport.

46. In advance of the construction work, the Contractor shall mount an awareness and hygiene campaign. Workers and local residents shall be sensitized on health risks particularly of AIDS.

47. Adequate Road signs to warn pedestrians and motorists of construction activities, diversions, etc. shall be provided at appropriate points.

48. Construction vehicles shall not exceed maximum speed limit of 40km per hour.

49. Should the Contractor, deliberately or accidentally, damage private property, he shall repair the property to the owner's satisfaction and at his own cost. For each repair, the Contractor shall obtain from the owner a certificate that the damage has been made good satisfactorily in order to indemnify the Client from subsequent claims.

50. In cases where compensation for inconveniences, damage of crops etc. are claimed by the owner, the Client has to be informed by the Contractor through the SE. This compensation is in general settled under the responsibility of the Client before signing the Contract. In unforeseeable cases, the respective administrative entities of the Client will take care of compensation.

51. Within 6 weeks of signing the Contract, the Contractor shall prepare an EHS-MP to ensure the adequate management of the health, safety, environmental and social aspects of the works, including implementation of the requirements of these general conditions and any specific requirements of an EMP for the works.

The Contractor's EHS-MP will serve two main purposes:

- For the Contractor, for internal purposes, to ensure that all measures are in place for adequate HSE management, and as an operational manual for his staff.
- For the Client, supported where necessary by a SE, to ensure that the Contractor is fully prepared for the adequate management of the HSE aspects of the project, and as a basis for monitoring of the Contractor's HSE performance.

55. The Contractor's EHS-MP shall provide at least:

- A description of procedures and methods for complying with these general environmental management conditions, and any specific conditions specified in an EMP;
- A description of specific mitigation measures that will be implemented in order to minimize adverse impacts;
- A description of all planned monitoring activities (e.g. sediment discharges from borrow areas) and the reporting thereof; and
- The internal organizational, management and reporting mechanisms put in place for such.

56. The Contractor's EHS-MP will be reviewed and approved by the Client before start of the works. This review should demonstrate if the Contractor's EHS-MP covers all of the identified impacts, and has defined appropriate measures to counteract any potential impacts.

57. The Contractor shall prepare bi-weekly progress reports to the SE on compliance with these general conditions, the project EMP if any, and his own EHS-MP. An example format for a contractor HSE report is given below. It is expected that the Contractor's reports will include information on:

- HSE management actions/measures taken, including approvals sought from local or national authorities;
- Problems encountered in relation to HSE aspects (incidents, including delays, cost consequences, etc. as a result thereof);
- Lack of compliance with contract requirements on the part of the Contractor;
- Changes of assumptions, conditions, measures, designs and actual works in relation to HSE aspects; and
- Observations, concerns raised and/or decisions taken with regard to HSE management during site meetings.

58. It is advisable that reporting of significant HSE incidents be done "as soon as practicable". Such incident reporting shall therefore be done individually. Also, it is advisable that the Contractor keeps his own records on health, safety and welfare of persons, and damage to property. It is advisable to include such records, as well as copies of incident reports, as appendices to the bi-weekly reports. Example formats for an incident notification and detailed report are given below. Details of HSE performance will be reported to the Client through the SE's reports to the Client

59. The Contractor shall provide sufficient training to his own personnel to ensure that they are all aware of the relevant aspects of these general conditions, any project EMP, and his own EHSMP, and are able to fulfil their expected roles and functions. Specific training should be provided to those employees that have particular responsibilities associated with the implementation of the EHS-MP.

General topics should be:

- Occupational Health and Safety Basics
- Occupational Health and Safety in water supply pipeline installation
- Safety Practices in Borehole installation and Aquifer Abstraction
- Electrical Safety Basics
- Hazard Identification and Control
- Hazard Communication Programme
- Accident Investigation
- Asbestos Management
- Safe work Procedures
- Fall Protection

- Noise Management Programme
- Workers Respiratory Programme
- Work place Violence Management
- Fire Safety
- Emergency Management; and
- Social and cultural awareness

60. It is expected that compliance with these conditions is already part of standard good workmanship and State of the art as generally required under this Contract. The item "Compliance with Environmental Management Conditions" in the Bill of Quantities covers these costs. No other payments will be made to the Contractor for compliance with any request to avoid and/or mitigate an avoidable HSE impact.

Example Format: HSE Report

Contract:

Period of reporting:

HSE management actions/measures:

Summarize HSE management actions/measures taken during period of reporting, including planning and management activities (e.g. risk and impact assessments), HSE training, specific design and work measures taken, etc.

HSE incidents:

Report on any problems encountered in relation to HSE aspects, including its consequences (delays, costs) and corrective measures taken. Include relevant incident reports.

HSE compliance:

Report on compliance with Contract HSE conditions, including any cases of non-compliance.

Changes:

Report on any changes of assumptions, conditions, measures, designs and actual works in relation to HSE aspects.

Concerns and observations:

Report on any observations, concerns raised and/or decisions taken with regard to HSE management during site meetings and visits.

Signature (Name, Title Date):

Contractor's Representative

Example Format: HSE Incident Notification

Provide within 24 hrs to the Supervising Engineer

Originators Reference No:

Date of Incident: Time:

Location of incident:

Name of Person(s) involved: Employing Company:

Type of Incident:

Description of Incident:

Where, when, what, how, who, operation in progress at the time (only factual)

Immediate Action:

Immediate remedial action and actions taken to prevent reoccurrence or escalation

Signature (Name, Title, Date):

Contractor’s Representative

ANNEX III: OCCUPATIONAL HEALTH AND SAFETY (OHS) PLAN

INTRODUCTION

Every project poses its HSE risks. This plan was necessitated to meet up with OHS standards and to achieve the objectives set for the proposed project. The project team shall undertake to ensure high performance standards and conformity with contract requirements by managing the works in a systematic and thorough manner.

PROJECT DESCRIPTION

2.1 Purpose

The purpose of this document is to describe the Project Occupational Health and Safety (OHS) plan for the proposed road rehabilitation and construction and the specific management controls, risk control systems and workplace precautions required to ensure compliance with Occupational Health and Safety Laws and Standards.

2.2 HSE Objectives

The Objectives for this plan are to:

- Adopt a positive Health & Safety Culture.
- Adopt the principles of prevention to avoid risk.
- Complete the project without incident (Zero fatalities, Zero Lost Time Injury (LTI) or occupational illness).

2.3 Scope of Work

The Project Occupational Health and Safety (OHS) plan covers the scope of works defined in the contract. This includes Preconstruction, Construction, Operation & Maintenance and Decommissioning phases.

2.4 Policy Statement

In addition to the existing HSE policy, other policies shall be developed which includes:

- Substance Abuse Policy – Prohibiting the consumption or possession of narcotics, drugs, alcohol and other banned substances
- Emergency Response Policy – Stating commitment to ensure adequate resources and arrangement are in place in the case an emergency.
- Community Affairs Policy – Stating commitment to foster healthy relationships with communities through observance of the highest standard of conduct.
- Road Safety Policy–Stating commitment to complying with Road Traffic regulations and continuously improving its road safety performance by implementing a Road Safety Management Plan (RSMP)

KEY RESPONSIBILITIES

Involvement of all in implementing, maintaining and continually improving OHS processes is the key to successful completion and achievement of quality objectives set by the management. All project personnel shall therefore be required to be familiar with the content of this OHS plan and shall participate in implementing, maintaining and improving the management system. It is the responsibility of the project manager and all key personnel to ensure that the requirements for quality are fulfilled for works under their responsibility. All new staff and staff who are given new responsibilities are to be inducted into the requirements set out in this plan in general and into their function and responsibilities in particular.

3.1 Project Manager Responsibilities

- Set good example in HSE issues.

- Ensure the availability of resources essential to establish, implement, maintain and improve the OHS Management System.
- Define, document and communicate roles, allocate responsibilities and accountabilities, delegating authorities, to facilitate effective OHS management.
- Ensure that all of the activities undertaken in the Project conform to Nigerian legislation, client requirements or international standards when applicable.
- Review objectives achievements throughout the year.

3.2 Project Supervisors Responsibilities

- Enforcing all phases of the established HSE plan.
- Set good example in HSE issues.
- Preparing Job Hazard Analysis when required.
- Ensuring the safety of all workers associated with the site.
- Conducting HSE inspections.
- Ensuring workers are competent for their allocated tasks.
- Attending and participating in HSE meetings.
- Participating in accident investigations.

3.3 HSE Manager/Supervisor Responsibilities

- Prepare relevant OHS documentation and procedures.
- Monitor the efficient implementation of OHS requirements.
- Participate and organize the OHS risk assessments.
- Advise management of compliance and of conditions requiring attention.
- Conduct regular HSE inspections.
- Make thorough analysis of statistical data and inspections; delineates problem areas; and makes recommendation for solutions.
- Take part in the review of all OHS incidents and assist in investigating incident.
- Monitor the efficient implementation of the Project's OHS requirements.
- Organize the Project's OHS risk assessment exercises.
- Check on the use of all types of personal protective equipment specifies the use of appropriate PPE for the various work activities. Evaluates their effectiveness and suggests improvements where indicated.

3.4 HSE Advisor Responsibilities

- Check on the use of all types of personal protective equipment specifies the use of appropriate PPE for the various work activities. Evaluates their effectiveness and suggests improvements.
- Conduct independent inspections to observe conformance with established OHS Plan and determines the effectiveness of individual elements of the plan (pre-task briefing, weekly toolbox talk, etc)
- Establish contact with Subcontractors with the objective of maintaining good relations and coordination of accident prevention activities and compliance with the established OHS plan.

- Correct unsafe acts and unsafe conditions.
- Deliver HSE induction/orientation course to all employees, including subcontractors.
- Deliver HSE awareness course and toolbox talk.
- Advise employees on OHS matters.

3.5 All employees' responsibilities

- Take all reasonable and practical steps to care for their own health and safety and avoid affecting the health and safety of co-workers and the general public.
- Follow all instructions and use the equipment properly
- Not interfere with any safety arrangements.
- Report any circumstances which may not comply with the project's OHS management system.

4.0 Competency

All personnel required to operate or work with any equipment or machine must be competent, be tested for each equipment that he/she shall be operating. All personnel who as part of their profession require licensing or certification must obtain the necessary certification before he/she shall be allowed to work on the site.

Fitness

All personnel working on site shall be required to be certified medically fit to do so by an approved medical facility or Medical Doctor (pre-employment medical examination).

6.0 HSE Training

6.1 Induction/Orientation

Every new or rehired employee and Subcontractors employees must undergo mandatory OHS orientation / induction. The purpose of the Induction is to educate workers and make them aware of the major potential hazards he or she shall come into contact with while working on the site; also, it is one more opportunity to stress the importance of HSE being the first priority in the operations. The content of the HSE orientation / induction shall cover the following subjects:

- Site safety rules.
- Personnel protective equipment requirements (PPE).
- Environmental sensitivity and protection.
- Preparation and planning of the job (Daily Pre-task talk).
- Emergency plan and muster points.

6.2 Project Specific HSE Training

In addition to the HSE orientation /induction, there shall be specific site HSE trainings which shall cover the following topics:

Manual handling.

Electrical Safety

Emergency Prevention, Preparedness and Response

Work at height training

First Aid training (for site First Aiders)

Lifting and Rigging

Safe Driving techniques (for drivers)

7.0 Hazard identification & HSE risk assessment

7.1 Project HSE Risk Assessment

The project HSE risk assessment shall be developed and recorded. The Project's HSE risk assessment shall be conducted by a team consisting of HSE Manager/ Supervisor and technical managers/supervisors. It must be approved by the Project manager.

7.2 Fire Risk Assessment

A fire risk assessment shall be developed and recorded. A fire safety plan shall be in place in the site.

7.3 Job Hazard Analysis

Job hazard analysis is required when the hazards and risks associated with a specific task is to be identified so as to implement control measures. The HSE department together with the technical managers/supervisors shall develop a job hazard analysis when applicable.

8.0 EMERGENCY PREPAREDNESS AND RESPONSE

Emergency procedures and evacuation plan shall be developed by the HSE Department and displayed on the notice board. These procedures shall be communicated to all staff. Also, each section/department shall have at least a trained first aider at all times.

9.0 HSE IMPLEMENTATION AND PERFORMANCE MONITORING

9.1 HSE Meetings

HSE management meetings shall be held once a month. The meeting is to help identify safety problems, develop solutions, review incident reports, provide training and evaluate the effectiveness of our safety programme. Some of the meetings shall be:

- Project/Site Management HSE Meeting for management and supervision (Monthly);

Tool box talk meetings for all workforce (Weekly);

Pre-task briefing for all workforces (Daily);

Special situation meeting (As required).

9.2 HSE Reporting

All incidents and illnesses must be reported to the Site Supervisor after which investigation shall commence and recorded so that appropriate corrective actions shall be implemented to prevent any re-occurrence and report findings shall be forwarded to management for review. Reporting requirements shall include notification of incident, investigation report, and monthly report. Notification of Incident form shall be developed which shall be filled and submitted to HSE department for investigation.

9.3 HSE Inspection and Audits

For continual improvement of HSE management system, HSE inspection and audit shall be conducted. An inspection checklist shall be developed. This is to ensure that the HSE management system is being adhered to. The inspection shall be conducted by the HSE department together with site management.

9.4 Corrective and Preventive Actions and Non-Conformities

During the cause of inspections, concerns raised shall be addressed and closed out. It is expected that within a period of two weeks, a close out inspection shall take place to verify that the corrective actions have been closed.

10.0 Project HSE Rules

The project HSE rules shall be developed and supervision shall develop specific rules and procedures when necessary. The following site rules shall be implemented at all times. The Site Manager shall draw these rules to the attention of their own workmen or staff. All sub-contractors must ensure that these rules are drawn to the attention of their workmen and staff. The Principal Contractor may implement additional site rules during the contract programme. Any such additional rules shall be notified to all personnel engaged on the project prior to their implementation. The HSE rules shall include but not limited to:

1. Personal Protective Equipment must be worn at all times;
2. All instructions issued by the Site Manager regarding the storage, handling or cleaning of materials, plant and equipment must be followed;
3. All vehicles must be parked in the designated areas;
4. Any workman suffering from a medical condition that might affect his work and/or that could require specific medical treatment must inform the supervisor before commencing work;
5. All site tools shall either be battery operated or at 110 volts operated;
6. No one shall be permitted on site if it is believed that they are under the influence of alcohol or drugs;
7. Vehicles must not reverse without a banksman in attendance;
8. All visitors to site must undergo a site-specific induction and operative Identity badges must be worn at all times;
9. All excavations must be secured;
10. Smoking and eating shall only be permitted in the designated area. This area shall be identified during induction;
11. All food and drink vendors on site shall be registered;
12. The variant of food and drink to be sold in the sites must be approved by the HSE officer;
13. No hot works operations are permitted without a hot work permit in place;
14. There shall be no radios or other music playing devices on site;
15. Good housekeeping practices to be adopted;
16. Compliance with all Ethical Power Permit to Work systems;
17. The site keyed access procedure must be strictly adhered to;
18. All Contractors must comply with Site Health & Safety Guidelines / Site Safety Method Statement;
19. No untrained worker shall be permitted to operate heavy machineries.

11.0 SAFE WORK PRACTICES

Implementing safe work practices is one of the keys to achieving our HSE objectives and some of these safe work practices include:

11.1 Personal Protective Equipment (PPE)

The basic PPE required for the project shall be Safety Glasses, Safety Boots, Hand Gloves, Hard Hat and Coverall. Any other PPE shall be used as applicable. Management is responsible for the provision of PPE and usage shall be enforced at all time. PPE shall be provided in circumstances where exposure to hazards cannot be avoided by other means or to supplement existing control measures identified by a risk assessment. An assessment shall be made to ensure that the PPE is suitable for purpose and is appropriate to the risk involved. Information, instruction & training shall be given to all employees on safe use, maintenance and storage of PPE. Employees shall, in accordance with instructions given, make full use of all PPE provided and maintain it in a serviceable condition and report its loss or defect immediately to the maintenance department where it shall be replaced. PPE shall be replaced when it is no longer serviceable and returned on a new for old basis. Employees shall sign to State that they have received PPE when issued.

12.0 WELFARE FACILITIES

The provision of welfare facilities on the site shall be communicated to all operatives at site induction. A cleaning regime shall be implemented and maintained for the duration of the construction phase to ensure the site welfare facilities remain in a clean and tidy condition.

If mains drinking water becomes unavailable during the construction phase bottled water shall be brought to site for all operatives for the necessary period.

All food and drink vendors on site shall be registered.

The HSE officer will ensure that only approved vendors are allowed to sell food.

The variant of food and drink to be sold on the sites must be approved by the HSE office

Access to the site should be restricted to avoid sale of contraband on site

Smoking and eating shall only be permitted in the designated area. This area shall be identified during induction.

13.0 SIGNAGE

Adequate provision for warning and directional signs shall be made.

14.0 PROJECT HSE PROCEDURES

OHS procedures shall be developed. Project activities shall generally be controlled in accordance with OHS Procedures. These procedures shall include:

- Lifting and Rigging Procedure
- HSE Reporting Procedure
- Working at Height Procedure.
- Emergency Procedure.