



REPUBLIC OF ZAMBIA

MINISTRY OF AGRICULTURE

**IRRIGATED AND SUSTAINABLE AGRICULTURE FOR
TRANSFORMATION PROJECT**

(P514111)

**ENVIRONMENTAL AND SOCIAL
MANAGEMENT FRAMEWORK
(ESMF)**

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Abbreviations and Acronyms

ARAP	Abbreviated Resettlement Action Plan
BoQ	Bill of Quantities
CFP	Chance Find Procedure
C-ESMP	Contractor – Environmental and Social Management Plan
CoC	Code of Conduct
CRC	Compensation and Resettlement Committee
ISAT	Irrigated and Sustainable Agriculture for Transformation
E&S	Environmental and Social
EHS	Environmental Health and Safety
EHSGs	Environmental Health and Safety Guidelines
EIA	Environmental Impact Assessment
ESCP	Environmental and Social Commitment Plan
ESIA	Environmental and Social Impact Assessment
ESMF	Environmental and Social Management Framework
ESMP	Environmental and Social Management Plan
ESF	Environmental and Social Framework
ESIRT	Environmental and Social Incident Response Toolkit
ESRM	Environmental and Social Risk Management
ESSs	Environmental and Social Standards
GBV	Gender Based Violence
GIIP	Good International Industry Practice
GRM	Grievance Redress Mechanism
IFC	International Financial Corporation
ILO	International Labour Organization
IPMP	Integrated Pest Management Plan
IWUA	Integrated Water User Association
M&E	Monitoring and Evaluation
MoA	Ministry of Agriculture
OHS	Occupational Health and Safety
PAP	Project Affected Person
PDO	Project Development Objective
PIU	Project Implementation Unit
PPE	Personal Protective Equipment
RAP	Resettlement Action Plan
RPF	Resettlement Policy Framework
SEA	Sexual Exploitation and Abuse
SEP	Stakeholder Engagement Plan
SH	Sexual Harassment
SOP	Standard Operating Procedure

TA	Technical Assistance
TOR	Terms of Reference
USD	United States Dollar
WHO	World Health Organization
WMP	Waste Management Plan

Executive Summary

The Environmental and Social Management Framework (ESMF) has been prepared for the Ministry of Agriculture who will be implementing the Irrigated and Sustainable Agriculture for Transformation (ISAT) Project, with financing from the World Bank Group. The project will increase access to irrigation, enhance integration into agriculture value chains and climate resilience in nine selected provinces of Zambia which include Central, Copperbelt, Eastern, Luapula, Muchinga, Northern, North-Western, Southern and Western. The proposed US\$108 million project will expand reliable, efficient, and climate-resilient irrigation, strengthen farmers' participation in agricultural value chains, and raise agricultural productivity in Zambia. It will develop and modernize irrigation and associated infrastructure; promote affordable, energy-efficient farmer-led systems; strengthen water governance, scheme management, institutions, and producer organizations; and improve climate-smart extension, digital services, production, storage, processing, logistics, and market linkages. Support will prioritize smallholders, women, youth, and vulnerable households. Investments in selected provinces and existing intervention areas will be confirmed through technical, economic, environmental, social, water-resource, and climate-risk assessments. The project will also finance capacity building, stakeholder engagement, coordination, monitoring, accessible grievance mechanisms, and implementation of the ESMF, including subproject screening, site-specific instruments, consultation, contractual mitigation measures, supervision, incident reporting, and corrective action.

This ESMF has been prepared to identify the potential environmental and social risks and impacts of proposed Project activities and to propose suitable mitigation measures to manage these risks and impacts. It maps out the Zambian laws and regulations and the World Bank's Environmental and Social Standards (ESSs) as outlined in the Environmental and Social Framework (ESF) and describes the principles, approaches, implementation arrangements, and environmental and social mitigation measures to be followed.

It also establishes the principles and procedures for undertaking consultations and implementing grievance mechanisms as required; a monitoring and evaluation system; and a reporting system. It establishes institutional responsibilities for implementation, supervision, monitoring and evaluation and reporting on environmental and social risk management throughout all phases of the project (design, construction, and operation). This ESMF lays out screening processes and tools to be directly implemented by the Ministry of Agriculture and Project Implementation Unit (PIU) to assess risks and impacts per activity. This will facilitate the recommendation of appropriate mitigation and monitoring measures for each activity.

It further describes the appropriate roles and responsibilities of ISAT Project and other stakeholders and outlines the reporting procedures, including determination of capacity building, technical assistance and resources required to successfully implement the provisions of the ESMF.

Policy, Legal and Institutional Review

The ESMF has been prepared in line with applicable national legislation and ESSs.

E&S Risks and Impacts

The project is expected to generate both positive and adverse impacts. Key benefits include employment creation, increased agricultural productivity, improved nutrition and food security, higher household incomes for small-scale farmers, and more efficient land use through agricultural intensification.

Potential adverse environmental and social risks include soil and water contamination from generated solid and hazardous waste; reduced downstream water availability from abstraction; vegetation clearance and associated habitat/biodiversity loss at new irrigation sites; air pollution; noise and vibration; soil and land degradation; Community health and safety risks and impacts such dust,

increased noise levels, road and traffic safety risks due to moving equipment, exposure to open excavations and trenches, GBV/SEA/SH, labour influx and exposure to communicable diseases; community health and safety risks from increased traffic and possible exposure to asbestos-containing materials in schemes to be rehabilitated, construction accidents, excavation hazards, machinery injuries, traffic accidents, drowning risks, chemical exposure, fumes; land acquisition causing physical and economic displacement; labour influx; impacts on cultural heritage; and financial/social exclusion/elite capture. Additional risks inferred from the proposed activities include altered river hydrology; vector breeding and water-related disease; specialized hazards from confined spaces, work at height, electrical installations, pressure pipelines, lifting and work near water; infrastructure vulnerability to extreme floods, drought, heat, lightning and wildfire; indebtedness, unfair commercial terms and exclusion under matching grants; land-tenure and intra-community disputes; operational child and public safety hazards; induced land-use change and habitat conversion and worker heat stress.

Table 1 below presents appropriate mitigation measures to the identified risks and impacts above.

Table 1: Summary of Potential adverse Risks and Impacts and Mitigation Measures

E&S Risks and Impacts	• Description of mitigation measures
Soil and water contamination from generated solid and hazardous waste (waste oil/fuel, electronic-waste, empty pesticides containers and asbestos waste)	• Develop and implement Waste Management Plan • Provide adequate waste receptacles and facilities at project sites/camp sites. • Training and awareness on safe waste disposal for all workers. • Final disposal should be at dumpsites approved by ZEMA • Waste oil from vehicles and equipment will be collected and temporarily stored in drums or containers at site for recycling to oil marketing companies or agents approved or recognized and have the capacity to undertake oil disposal. • Dispose of faecal sludge via septic tanks that will be emptied regularly. • Develop and implement the Asbestos Waste Management Plan. • Develop and Implement the Electronic Waste Management Plan. • E-waste to be collected from the generation points securely stored under lock and key pending final disposal in accordance with the Environmental Management (Licensing) Regulations (Statutory Instrument No. 112 of 2013). • Develop and implement the integrated pesticide management plan (IPMP) in line with the World Bank Environmental Health and Safety Guidelines (EHSs) and ZEMA regulations on pesticides and toxic substances.
Habitat/Biodiversity loss	• Exclude areas with critical habitats for the project works. • Limit vegetation clearance to project footprint • Keep to a minimum ground vegetation loss and preserve trees. • Practice topsoil stripping and stockpile for use. • Include biodiversity mitigation measures in ESIAs/ESMPs.
Air pollution	• Ensure contractors operate only well-maintained engines, vehicles, trucks, and equipment. A routine maintenance program for all equipment, vehicles, trucks, and power generating engines should be in place. • The project should ensure the use of good quality fuel and lubricants only. • Construction traffic speed control measures should be enforced on unpaved roads passing through communities.

	• Reduction of carbon emissions both by using energy more efficiently and by increasing the use of renewable sources of energy • Sensitize workers and the community to refrain from open air burning of solid waste, including construction and agricultural waste.
Noise and vibration	• Proposed investments should require contractors to use equipment and vehicles that are in good working order, well maintained, and that have some noise suppression equipment (e.g., mufflers, noise baffles) intact and in working order. This will be achieved by making it a component of contractual agreements with the construction contractors. • Engines of vehicles/trucks and earth-moving equipment should be switched off when not in use. • Cordone off work areas. • Limit works to daytime only.
Reduced downstream water availability from abstraction and siltation	• Implement abstraction controls to avoid depletion. • Sustain environmental flow releases downstream. • Implement water conservation to balance supply needs with ecosystem and socio-economic requirements. • Avoid discharge of sediments into water bodies to prevent siltation.
Soil and land degradation	• Minimize land clearance to avoid unnecessary exposure of bare ground to the elements of the weather. • Re-vegetate cleared areas and rehabilitated excavated sites including borrow pits.
Community health and safety risks and impacts such dust, increase noise levels, road and traffic safety risks due to moving equipment, exposure to open excavations and trenches/ GBV/SEA/SH, labour influx and exposure to communicable diseases.	• Develop and implement a Traffic Management Plan. • Ensure that trucks carrying construction materials such as sand, quarry dust, laterite etc. have the buckets covered with tarpaulin or appropriate polythene material from or to project site. • Only road worthy vehicles/trucks should be used. • Only experienced drivers/operators should be employed. • Except for areas secured by fencing, all active construction areas will be marked with high-visibility tape to reduce the risk of accidents involving pedestrians and vehicles. • All open trenches and excavated areas will be backfilled as soon as possible after construction has been completed. Access to open trenches and excavated areas will be secured to prevent pedestrians or vehicles from falling in. • Adequate sanitary facilities will be available for workers. • Construction workers should be educated to adhere to basic rules regarding protection of public health, including most importantly hygiene and disease (HIV/AIDS and SEA/SH) prevention. • Contractors must provide training for drivers. • Establish speed limits. • Establish speed control measures (humps, speed limit signs) etc. • Emergency Preparedness and Response Plan has been developed. • Develop Code of Conduct for stakeholders and participants • Enforce safe driving and take disciplinary action against repeat offenders
Occupational health and safety risks and impacts including construction accidents, excavation hazards, machinery injuries, traffic accidents, drowning risks, chemical	• Develop and implement sub project specific Occupational Health and Safety (OHS) plan that will include detailed OHS procedures (risk assessments and safe systems of working) based on the Environmental, Health, and Safety Guidelines (EHSGs) and Good International Industry Practice (GIIP) and other relevant guidance, and specific requirements of ESS2.

exposure, dust, noise, and fumes, ergonomic risks	- The project will require all contractors to implement an Environmental, Health and Safety (EHS) plan which will outline procedures for avoiding health and safety incidents and for emergency medical treatment. This will be achieved by making it a component of contractual agreement. - Implement the Labour Management Procedures. - All workers to undergo EHS induction training. - Contractors' workers will be required to wear task specific personal protective equipment (PPE) including hard hats, high-visibility vests, safety boots and gloves and life vests as appropriate in accordance with the EHS plan. - Always enforce use of PPEs for all staff and workers and ensure supervision of the same to minimize accidents. - All construction and other workers will be sufficiently trained in the safe methods pertaining to their area of work to avoid injuries. - Development of Code of Conduct.
Impacts on cultural heritage/archaeological interest	The project should implement a chance find procedure and reporting system to be used by contractors if a cultural heritage feature or ecologically sensitive item/issue is encountered.
Inequality among project beneficiaries especially women, youth and PwD	- A Stakeholder Engagement Plan with accessible GRM has been developed. - Identify disadvantaged/vulnerable (D/V) persons or groups and assess disproportionate risks. - Integrate gender considerations and local cultural norms into risk analysis.
Labor related issues	- Workers should have written and signed contracts for their jobs and worker's grievance redress system should be availed to them. - LMP to be implemented
Gender Based Violence/Sexual Exploitation and Abuse and Sexual Harassment	- Development of Gender/GBV/SEA/SH Action Plan - Development of Code of Conduct for all workers - Sensitization/ training of workers and community groups and members on GBV issues
Public Health HIV/AIDS/STI's	- Design and implement public health awareness, sensitization and prevention program for the project. - Development of Code of Conduct for all workers
Land acquisition and resettlement	Where necessary develop and implement a Resettlement Action Plan/Livelihood Restoration Plan
Financial/Social Exclusion/Elite Capture	Implement the SEP with provisions for grievance redress mechanism and management procedures.
Vector breeding and water-related disease associated with reservoirs, canals, drainage systems and irrigated fields	Design canals and drains to prevent stagnant water; maintain flow and promptly repair leaks; clear vegetation and sediment without damaging sensitive habitats; provide community awareness and protective measures; monitor vector breeding and water quality and implement integrated vector management without indiscriminate pesticide use.
Specialized construction and maintenance hazards, including work at height, confined spaces, electrical systems, pressure pipelines, lifting operations and work over or near water	Require task-specific risk assessments, permits to work and method statements; use trained and authorized workers; apply isolation and lockout procedures; provide fall protection, atmospheric testing, ventilation, rescue plans, lifting plans and competent supervision; inspect equipment; provide life jackets and rescue arrangements for work near water.
Climate and natural-hazard risks to infrastructure and operations,	Use climate-resilient design criteria and hydrological studies; provide adequate spillways, drainage, erosion protection and freeboard;

including extreme floods, drought, heat, lightning, erosion and wildfire	incorporate drought operating rules and water-efficiency measures; protect electrical systems against lightning; prepare heat-stress, flood and wildfire procedures; maintain contingency supplies and periodically update designs using monitoring data.
Economic and social risks from matching grants, productive alliances and commercial arrangements, including indebtedness, unaffordable contributions, unfair contracts and exclusion of smallholders	Apply transparent and accessible eligibility and selection criteria; assess affordability and financial viability; disclose costs, obligations and risks in understandable formats; provide independent business and legal advice; avoid coercive collateral requirements; monitor benefit distribution; establish appeal and grievance channels; tailor participation and co-financing arrangements for women, youth and vulnerable households.
Land-tenure and intra-community conflict arising from irrigation expansion, scheme boundaries, access roads, water infrastructure and benefit allocation	Verify land status and customary and statutory rights through participatory mapping; document voluntary agreements; consult traditional authorities, women, tenants and resource users separately where needed; avoid coercion; establish transparent scheme membership and allocation rules; resolve disputes before works; prepare ESS5 instruments where access restrictions or displacement cannot be avoided.
Child and public safety risks during operation of canals, pump stations, reservoirs, processing facilities and increased vehicle movement	Apply safety-by-design; fence or guard hazardous locations; provide safe crossings, lighting, warning signs and restricted access; separate pedestrians from vehicles and machinery; conduct school and community awareness; maintain emergency contacts, first aid and rescue equipment; investigate incidents and correct recurring hazards.
Induced land-use change and indirect habitat loss from improved irrigation, roads and market access	Assess indirect and induced impacts beyond the immediate footprint; use exclusion criteria for critical habitats and protected areas; condition financing on land-use compliance; support production intensification within approved footprints; monitor satellite or field indicators of encroachment and habitat conversion.
Occupational heat stress and extreme-weather exposure for construction, farm, warehouse and processing workers	Assess heat and weather risks; schedule strenuous work during cooler periods; provide shade, potable water, rest breaks and acclimatization; train supervisors and workers to recognize symptoms; maintain first-aid and emergency referral arrangements; adjust or suspend work during dangerous heat, storms, lightning or flooding.

Environmental and Social Risk Management Instruments.

As part of the ESMF the following instruments have been prepared to address potential environmental and social risks under the ISAT Project: Resettlement Policy Framework, Waste Management Plan, Asbestos Waste Management Plan, the Integrated Pesticide Management Plan (IPMP).

In addition to this ESMF, other E&S instruments including the Environmental and Social Commitment Plan (ESCP), Stakeholder Engagement Plan (SEP) with provisions of a Grievance Redress Mechanism (GRM) and Labor Management Procedures (LMP) have been prepared and publicly been disclosed on National Authorizing Office, MoA and World Bank websites. There are also site-specific instruments that will be prepared which include environmental and social management plans (ESMPs),

environmental and social project briefs (ESPBs), and environmental social impact assessment (ESIA) reports.

The PIU's Environmental and Social Specialists will oversee implementation of the ESMF and will ensure that required approvals are obtained before any subproject activity begins. Following approval, the relevant documents will be disclosed on the MoA and World Bank websites.

Monitoring and Reporting

The MoA PIU will oversee ESMF implementation through monthly site visits, reports from field staff and contractors, and mobile applications providing real-time updates. They may also engage independent firms to conduct field monitoring and environmental and social audits, with findings reported to the PIU.

1. Introduction

An Environmental and Social Management Framework (ESMF) is an instrument that examines the risks and impacts when a project consists of a program and/or series of subprojects, and the risks and impacts cannot be determined until the program or subproject details have been identified. The ESMF sets out the principles, rules, guidelines, and procedures to assess the environmental and social risks and impacts. It contains measures and plans to reduce, mitigate and/or offset adverse risks and impacts, provisions for estimating and budgeting the costs of such measures, and information on the agency or agencies responsible for addressing project risks and impacts, including on its capacity to manage environmental and social risks and impacts. It includes adequate information on the area in which subprojects are expected to be sited, including any potential environmental and social vulnerabilities of the area; and on the potential impacts that may occur and mitigation measures that might be expected to be used.

This ESMF has been developed to support the environmental and social due diligence provisions for activities financed by the World Bank with respect to the Irrigated and Sustainable Agriculture for Transformation Project (P514111). The project will support promotion of irrigated and sustainable agriculture practices and market linkages in targeted sites in Zambia. The MoA will be implementing the project activities. The proposed US\$108 million project aims to increase access to reliable and efficient irrigation services, strengthen farmers' participation in agricultural value chains, and enhance the productivity and climate resilience of Zambia's agriculture sector. The project will support the development, rehabilitation, and modernization of priority irrigation schemes and associated infrastructure, including water abstraction, conveyance, distribution, drainage, and on-farm water-management systems. It will also promote farmer-led irrigation through affordable and energy-efficient technologies, including solar-powered systems, with targeted measures to improve access for women, youth, vulnerable households, and smallholder farmers. Complementary support will strengthen water governance, scheme management, operation and maintenance arrangements, irrigation institutions, and the capacity of water-user and producer organizations.

To increase agricultural productivity and commercialization, the project will strengthen climate-smart research and extension services, promote improved production and post-harvest practices, and expand access to digital agricultural, climate, and market information. It will facilitate farmers' linkages to markets through matching grants and other support for productive alliances, aggregation, storage, processing, logistics, and last-mile infrastructure. These interventions are expected to reduce production and post-harvest losses, improve product quality and market readiness, and enable participating farmers and enterprises to respond more effectively to market demand.

The Project activities will be implemented in selected provinces and existing project intervention areas. Specific locations and investments will be confirmed during implementation through technical, economic, environmental, social, water-resource, and climate-risk assessments. The selection and design of investments will consider water availability and competing uses, land requirements, accessibility, climate vulnerability, economic viability, and potential impacts on communities, livelihoods, occupational and community health and safety, biodiversity, and other environmental and social receptors. Where relevant, designs will incorporate resource efficiency, pollution prevention, climate adaptation, universal access, stakeholder engagement, and measures to avoid or minimize land acquisition and livelihood disruption.

The project will finance technical assistance, institutional capacity building, stakeholder engagement, monitoring and evaluation, fiduciary management, procurement, coordination, and reporting. It will also support accessible grievance mechanisms and the implementation of environmental and social instruments prepared in accordance with the ESMF. Because the precise location, scale, and design of some subprojects will be determined during implementation, the ESMF will guide screening, risk classification, preparation of site-specific instruments, consultation and disclosure, integration of mitigation measures into designs and contracts, supervision, monitoring, incident reporting, and

corrective action throughout the project cycle. The ESMF follows the World Bank Environmental and Social Framework (ESF) as well as the national laws and regulations of Zambia.

The objective of the ESMF is to assess and mitigate potential negative environmental and social risks and impacts of the Project consistent with the Environmental and Social Standards (ESSs) of the World Bank ESF and national requirements. More specifically, the ESMF aims to (a) assess the potential environmental and social risks and impacts of the proposed Project and propose mitigation measures; (b) establish procedures for the environmental and social screening, review, approval, and implementation of activities; (c) specify appropriate roles and responsibilities, and outline the necessary reporting procedures, for managing and monitoring environmental and social issues related to the activities; (d) identify the staffing requirements, as well as the training and capacity building needed to successfully implement the provisions of the ESMF; (e) address mechanisms for public consultation and disclosure of project documents as well as redress of possible grievances; and (f) establish the budget requirements for implementation of the ESMF.

This ESMF should be read together with other E&S management plans prepared for the project, both the annexures to the ESMF and the stand-alone ones.

2. Project Description

Project Components

The Project Development Objective (PDO) is to increase access to irrigation, enhance integration into agriculture value chains and climate resilience in Zambia. The project aims to address the interconnected constraints to transform the agriculture sector, including irrigation, knowledge, markets, and institutional capacity. The project addresses identified gender disparities targeting women farmers with specific measures to expand their access to irrigation services, financial products and digitally enabled extension. The project is organized into four components totaling US\$108 million.

Component 1: Irrigation Development and Scale-up (US\$67 million). This component aims to increase the area under irrigation in Zambia by supporting a portfolio of public scheme investments and scaling up farmer-led irrigation, addressing the full spectrum from large-scale infrastructure development to smallholder adoption of irrigation technologies. It will finance civil works, goods, technical assistance, and results-based financing instruments across three sub-components.

The major project activities under component 1 will include the following:

- Development and rehabilitation of small to medium-scale irrigation schemes associated with 8 to 10 dams rehabilitated under IDSP located in Eastern, Northwestern, Southern and Western provinces.
- Land clearing, civil works, installation of pump and booster stations, pipework, installation of hydrants and irrigation systems to establish irrigation schemes at the rehabilitated dams under the closed Irrigation Development Support Project (IDSP).
- Construction of weirs across selected streams/rivers to convert the temporal irrigation infrastructure (earth) that were supported by Japan International Cooperation Agency (JICA) to permanent infrastructure to improve the stability and safety of the structures and increase the volumes of water being impounded and subsequently expand on the irrigated areas by the small-scale farmers across up to 21 sites located in Central, Copperbelt, Luapula, Muchinga, Northern and Northwestern Provinces.
- Use of construction material such as aggregates, gravel, and quarry dust for the construction works.
- Transportation of construction materials.
- Growing and irrigating crops.
- Use of agricultural chemicals such as pesticides and fertilizers.
- Expansion of the Manyonyo and Magobo Irrigation Schemes including the Farmer-Led Irrigation Development (FLID) initiatives.

Component 2: Knowledge Generation and Digital Dissemination (US\$10 million IDA and US\$8 million FS2030TF).

This component aims to strengthen the knowledge and information systems that underpin sustainable irrigated agriculture, strengthening the extension system addressing the weak research-to-extension linkage that has constrained technology adoption, productivity growth, climate resilience, and soil health. The component finances rehabilitation works, goods, and technical assistance across two sub-components.

The following activities are envisaged under component 2:

- Rehabilitation of the Zambia Agricultural Research Institute (ZARI) National Irrigation Research Station and its irrigation scheme in Chikankata district Southern Province, to modern standards including the rehabilitation of its irrigation scheme using climate resilient

design standards and renewable energy powered water abstraction system to enable demonstration of irrigated agriculture practices to farmers.

- Rehabilitation works will mainly involve removal of worn-out roof, fittings, damaged/out of life installations, land clearing, installation of demonstration irrigation system and cleanup of the area to remove the construction debris/rubble.
- Transportation of construction materials.

Component 3: Market Access and Value Chain Development (US\$17 million). This component aims to promote the commercialization of agricultural production along key value chains by fostering private sector engagement and improving last-mile infrastructure, with a view to enhancing farmers' economic outcomes, improving climate resilience, and reducing post-harvest losses. The component is aligned with the World Bank's AgriConnect approach and finances matching grants and technical assistance. All investments under this component will be screened for climate risk and required to meet climate-resilient design standards, consistent with the World Bank's Paris Alignment commitments. Where relevant, investments will prioritize low-carbon technologies and practices. Activities will be focused in the ISAT project intervention areas and in locations previously supported under the IDSP, to ensure continuity with past investments and consolidate earlier gains.

Under this component, the project will finance the following activities:

- Aggregation and collection infrastructure such as collection points and bulking centers.
- Cold storage and cold-chain solutions, prioritizing solar-powered options to minimize carbon footprint and reduce exposure to fuel price volatility.
- Processing and value addition investments aligned with proven anchor firm models.
- Warehousing, distribution, and logistics infrastructure reduces losses and improves delivery reliability.
- Help aggregators design bankable, inclusive sub-projects.
- Support farmers with production planning, quality, and delivery discipline.
- Support aggregators and farmers integrating climate-resilient practices into sub-project design and business planning, including the adoption of energy-efficient post-harvest technologies.
- Strengthen “soft infrastructure” such as contracts, traceability records, and quality assurance routines that make physical infrastructure effective.

Component 4: Project Management, Monitoring and Evaluation (US\$6 million). This component aims to support the efficient and accountable implementation of the project by covering the costs for project management related to staffing, consultancies, and equipment, capacity building of the newly established Department for Project Management and Monitoring (DPMM) as well as implementation ESMF, monitoring and evaluation of all project activities in line with the Results Framework, adequate fiduciary (procurement and financial management), audits and accountability mechanisms for oversight, including a grievance redress mechanism.

3. Policy, Legal and Institutional Framework

This section highlights the national legal, regulatory, and institutional frameworks applicable to the Project.

3.1 Zambia's Legal and Regulatory Framework

Table 2: Zambia's Relevant Legal and Regulatory Framework

Legislation	Interpretation	Relevance	Compliance
Environmental Management Act CAP 204 of the Laws of Zambia as amended by Environmental Management Act No. 8 of 2023	The is the principal legislation governing environmental management in Zambia. The Act provides for the sustainable management of natural resources and protection of the environment, and the prevention and control of pollution. Of relevance is section 29 of the Act which states that “A person shall not undertake any project that may have an effect on the environment without the written approval of the Agency, and except in accordance with any conditions imposed in that approval”. In relation to this project, some of the functions of ZEMA are to review environmental impact assessment reports and undertake environmental auditing and monitoring. The Act also provides for public participation in decision-making and access to environmental information.	A project of this nature requires that environmental issues are identified at an early stage and environmental management measures incorporated in the planning stage. The sections of the Act which are relevant to the project development include the following: Division II – Water Pollution; civil works during the construction of the irrigation schemes and infrastructure, rehabilitation of the ZARI irrigation demonstration center, generation of wastes and transportation of construction materials and handling of oils and use of agrochemicals has a potential to pollute water resources including siltation and eutrophication. Division III – Air Pollution; the civil works during the construction of the irrigation schemes and infrastructure, rehabilitation of the ZARI irrigation demonstration center and transportation of construction materials and burning of fuels by the construction machinery and vehicles has a potential to generate dust and gaseous emission that will lead to air pollution. Division IV – Waste Management; this division prohibits practices that have potential to lead to unsound waste management practices. Waste streams to be generated during the subproject activities will mainly	No works will be initiated before a decision is made by ZEMA, the competent authority in the ESIA decision-making process in Zambia. Further, the following environmental management Licences will be obtained from ZEMA and the conditions attached complied with in full: - Emission Licence – governing air and water quality. - Hazardous waste management Licence to deal with hazardous waste. General waste is governed by the Solid Waste Regulation and Management Act, CAP 181 of the Laws of Zambia. - Pesticides and Toxic Substances Licence - governing the importation,

Legislation	Interpretation	Relevance	Compliance
		include: construction debris/rubble, soil spoils, asbestos, used containers for paints, used paint brushes, kitchen waste, process water, effluent, used oils, used oil filters, used lighting bulbs/fluorescent tubes, used cement bags, used fertilizer bags, used containers for pesticides, waste or expired agricultural chemicals, and other used package materials. Division VI – Noise; this section prohibits emission of any noise above the standards. The regulations for noise have not been developed yet and therefore there are no noise standards in place. Noise will be generated from the construction machinery, moving vehicles, pumps, and farming implements (tractors, boom sprayers, combine harvesters etc). Division VIII – Natural Resources Management. Land clearing to facilitate subproject activities will result in vegetation removal that will subsequently lead to biodiversity/habitat loss.	manufacturing, use, export, formulation, storage and transportation of chemicals including agrochemicals. iv. Noise mitigation measures to be included in the E&S instruments and monitoring of noise levels will be conducted in worksites. v. Mitigation measures for biodiversity loss risks to be included in the site-specific E&S instruments.
Environmental Management (Environmental Impact Assessment) Regulations Statutory Instrument No. 3 of 2026	In line with the principal Act, the EMA of 2011, these regulations demand that before a developer commences implementing a project, an ESIA report should be prepared and submitted to the relevant regulatory authority for review and approval. Regulation 4. states that: <i>“A developer who intends to undertake project that is likely to have an adverse effect on the environment shall submit to the Agency an -</i>	The implementation of the subproject activities will involve land clearing and civil works for the establishment of irrigation schemes, rehabilitation of structures, providing financing for the construction of aggregators, wholesalers, bulking centers, and other associated support facilities. Such activities may cause environmental and social risks and impacts on the environment through habitat/biodiversity loss, water pollution, eutrophication and siltation of surface water bodies, increased dust levels, generation of solid and hazardous waste, occupational health and safety (OHS) risks and impacts and community health and safety risks	In compliance with the requirements of these regulations, all subprojects will be screened and categorized in terms of their risk levels. Depending on the risk category, either an environmental and social project brief (ESPB) or an environmental and social impact statement (ESIS) shall be prepared in accordance with the regulations.

Legislation	Interpretation	Relevance	Compliance
	<i>environmental and social project brief; or</i> <i>environmental and social impact statement.”</i>	and impacts. The scale of such type of activities require that associated environmental and social issues are identified at an early stage and environmental management measures incorporated in the planning stage.	No works will commence before a decision is made by ZEMA, the competent authority in the ESIA decision-making process in Zambia
Environmental Management (Licensing) Regulations (Statutory Instrument No. 112 of 2013))	There are several parts in this statutory instrument giving regulatory powers to ZEMA to control the discharge of water pollutants, air emitting pollutants, pesticides and toxic substances, hazardous waste and ozone depleting substances. The parts of relevance to the project at hand are II (Air and Water Pollution) and IV (Hazardous Waste). Part IV applies to: (a) the control and monitoring of the generation, collection, storage, transportation, pre-treatment, treatment, disposal, export, import, transit, trade in and transboundary movement of the hazardous waste listed in the Fifth Schedule; and (b) the waste specified in the Sixth Schedule, if that waste exhibits the characteristics found in the Seventh Schedule. Regulation 19. (1) demands that any person who intends to generate, pre-treat, treat, handle, transport, store, dispose of, transit, trade in or export hazardous waste shall apply to the Agency for a hazardous waste license.	Construction and rehabilitation works to establish the irrigation schemes and agricultural activities will generate dust and wastes including hazardous waste and use of agrochemicals. Relevant parts of the regulations include: Part II – Air and Water Pollution Part IV – Hazardous Waste Part V – Pesticides and Toxic Substances	Dust emissions with potential to cause air pollution, particularly during the construction phase, will be prevented or minimized by consistently watering down dusty areas. This will ensure that the emission limit of 50 µg/m³, for ambient respirable particulate matter (PM₁₀), as specified in the Second Schedule, is set within limits. Agrochemicals to be obtained from ZEMA licensed suppliers and disposed of empty pesticides containers in line with the hazardous waste licensing regulations. The following environmental management Licences will be obtained from ZEMA and the conditions attached complied with in full: i. Emission Licence – governing air and water quality.

Legislation	Interpretation	Relevance	Compliance
			ii. Hazardous waste management Licence to deal with hazardous waste. General waste is governed by the Solid Waste Regulation and Management Act, CAP 181 of the Laws of Zambia. iii. Pesticides and Toxic Substances Licence - governing the importation, manufacturing, use, export, formulation, storage and transportation of chemicals including agrochemicals.
Forests Act, CAP 199 of the Laws of Zambia	This Act was enacted to ensure that that national forests, Local Forests, joint forest management areas; are protected for the purposes of conservation and use of forests and trees for the sustainable management of forests ecosystems and biological diversity. The Act concerns the management and conservation of forest resources and, to some extent, the protection of biological diversity and generally the environment in Zambia	Establishment of irrigation schemes will result in clearing of vegetation. In addition, some subprojects may be implemented near national forests or forest management. Creation of borrow pits by contractors or primary suppliers may also adversely affect vegetation.	To avoid and minimize implementation of project activities in reserved national forest (critical habitat), an exclusion list has been developed to mitigate such risk. The exclusion list does not allow the implementation of subprojects in the national gazetted forests. If the area of vegetation to be cleared is significant, and there are impacts on critical and natural habitats then the subproject would have to apply the mitigation hierarchy to manage risks

Legislation	Interpretation	Relevance	Compliance
			and impacts related to indiscriminately clearing of forest. The Forestry Department will also be consulted on the matter.
Agricultural Lands Act CAP 187 of the Laws of Zambia	The Act provides for the establishment of the Agricultural Lands Board; to prescribe the composition and membership thereof; to prescribe its powers and functions; to provide for tenant farming schemes; and to provide for matters incidental to or connected with the foregoing. The Act guides the management of agricultural land and tenancy through the Agricultural Lands Board that manages state lands, handle leaseholds for farming, and oversee tenant farming schemes.	The project involves creation, supporting and management of irrigation schemes at subproject level. Hence, the project needs to conform with the requirements of this Act.	In compliance to this act, the project will on consult the Agricultural Lands Board on matters of the irrigation schemes to be created at subproject level and agricultural land and tenancy matters,
Agriculture (Fertilizers and Feed) Act CAP 226 of the Laws of Zambia	Regulates the manufacturing, processing, importation, and sale of fertilizers and farm feeds, setting standards of effectiveness and purity. The Act provides for the regulation and control of the manufacture, processing, importation and sale of agricultural fertilizers and farm feed; to provide for minimum standards of effectiveness and purity of such fertilizers and feed; and to provide for matters incidental to or connected with the foregoing.	During the operational phase, the subprojects will use farming inputs including fertilizers. Hence, the project needs to conform with the requirements of this Act.	The project will ensure that the procurement, transportation, storage and use of fertilizers is in conformity with the Act.

Legislation	Interpretation	Relevance	Compliance
Local Government Act, CAP 281 of the Laws of Zambia	The Act came into force in 2019 and provides for the establishment of Councils in districts, the functions of local authorities and the local government system. Some of these functions relate to pollution control and the protection of the environment in general. Section 17. (1) stipulates that “Whenever by this Act a power is conferred on a local authority to establish and maintain an undertaking, service or facility, the local authority may (a) control the undertaking, service or facility and regulate its use by the public or any class of the public”.	The subprojects are located in various selected districts across Zambia. Therefore, MoA and contractors will recognize local authorities at project sites and comply with the specifications and any relevant bye-laws.	The project and the contractor including subcontractors will comply with the specifications and any relevant bye laws of each Municipality under which the subproject activities will be undertaken. Section 36 of the Act provides for the establishment of Ward Development Committees (WDCs) appointed by the Town Clerk or Council Secretary. The success of the implementation of the project during and post the construction period will hinge, to some extent, on the cooperation between project and the WDCs. These committees can be used as conduits for providing information from the council to the local communities. The implementation of these subprojects will require the support of the local authority in terms of approval and supervision of some these construction-related subprojects.
Solid Waste Regulation and Management Act, CAP 181 of the Laws of Zambia	An Act to provide for the sustainable regulation and management of solid waste; general and self-service solid waste services; the incorporation of solid waste management	The subproject activities will result in generation of general waste throughout the life cycle of the project.	In compliance with this Act, all municipal solid waste generated at construction sites will be collected in designated waste bins and

Legislation	Interpretation	Relevance	Compliance
	companies and define their statutory functions; the licensing and functions of solid waste service providers, operators and self-service solid waste providers and provide for their functions; the regulation, operation, maintenance and construction of landfills and other disposal facilities; the setting and approval of tariffs for management of solid waste and provision of solid waste services; and matters connected with, or incidental to, the foregoing. Section 24. (1) states that “An occupier or owner shall clean or cause to be cleaned the area around the owner’s or occupier’s property or other premise within the owner’s or occupier’s control. (2) A person shall not place or dump, cause or permit to be placed or dumped on, at the frontage of a property or any other premises, solid waste, other than for purposes of enabling the convenient collection of the solid waste by a local authority and a solid waste management company, licenced solid waste service provider or self-service solid waste provider”.		offloaded at approved sites. No open air burning of waste will be allowed anywhere within the work sites. The project shall obtain permits from respective Councils to govern the generation, management, transportation and disposal of solid waste and comply with the conditions of the permits.
National Council for Construction Act, CAP 443 of the Laws of Zambia	An Act to provide for the promotion, development and regulation of the construction industry to promote economic growth and competitiveness and create	The project involves procurement and construction works by a competitively selected contractor(s) and	All procurements bids pertaining to works will be checked to ensure that

Legislation	Interpretation	Relevance	Compliance
	sustainable employment; continue the existence of the National Council for Construction and provide for its functions. Section 58. (1) states that “A person shall not: (a) undertake construction works for, or be subcontracted by a contractor that is not registered in accordance with this Act; (b) subcontract any construction work to a contractor that is not registered in accordance with this Act; or (c) award to a contractor that is not registered to carry out any construction works”.	therefore, the project will ensure that only contractors who are registered with NCC are procured.	the prospective contractors meet the requirements of this Act.
The Occupational Health and Safety Act, CAP 296 of the Laws of Zambia	This Act is promulgated to establish the Occupational Health and Safety Institute and provide for its functions; provides for the establishment of health and safety committees at workplaces and for the health, safety and welfare of persons at work; provide for the duties of manufacturers, importers and suppliers of articles, devices, items and substances for use at work; provide for the protection of persons, other than persons at work, against risks to health or safety arising from, or in connection with, the activities of persons at work. Section 11 of Part III requires that an employer of ten or more persons at any	The operation of construction machinery and equipment during the construction and rehabilitation works at subproject level can cause unsafe working conditions. The generation of dust at workplaces can deteriorate the quality of air and thus affect the health of employees. Some of the project beneficiaries will be involved construction, and use of pesticides. If same working conditions are not maintained to as required by this Act, this may lead to occupational health and safety \ risks among the workers and surrounding communities.	The project will provide adequate and clear information, instruction, training and supervision including task specific standard operating procedures to employees to ensure the health and safety of the employees at their workplace and surrounding communities. All employees will be trained in health and safety protocols. All employees will be equipped with adequate and appropriate personal protective equipment (PPE) and the devices, tools and equipment that will be used by the employees will be regularly inspected, maintained and repaired if found to be defective.

Legislation	Interpretation	Relevance	Compliance
	workplace establishes a health and safety committee. According to section 13 the functions of the health and safety committee are: • promote cooperation between the employer and the employees in achieving and maintaining healthy and safe working conditions. • share information about occupational health, safety and welfare with employees. • investigate and resolve any matter that may be a risk to the health and safety of employees at a workplace. • review the measures taken on the health and safety of employees at a workplace; and • formulate, review and disseminate to the employees the standards, rules and procedures relating to health and safety to be carried out at the workplace. • Section 16 of Part IV provides the duties of employers at workplaces in respect of health and safety at workplaces. These duties include: • ensure, so far as is reasonably practicable, the health, safety and welfare of the employees of the employer at a workplace; and • place and maintain an employee in an occupational environment adapted to the employee's physical,		The duties of an employee at a workplace, according to section 17, with regard to health and safety are to: • take reasonable care for the employee's own health and safety and that of other persons who may be affected by the employee's acts or omissions at the workplace. • not operate any machine or engage in a process which is unsafe or is an imminent risk to the employee's own health or safety and that of others; and • cooperate with the employer or any other person in relation to any duty imposed on the employer or that other person, so far as is necessary to enable that duty or requirement to be performed or complied with. The employee is also expected to immediately inform the employer, the committee or health and safety representative if there are reasonable grounds to believe that any item, device, article, plant or substance,

Legislation	Interpretation	Relevance	Compliance
	physiological and psychological ability.		condition or aspect of the workplace is, or may be, dangerous to the employees' occupational health or safety at or near the workplace. An OHS plan will be prepared and implemented consistent with the Act.
Public Health Act, CAP 295 and Public Health (Infected Areas) (Coronavirus Disease 2019) Regulations, No. 22 of 2020	The Act empowers a Council to prevent unhealthy activities. It provides for the prevention of disease, and provision of drainage, latrine and disposal of sewerage and treatment systems. Project staff will be working at the site during operations. It is therefore the project's responsibilities to ensure that the staff are made aware of what constitutes an infectious disease and what should be done in case of infectious diseases being detected among them. Section 17 states that "Any Local Authority may direct the destruction of any building, bedding, clothing or other articles which have been exposed to infection from any infectious disease, or which in the opinion of the Medical Officer of Health are infected, and any such direction shall be sufficient authority for a Medical Officer of Health or Sanitary Inspector or person authorized thereto to destroy	During the rehabilitation and construction works, there is a possibility that public health conditions can be compromised through the generation of waste by construction workers. The workers will also be using portable toilets. Indiscriminately disposed of waste is unsightly and is a nuisance as defined in section 67 of the Public Health Act. Section 64 of the Act gives powers to a local authority to take all practicable measures for maintaining its district at all times in clean and sanitary condition, and for preventing the occurrence of any nuisance or condition liable to be injurious or dangerous to health. Some of the project interventions may cause public health risks and impacts on the local communities due to indiscriminate disposal of solid and hazardous waste that may lead to the spread of diseases.	Nuisance situations that could lead to spread of infectious diseases and putting public health and safety at risk will not be allowed within and around the Project area. Project will develop site-specific health management plans that will form part of the ESMP to avoid and minimize the spread of diseases.

Legislation	Interpretation	Relevance	Compliance
	the same, and a Local Authority may with the approval of the Minister give compensation for any building, bedding, clothing or other articles destroyed in pursuance of any direction under this section”.		
The Roads and Road Traffic Act CAP 464 of the Laws of Zambia	An Act to make provisions for the care, maintenance, and construction of roads in Zambia, for the control motor traffic, for the licensing of drivers and motor vehicles, for the compulsory third party insurance of motor vehicles, for the licensing and control of public service vehicles and public services, and for other miscellaneous relating to roads and motor traffic.	Construction and rehabilitation works are likely to disturb the flow of traffic. Measure to be employed include the use of signages, flaggers, barricading of the worksites for the safety of motorist and pedestrians	All drivers working on project related activities will be licensed in compliance to this Act. All project related vehicles including farming implements must be fit for purpose, passed the necessary vehicle inspections, registered, possess test certificates and all drivers possess valid driving licenses for the vehicle driven or operated, that the driver is competent, the driver is physically fit to drive and within all legal parameters such as age etc.
Water Resources Management Act, CAP 198 of the Laws of Zambia read together with Statutory Instrument No 18 of 2018	The Water Resources Management Act of 2011 repeals and replaces the Water Act of 1949. It provides for establishment of the Water Resources Management Authority (WARMA) and defines its functions and powers; provide for the management,	The subproject activities will utilize and impact on both surface and groundwater sources through abstraction of water for construction works and irrigation of crops. The project will obtain water permits from WARMA and comply with permit conditions.	A permit will be obtained from WARMA before construction works begin. Works to be carried out before the wet season to minimize soil erosion and siltation of the surface water resource. No dredged material

Legislation	Interpretation	Relevance	Compliance
(ground water and borehole regulations)	development, conservation, protection and preservation of the water resource and its ecosystems. The Act also provides for the equitable, reasonable and sustainable utilization of the water resource. The Act also provides for the domestication and implementation of the basic principles and rules of international law relating to the environment and shared water resources as specified in the treaties, conventions and agreements to which Zambia is a State Party. Section 18 (1) (b) provides for the regulation and supervision of the use of water. Further, Section 46(2) provides that “A person, trade or industrial undertaking who or which, as the case may be, wishes to discharge any effluent into a water resource shall do so in accordance with the Environmental Management Act, 2011”. As specified in section 57, in relation to the management of shared water resources, WARMA is given powers to: • establish national mechanisms for dispute resolution regarding shared water resources. • promote and ensure stakeholder participation, as part of Government’s decision support system, in the management of shared water resources; and		will be left piled on the sides of the bridge which can easily be eroded back into the river thereby increasing suspended material and siltation in surface water. Water abstraction permits will have to be obtained prior to commencement of construction works. Borehole drilling permits will be obtained from WARMA prior to construction.

Legislation	Interpretation	Relevance	Compliance
	facilitate the building of appropriate capacity for negotiations of shared water resources agreements as well as participation in institutions established to deal with shared water resources. According to section 71, a permit is required for water works that relate to the construction of water works, supply of water from a borehole, dewatering of a mine, draining of a dambo, swamp or wetland.		
National Heritage Conservation Act (CAP 173)	The Act was enacted in 1989 and established the National Heritage Conservation Commission (NHCC). The Act provides for the Conservation of Ancient, Cultural and Natural Heritage, relics and objects of aesthetic, historical, pre-historical, archaeological or scientific interest by preservation, restoration, rehabilitation, reconstruction, adaptive use and good management. Section 42 states that “Any person, who discovers what appears to be an ancient heritage or relic shall report his discovery to the Commission within fourteen days”.	Construction works may lead to inadvertent finding of relics of cultural, historical and natural value. Such relics may also be excavated during the acquiring of raw materials and excavation activities during construction.	The project will conserve any site or relic of historical or archaeological value in line with the provisions of the National Heritage and Conservation Commission (NHCC) Act. In addition, any discoveries of what appears to be an ancient heritage, or relic shall be reported to the Commission within fourteen days.
Employment Code Act, CAP 268 of the Laws of Zambia	This Act provides legislation relating to the employment of persons; to make provision for the engagement of persons on contracts of service and to provide for the form of and enforcement of contracts of service; to make	The rehabilitation and construction works will involve the employment of workers with a mix of a skill set which will include engineers, drivers, construction	The project, contractors and subcontractors will ensure that individuals employed are of legal employment age and are provided with conditions of service that meet

Legislation	Interpretation	Relevance	Compliance
	provision for the appointment of officers of the Labour Department and for the conferring of powers on such officers and upon medical officers; to make provision for the protection of wages of employees; and to provide for the control of employment agencies	workers, office workers, general workers, surveyors, etc.	or exceed the national minimum conditions of service. Employees will not be subjected to exploitation and abuse of their rights through casualization. According to this law, it is illegal for any employer to engage an employee on casual basis for any job that is of a permanent nature. The Act also bans unjustified termination of employment by employers.
Zambia Wildlife Act, CAP 201 of the Laws of Zambia	The Zambia Wildlife Act, No. 14 of 2015 provides for the sustainable management of wildlife in Zambia. The Act includes provisions for the regulation of the keeping, ranching, harvesting, hunting, and export of animals (including birdlife) and their products. The local management of wildlife resources and habitats is partly delegated to Community Resource Boards (CRBs) in designated game management areas (GMAs). Section 16(2) provides that <i>“A mining right shall not be granted in a National Park, Community Partnership Park or bird or wildlife sanctuary without an environmental impact assessment conducted in accordance with procedures specified by the Environmental Management Act, 2011, and which procedures shall take into account the</i>	Extraction of gravel, construction or rehabilitation of irrigation infrastructure will require construction materials such as aggregates, gravel, quarry dust etc. that will necessitate carrying out mining/quarrying activities to extract these materials.	The project will ensure that no quarrying activities are undertaken in wildlife protected areas by ensuring that due diligence is conducted on the source of raw materials for construction from suppliers. The Department of National Parks and Wildlife will also be consulted to avoid project activities encroaching on wildlife habitats.

Legislation	Interpretation	Relevance	Compliance
	<i>need to conserve and protect (a) the air, water, soil, flora, fauna, fish, fisheries and scenic attractions in or on the land over which the right is sought; and (b) features of aesthetic, cultural, architectural, archaeological, historical or geological interest in or on the land over which the right is sought”.</i>		
Chiefs Act CAP 287 of the Laws of Zambia	An Act to make provision for the recognition, appointment and functions of Chiefs and Deputy Chiefs; for the exclusion of former Chiefs and Deputy Chiefs from specified areas in the interests of public order; for the appointment and functions of Chief Retainers; and for matters incidental to or connected with the foregoing. Section 10. (1) provides that “<i>Subject to the provisions of this section, a Chief shall discharge- Functions of Chiefs and Deputy Chiefs (a) the traditional functions of his office under African customary law in so far as the discharge of such functions is not contrary to the Constitution or any written law and is not repugnant to natural justice or morality; and(b) such functions as may be conferred or imposed upon him by this Act or by or under any other written law”.</i>	The subproject sites are located within the jurisdiction of the respective traditional authorities. In some areas, the project sites may be situated on traditional land.	The project will consult the area Chiefs of every subproject site to ensure compliance with the requirements of the local traditional authority, customs, norms and traditions.

Legislation	Interpretation	Relevance	Compliance
Laws against Sexual Offences	Zambia's legal framework surrounding sexual offences is primarily housed within the Penal Code Act Chapter 87. The Penal Code Prohibits sexual offences which include rape, grievous sexual act, marital rape, incest, sexual touching or interference, sexual grooming of child, sexual intercourse with person under sixteen, inducing or encouraging violation of child under the age of sixteen, custody or abduction of child under sixteen and indecent assault.	The contextual reality that subprojects will be undertaken in rural areas with social norms that perpetuate sexual offences against women and adolescent girls. Further, some of the construction workers may be away from their families for a period of time, a situation which may prompt others to be involved in sexual offences. The increase in disposable income amongst workers will result in power imbalance between the haves and the have not; has potential to bring about unwholesome behaviour such as abuse of alcohol that can catalyse sexual offences.	The contractor will be required to explain the sexual offences to the workers and the associated consequences of being involved in such acts. Anyone being involved shall be reported to the relevant authorities as required in section 33 of the Act. Workers will also sign the Code of Conduct which will guide employee behaviour.
Anti-Gender-Based Violence Act, CAP 106 of the Laws of Zambia	This law does not only offer a comprehensive framework for protection, but also a means of survival for victims and survivors of gender-based violence (GBV), and prosecution of perpetrators. The Act specifically provides for: • The establishment of a gender-based violence fund to assist victims and or survivors. • Establishment of shelter to support victims and or survivors of gender-based violence. • Provision of emergency monetary relief • Addressing of harmful traditional practices. The Act defines gender-based violence as “any physical, mental, social or economic abuse against a person because of that	Such type of civil works can exacerbate risks of GBV as a result of interaction of workers with the local communities. This legislation provides for mitigation and response to GBV.	Measures to prevent the occurrence of gender-based violence will include ongoing sensitization among the workforce about the need to avoid such anti-social behaviour and the consequences as provided in the law. The project and contractor will also ensure that victims have access to justice, assistance for telephone hotlines and women's resource centre that provide legal and psychosocial support to victims. The project shall assess risks and prepare corresponding GBV/SEA/SH action plan with

Legislation	Interpretation	Relevance	Compliance
	<i>person's gender." In particular, the Act lists the following as amounting to gender-based violence:</i> <i>• Violence that results in or is likely to cause physical, sexual or psychological harm or suffering to a person, including threats of such acts, coercion or arbitrary deprivation of liberty, whether occurring in public or private life; and</i> <i>• Actual or threatened physical, mental, social or economic abuse that occurs in a domestic relationship.</i> <i>The Act seeks to address all forms of gender-based violence. It goes on further to list the types of abuses arising from cultural practices to include forced virginity testing, forced marriages, "sexual cleansing" and child marriages. It also defines such abuse to include "abuse perpetrated on a person by virtue of the person's age, physical or mental incapability, disability or illness."</i>		appropriate mitigation measures that are consistent with national laws.
The Gender Equity and Equality Act, CAP 276 of the Laws of Zambia	This is an Act that provides for gender equity, equality and integration of both sexes in society; promote gender equity and equality as a cross cutting issue in all spheres of life and stimulate productive resources and development opportunities for both sexes; prohibit harassment, victimization and harmful social, cultural and religious practices; provide for public awareness and training on issues of gender equity and equality; and to provide for the elimination of	Inequalities in accessing resources and employment opportunities may ensue during project implementation inhibiting economic benefits trickling down to women. The Act is relevant to guide the project to ensure employment opportunities and recruitment procedures are gender inclusive.	To achieve gender equity and equality, the following will be undertaken in line with sections 14 through 20: • Both sexes shall have equal opportunity for employment. • Both sexes shall enjoy equal rights before the law.

Legislation	Interpretation	Relevance	Compliance
	all forms of discrimination against women, empower women and achieve gender equity and equality by giving effect to the Convention on the Elimination of all Forms of Discrimination against Women, the Protocol to the African Charter on Human and People's Rights on the Rights of Women in Africa and the SADC Protocol on Gender and Development.		• Both sexes shall have equal access to justice and protection before the law. • Both sexes shall have equal access and rights to training at the workplace. • Both sexes shall have equal access to modern, appropriate and affordable technology and support services.

3.2 Institutional Framework

3.2.1 Zambia Environmental Management Agency (ZEMA)

The lead Agency responsible for managing environmental assessments and permitting in Zambia is the Zambia Environmental Management Agency (ZEMA). The Agency is mandated by the Environmental Management Act, CAP 204 as amended by Environmental Management Act No. 8 of 2023 to do all such things as are necessary to ensure the sustainable management of natural resources and protection of the environment, prevention and control of pollution. The Agency approves or rejects environmental assessments (ESA) undertaken by a proponent of a policy, plan, programme or project that may have adverse effects on the environment. The Agency also issues the following categories of environmental management Licenses/Permits depending on the activity:

- Emission License that governs air and water quality
- Hazardous waste License that governs the generation, pre-treatment, treatment, handling, transportation, storage, disposal, transit, trade in or export of hazardous waste.
- Pesticides and Toxic Substances License governing the governing the importation, manufacturing, use, export, formulation, storage and transportation of chemicals including agrochemicals.

3.2.2 The Water Resources Management Authority (WARMA)

The Water Resources Management Authority (WARMA) is a statutory body established under the Water Resources Management (WRM) Act No. 21, 2011. The WRM Act mandates WARMA to regulate, manage, develop, protect, and conserve water resources in Zambia for all users. The main purpose of the Authority is to serve as the **regulatory body** for the management and development of water resources across the country. The Authority issues Water Permits for various activities that exert demand on the use of water resources.

3.2.3 National Council for Construction

The National Council for Construction (NCC) is a statutory body in Zambia established under the National Council for Construction Act No. 10 of 2020 to regulate, promote, and build capacity in the construction industry. It oversees contractor registration, project registration, construction standards, training, and industry development.

3.2.4 Ministry of Agriculture

The Ministry of Agriculture is responsible for promoting agricultural development, food and nutrition security, and sustainable management of the agricultural sector in Zambia. The Ministry formulates and implements agricultural policies, provides extension and research services, supports irrigation development, and facilitates market access for farmers. It also coordinates agricultural programs and oversees statutory institutions to enhance agricultural productivity, rural livelihoods, and national economic growth. The ministry is the Implementing Agency of the ISAT project.

3.2.5 Ministry of Labour and Social Security (MLSS)

The Ministry of Labour and Social Security (MLSS) is a statutory body charged with the responsibility of formulating and administering policies as well as regulating activities in the labour and employment sector to enhance the sectors' contribution to sustainable social and economic development. The Ministry through the Labour Department and department of Occupational Health and Safety Services conducts labour and OHS inspections to ensure that employees are provided with written contracts of employment and operate in a safe working environment including provision of PPE and OHS training. The Department also investigates complaints relating to employment conditions of service, unfair treatment of workers by their employers, etc.

3.3 World Bank Standards and Key Gaps with the National Framework

The World Bank's environmental and social standards applicable to project activities are summarized below.

Table 3: Relevant World Bank ESSs to the project

E&S Standard	Relevance and Compliance	Key Gaps
1. Assessment and Management of Environmental and Social Risks and Impacts	Relevance: ESS1 is relevant to the project to guide the assessment and management of environmental and social (E&S) risks and impacts throughout the project lifecycle. The project's activities which include the development and improvement of irrigation schemes, promotion of farmer-led irrigation, capacity building, and market access interventions are expected to pose a range of E&S risks and risks. Key anticipated E&S risks include those related to construction activities, resource utilization, community interactions, land use changes, and limited institutional capacity for E&S management. Compliance: In line with ESS1 requirements, MoA will ensure that subproject activities undergo an Environmental and Social Assessment (ESA) process proportionate to the nature and scale of the subprojects, and corresponding E&S instruments such as ESIA, ESMPs/ESPBs are prepared.	No major gaps identified. ESS1 is aligned with the national legislation. Both ESS1 and the national law on environment demand for identification, analysis and provision of mitigation measures, ESIA prepared and approved prior to implementation of activities that may have adverse E&S risks and impacts on the environment and humans. However, the national law/policy on the inclusion of the vulnerable groups during the ESIA process is not clearly defined. Therefore, ESS1 will be used as a more stringent requirement for the inclusion of vulnerable groups in the ESIA process.
2. Labor and Working Conditions	Relevance: The project involve several types of workers: Direct Workers (such as PIU personnel and technical experts), Contracted Workers (hired by contractors and service providers for construction, infrastructure improvements, and training activities), and Primary Supply Workers (people employed by suppliers of irrigation equipment, building materials, and agricultural products). Community Workers may also take part, especially in farmer-led irrigation or extension programs. Some of the main labour risks include OHS issues related to works on irrigation systems, exposure to hazardous substances like asbestos found in older facilities, risks linked to an influx of workers, and the need to maintain fair and non-discriminatory hiring processes. Compliance: To address these matters, Labor Management Procedures (LMP) have been prepared outlining measures to ensure safe work	No gaps identified. ESS2 is aligned with the national legislation. ESS2 and the national legislation provide for written contracts for workers, worker GRM, safe work environment including provision of PPE to employees.

	conditions, prevent child and forced labour, promote fairness, and provide accessible channels for worker grievances. OHS risks to be assessed and managed through site-specific OHS plans, task-based risk assessments, safe work procedures, worker training, appropriate PPE, equipment inspection and maintenance, emergency preparedness, incident reporting, and compliance with ESS2, national OHS requirements, the World Bank Group EHS Guidelines, and Good International Industry Practice	
3. Resource Efficiency and Pollution Prevention and Management Relevant	Relevance: The project will develop and rehabilitate irrigation schemes, expand farm-led irrigation, and support market access and value chain integration. These efforts require substantial water and energy use and may generate general and hazardous waste and emissions during construction and operation. Key considerations include improving energy and water efficiency, managing waste and fertilizer and pesticide use, controlling air emissions, and preventing water pollution. Compliance: The project will implement controls on the abstraction of water to avoid depletion and promote energy use efficiency and diversified energy mix. Risks from fertilizers and pesticides use will be addressed via an Integrated Pest Management Plan (IPMP). All measures will follow WBG EHS Guidelines and industry best practices, with details provided in relevant management plans to be developed as part of site specific ESIA or ESMPs.	No gaps identified. ESS3 is aligned with the national legislation. Both ESS3 and national law promote sustainable utilization of water resources, energy efficiency and diversified energy mix.
4. Community Health and Safety Relevant	Relevance: ESS4 is relevant because the irrigation schemes rely on existing dams as associated facilities there are likely to be residual risks related to dam or embankment failure, downstream flooding, unsafe canals and excavations, traffic accidents, hazardous materials, water contamination, vector-borne disease, labour influx, GBV/SEA, and inadequate emergency preparedness, all of which may affect nearby communities, particularly vulnerable groups. Other risks include increased traffic and road safety concerns from an increase in movement of vehicles and machinery, community exposure to hazardous materials such as agrochemicals and possible asbestos in existing infrastructure and the need for robust emergency preparedness and response mechanisms.	No gaps identified. ESS3 and the national legislation provide for the protection of safety and health of the communities in which the subproject activities will be implemented. For example, both ESS4 and national law require that the project protects the community from communicable diseases, exposure to dust and hazardous materials, road traffic injuries/death, anti-social behaviour of workers including SEA/SH incidents towards the local community.

	Compliance: The project will ensure these risks are systematically assessed and managed in line with ESS4 and mitigation measures and management plans detailed in ESMPs. Compliance will require assessment of the current conditions of the dams, review of operation and maintenance arrangements, and recommending corrective actions. Site-specific ESIAs, ESMPs, SEA/SH Action Plans, emergency preparedness and response measures, and accessible grievance mechanisms to be prepared and implemented in line with GIIPs, the World Bank WBG EHSs and the Zambian legislation. Special attention will be given to needs of vulnerable groups, including women, children, and persons with disabilities, to ensure inclusive and equitable project benefits and risk mitigation.	
5. Land Acquisition, Restrictions on Land Use and Involuntary Resettlement	Relevance: ESS5 is relevant because the development, expansion, upgrading, and rehabilitation of irrigation schemes and associated facilities may require additional land, alter existing land uses, restrict access to land or natural resources, affect assets and livelihoods, and result in physical and/or economic displacement. These impacts may affect individuals and communities, including both formal and informal land users, even where project activities primarily rely on existing infrastructure Compliance: As the specific locations and scale of impacts are not yet defined, environmental and social assessments will be undertaken through the feasibility studies to identify land acquisition, and displacement impacts and determine the appropriate ESS5 instruments. A resettlement policy framework annexed to this ESMF has been prepared to guide the process and the project should ensure site-specific Resettlement Action Plans (RAPs) are prepared, disclosed, consulted upon, and implemented, as required, once the nature and extent of impacts are confirmed and before the relevant works commence.	The key gap between ESS5 and the national legislative and regulatory framework lie in non-eligibility for compensation for the project affected persons (PAPs) illegally settled on a project land. The national law does not recognize illegal settlers on a project land as being eligible for compensation while ESS5 demands that illegal settlers be compensated despite being illegally settled on the project land prior to the relocation of the said persons.
6. Biodiversity Conservation and Sustainable Management of Living Natural Resources	Relevance: The project activities have the potential to impact natural habitats, biodiversity, and ecosystem services. Project activities will be implemented in multiple provinces, including areas around existing rehabilitated dams, and may involve abstraction of surface and groundwater, infrastructure development, and intensification of agricultural production. These interventions could affect aquatic and terrestrial habitats, species of concern, and ecosystem services, and may	No gaps identified. ESS6 and the national legislation adequately provide for the protection and conservation of protected areas such as wetlands, national parks, national forests and biodiversity. Therefore, ESS6 is well aligned with the national legislation.

	also introduce risks related to the use of agrochemicals and invasive species. Compliance: Compliance: The project will implement the ESMF screening criteria to identify and classify modified, natural, and critical habitats and areas of high biodiversity value before subproject approval. It will apply the mitigation hierarchy throughout the project life cycle, avoid or minimize impacts on sensitive habitats, and promote climate-smart, water-efficient agriculture and resilient infrastructure in accordance with GIIPs and WBG EHSs. Agrochemical risks will be managed through the Integrated Pest Management Plan annexed to this ESMF, including controls on pesticide and fertilizer use, runoff, contamination, and invasive species. These measures will also be included in site specific E&S instruments to be implemented and monitored. confirm.	
8. Cultural Heritage	Relevance: ESS8 is relevant to the project because Project activities will involve earthworks, excavation, and infrastructure development which may result in direct impacts such as disturbance, damage, or destruction of archaeological sites, historical structures, or other cultural heritage. Indirect impacts may include changes to the setting or accessibility of cultural heritage sites, or disruption of intangible heritage practices linked to land and water use. Compliance: To mitigate against cultural heritage loss, the project has developed the Chance Finds Procedure as part of the ESMF which will also be included in site specific ESIs/ESMPs.	No gaps identified. ESS8 is aligned with the national law on Cultural Heritage. Both ESS8 and the national provide for the protection and preservation of both intangible and tangible cultural heritage.
10. Stakeholder Engagement and Information Disclosure	Relevance: Stakeholder engagement is relevant because project activities may affect smallholder farmers, Water Users Associations, communities near irrigation schemes, and disadvantaged or vulnerable groups, while also involving government agencies, private sector actors, civil society organizations, and development partners are categorized into project-affected persons (PAPs) or interested parties (IPs). Compliance: The project will implement stakeholder engagement throughout its lifecycle to identify and address stakeholder views and concerns in subprojects design and implementation. The disclosed Stakeholder Engagement Plan, including the project-level Grievance Redress Mechanism, will guide inclusive consultations.	Like ESS1, no major gaps identified. Both ESS10 and the national law on environment demand for stakeholder consultations and disclosure of E&S instruments prepared for the project. However, the national law/policy on the inclusion of the vulnerable groups during the ESIA process is not clearly defined despite. Therefore, ESS10 will be used as a more stringent requirement for the inclusion of vulnerable groups in the ESIA process.

3.4 World Bank Group Environmental Health and Safety Guidelines

The World Bank Group Environment, Health and Safety Guidelines (EHSs) are technical reference documents with general and industry-specific examples of Good International Industry Practices (GIIPs). They define acceptable pollution prevention and abatement measures and emission levels in World Bank financed projects. The EHS Guidelines contain the performance levels and measures that are generally considered to be achievable.

3.4.1 General Environmental Health and Safety Guidelines

The World Bank Group General Environmental, Health and Safety Guidelines provide technical guidance GIIPs for managing risks that may arise during implementation of the ISAT Project and should be applied together with relevant industry-specific EHS Guidelines. For irrigation infrastructure, water storage and conveyance systems, access roads, agricultural production, storage, and associated value-chain activities, the Guidelines will inform measures to prevent and control dust, air emissions, noise and vibration, soil erosion, wastewater, solid and hazardous waste, agrochemical spills, water pollution, and inefficient use of energy and water. They will also guide occupational health and safety measures, including hazard identification, worker training, safe equipment operation, use of personal protective equipment, emergency preparedness, first aid, and management of physical, chemical, and biological hazards. Community health and safety provisions will address traffic and road safety, communicable and vector-borne diseases, exposure to hazardous materials, unsafe excavations and canals, infrastructure safety, and emergency response. These requirements should be incorporated into environmental and social assessment instruments, contractor specifications, codes of conduct, site-specific management plans, monitoring arrangements, and incident-reporting procedures.

3.4.2 Industry Sector Environmental Health and Safety Guidelines

The World Bank Group Industry Sector Environmental, Health and Safety Guidelines applicable to the ISAT Project include the Guidelines for Annual Crop Production, which address soil conservation, water management, nutrient and pesticide use, biodiversity, waste, occupational health and safety, and community risks associated with irrigated agriculture. Where relevant to specific subprojects, the Guidelines for Aquaculture, Food and Beverage Processing, and Mammalian Livestock Production should also be applied alongside the General EHS Guidelines, particularly for irrigation infrastructure, agro-processing, livestock, storage, and value-chain activities.

4. Environmental and Social Baseline Conditions

4.1 Geographical Location of Potential Project Sites

The project will be implemented countrywide in selected districts of Southern Province, Eastern, Western, North-Western, Central, Copperbelt, Northern, Luapula and Muchinga Provinces targeting the 8 dams rehabilitated under IDSP and 21 COBSI sites supported by JICA.

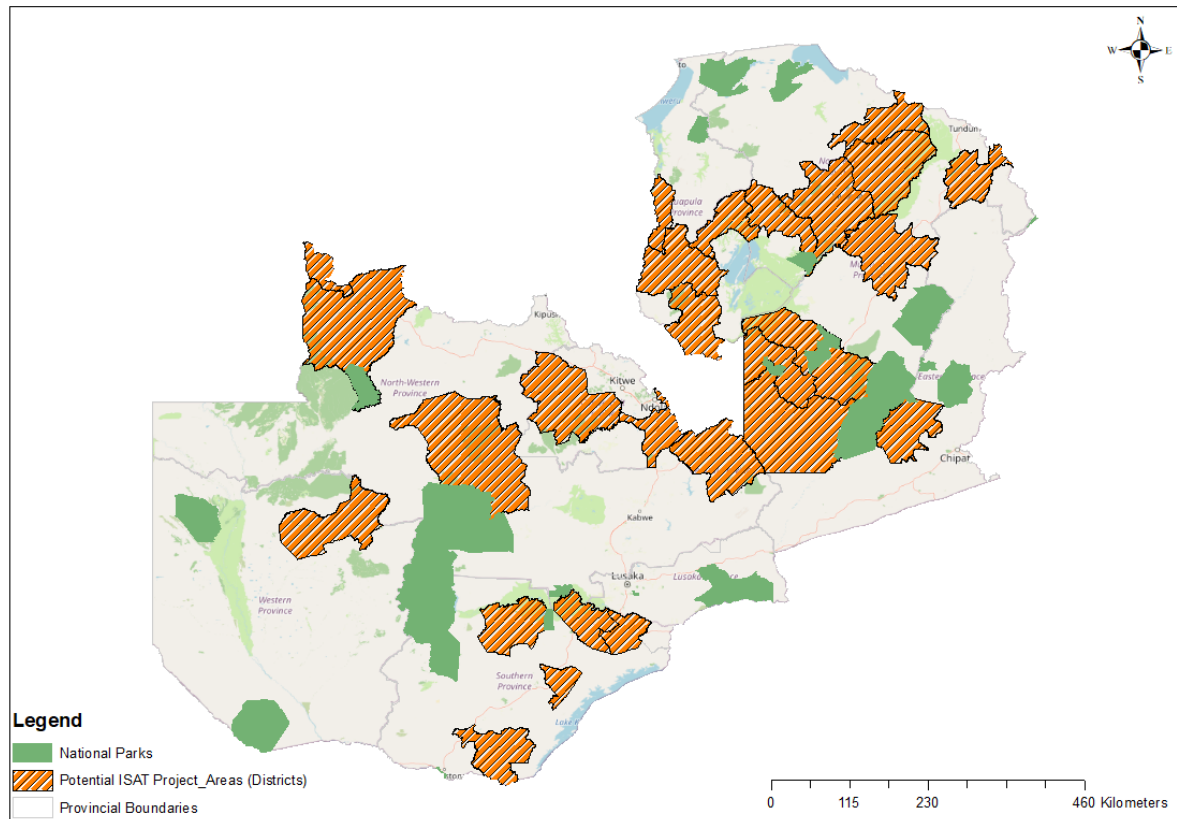


Figure 1: Potential ISAT Project Sites. Source: Satellite data



Figure 2: A rehabilitated dam under IDSP (Ngolongozya, Zimba District, Southern Province)



Figure 3: One of the COBSI sites supported by JICA

4.2 Existing Environmental and Social conditions

4.2.1 Southern Province

Southern Province with a population of 2,388,091 people (2022 census) is located in southern Zambia and includes plateau, escarpment and Zambezi Valley landscapes, with Choma as the provincial capital. The province is largely rural and agriculture-based, with project-relevant districts including areas characterized by dispersed settlements, customary land tenure, rain-fed farming, livestock rearing, and dependence on local water resources. The province experiences a tropical savanna climate with cool, dry, hot dry, and warm, wet seasons. Rainfall is variable and generally low to moderate, with recurrent droughts and occasional flooding, especially in valley and low-lying areas. Climate variability affects crop production, livestock, water availability, and household food security. It is classified largely under Agro-Ecological Region I and receives less than 800 mm of annual rainfall and frequently faces prolonged dry spells and late-onset rainy seasons. Limited rainfall heavily limits maize and crop yields across farming hubs like Kalomo, Choma, and Mazabuka. While drought is the primary concern, extreme weather events also bring flash floods that submerge fields, destroy rural infrastructure, and displace communities particularly in low-lying areas like Namwala and the Kafue Flats. There are three major seasons: a cool dry season from April to August, a hot dry season from August to November, and a warm wet season from November to April. The maximum heat is experienced during November, while the maximum rainfall is received during December.

Rapid population growth, charcoal production, and the expansion of agricultural land have drastically reduced forest cover. This vegetation loss exacerbates soil erosion, land acidification, and localized climate shifts. Unreliable rainfall and drying rivers have led to a severe shortage of water for crop irrigation, livestock (such as the province's significant cattle population), and domestic use. Agriculture is the primary economic activity in Southern Province with a mix of small holders and commercial

maize farms across the province. Compared to other major agricultural regions, such as Eastern Province, Southern Province has more abundant land and access to water but receives less rainfall.

Water resources are linked mainly to the Zambezi River Basin, Lake Kariba, the Kafue River system, seasonal streams, wetlands, and groundwater. Groundwater availability varies, and some escarpment and valley areas face limited and unreliable water access. Soil erosion, deforestation, and reservoir siltation are key concerns for water storage and irrigation-related infrastructure.

Vegetation includes miombo woodland on plateau and escarpment areas, mopane and acacia savanna in drier lowlands, riverine vegetation along watercourses and floodplain grasslands around wetland systems. Sensitive ecological features include wetlands, riparian zones, national parks, game management areas and wildlife corridors. Key pressures include deforestation, charcoal production, overgrazing, conversion of woodland to farmland, invasive species and human-wildlife conflict.

Soils range from sandy loams and clays on the plateau to shallow, rocky and sandy soils in escarpment and valley areas. Land use is dominated by smallholder agriculture, livestock rearing, commercial farming in selected districts, conservation and tourism areas, and energy-related activities around Lake Kariba and Maamba.

The population is predominantly rural, with livelihoods based mainly on rain-fed agriculture, livestock, fishing, informal trade, charcoal production and tourism-related activities in and around Livingstone. Customary land tenure is common in rural areas, while statutory leaseholds are more prevalent in commercial farming areas.

Rural poverty remains high, and vulnerable groups include women, female-headed households, youth, persons with disabilities, elderly persons and households with limited access to productive land, water, finance or extension services. Women play a central role in agriculture and household food security but often face constraints in land ownership, decision-making, credit and access to agricultural inputs and services.

Access to health, education and social services is more limited in remote rural, escarpment and valley communities. Key public health concerns include malaria, HIV/AIDS, malnutrition, and waterborne diseases, which may be exacerbated by poor WASH conditions, seasonal flooding, drought-related food insecurity, and long distances to facilities.

4.2.2 Western Province

Mongu is the Provincial Capital of Western Province of Zambia. The province experiences a dynamic, highly vulnerable environment dominated by the upper Zambezi basin and is highly prone to drought. Prolonged dry spells frequently ruin planted crops and threaten both water and energy supplies. Conversely, during heavy precipitation years, the region battles flash floods and widespread waterlogging in low-lying areas, which can lead to seed rot and disrupted agricultural productivity. However, seasonal flooding is critical for natural irrigation, supporting huge herds of cattle and allowing small-scale farmers to grow crops like maize and rice. Further, seasonal shifts are extreme. The hot dry season (Sept–Oct) brings temperatures climbing into the mid-30s°C, while the cool dry season (May–Aug) can bring much lower temperatures and occasional ground frost at night. Climate change compounded by erratic weather patterns creates a high-risk cycle of severe droughts and flash floods, profoundly impacting food security, water supplies, and the ecological health of the region.

The geography of the province is dominated by the Barotse Floodplain of the Zambezi River, extending from the confluence of the Zambezi with the Lungwebungu and Kabompo Rivers at the northern border of the province, to a point below Senanga and above the Ngonye Falls in the south. The Barotse Flood plain is the most prominent feature. It is a vast 5,500-kilometer wetland that stretches about 250 kilometers. The plain experiences seasonal inundation from upstream rainfall between December and

June. Much of the landscape rests on ancient, gently undulating Kalahari sand dunes. The region is covered by savanna grasslands, miombo woodlands, and scattered teak forests.

The dominant soils in Western Province are on Kalahari sands which favour tree growth. Most of Western Province is wooded with the remaining part being unsuitable for tree growth due to waterlogged soils and/or flooding. About 5% of the total surface area of Western Province, belongs to the Demarcated Forest or Forest Estate. The Forest Estate consists of Local Forest and National Forest. The wooded areas near settlements are used for fuelwood, poles and shifting cultivation of mainly cassava and/or bulrush millet

Generally, less than 2% of the forests areas is used for crops at any particular moment. After a few crop harvests the area has to be rested and forest regeneration takes place. Up to 50% of the forest area may be in the forest regeneration phase. Even outside the latter there is hardly virgin forest to be expected due to shifting cultivation, burning, logging, etc. Western Province is home to the Sioma-Ngwezi and Liuwa Plains National Parks hosting a variety of wildlife including wildebeest.

Western Province has a population of 1,375,604 people based on the 2022 census of population and housing. The population in the province is predominantly rural, with livelihoods based mainly on rain-fed agriculture, livestock, fishing, informal trade and charcoal production. The dominant ethnic group are the Lozi, Mbunda, Nkoya and other groups. Customary land tenure is common in rural areas, while statutory leasehold is more prevalent in urban areas.

Rural poverty remains high, and vulnerable groups include women, female-headed households, youth, persons with disabilities, elderly persons and households with limited access to productive land, water, finance or extension services. Women play a central role in agriculture and household food security but often face constraints in land ownership, decision-making, credit and access to agricultural inputs and services.

Access to health, education and social services is more limited in remote rural communities. The province is also faced with challenges of malaria prevalence, HIV/AIDS, malnutrition and waterborne diseases, which may be exacerbated by poor WASH conditions, seasonal flooding, drought-related food insecurity and long distances to facilities.

4.2.3 North-Western Province

The province lies in the watershed between DR Congo and Zambezi river systems. Solwezi is the provincial capital of North- Western Zambia. North-Western Province features a humid, tropical climate with distinct wet and dry seasons. It is characterized by reliable rainfall (over 1,200mm annually), highly acidic plateau soils, and vast protected forest reserves. While rich in timber, the environment is increasingly pressured by large-scale mining operations and localized deforestation. Temperature in North-Western province varies by season, with cool dry months from April to August, hot dry periods leading up to October, and warm wet weather spanning November to April. Precipitation in the province is highly reliable with heavy downpours, especially in northern districts like Mwinilunga and Solwezi.

Soils are predominantly acidic and heavily leached, sometimes featuring Kalahari sands in the western fringes (like Kasempa). Traditional shifting agriculture (chitemene) is common, which, combined with natural scouring from heavy rains, leads to localized depletion of soil fertility. The reliable rains allow successful cultivation of cassava, sorghum, finger millet, maize, and sweet potatoes. The province is heavily timbered with savannah vegetation and large tracks of dry evergreen forests. Nearly half (approx. 47%) of the province is made up of strictly protected forests and game management reserves.

The major rivers in the province include the Zambezi River, Kafue River, Kabompo River, Lumwana River and Lunga River. Approximately 80% of the area is covered by mature miombo woodlands, making North-Western Zambia's most densely forested province and a key source of timber, non-timber

forest products, and biodiversity. These woodlands support wildlife habitats and contribute to carbon sequestration, though deforestation pressures from mining and agriculture have increased in recent decades. Busanga Swamps and plains in Kafue National Park, West Lunga National Park and Zambezi grasslands in the far west of the state are the major national parks in the Province.

The region serves as a major copper mining hub (e.g., Sentinel, Lumwana). Large-scale open-pit mining, alongside the development of haul roads and power lines, has contributed to significant deforestation and habitat loss.

The population in North-Western Province is predominantly rural, with livelihoods based mainly on rain-fed agriculture, livestock, fishing, informal trade and charcoal production. The population of North-Western province is estimated at 1,278,357 people (2022 census). The Luvale, Kaonde and Lunda are the dominant ethnic group and other groups. Customary land tenure is common in rural areas, while statutory leasehold is more prevalent in urban districts.

Rural poverty remains high, and vulnerable groups include women, female-headed households, youth, persons with disabilities, elderly persons and households with limited access to productive land, water, finance or extension services. Women play a central role in agriculture and household food security but often face constraints in land ownership, decision-making, credit and access to agricultural inputs and services.

Access to health, education and social services is more limited in remote rural communities. Key public health concerns include malaria, HIV/AIDS, malnutrition and waterborne diseases, which may be exacerbated by poor WASH conditions, seasonal flooding, drought-related food insecurity and long distances to facilities.

4.2.4 Copperbelt province

The Copperbelt Province whose provincial capital is Ndola faces severe environmental challenges primarily driven by intensive copper mining, rapid urbanization, and deforestation. Major issues include toxic soil/groundwater contamination, poor air quality from industrial emissions, and heavy pressure on local woodlands. Tailings dam failures and seepage have severely polluted vital water bodies like the Kafue and Mwembeshi rivers, as well as local aquifers, forcing temporary shutdowns of drinking water supplies. Historic and active mining operations have resulted in high levels of particulate matter and Sulphur dioxide emissions, leaving soils tainted with heavy metals.

The province further suffers from significant deforestation, driven by a dense population, charcoal burning, and historic agricultural clearing. Inactive or abandoned mining areas often feature unreclaimed (not restored) land, gaping pits, and eroded waste heaps.

The province generally lies on an undulating plateau (900–1,500m) and experiences three distinct seasons: Cool, dry winters: May to July (average temp ~20°C, minimal rain). Hot, dry season: August to October (max temps up to 36°C). Wet season: November to April (accounts for over 90% of the region's ~1350 mm annual precipitation).

According to Chidumayo (2025), between 1937 and 1983 a total of 391 400 ha of woodland, representing 51% of the 768 900 ha in the Zambia Copperbelt, had been deforested for industrial and household wood fuel. The rapidly growing demand for charcoal by the increasing urban population, and the growing problem of acid dust and rain pollution from copper smelters, pose serious threats to forest conservation in this industrial region of Zambia. Current forest conservation is restricted to the establishment of exotic forest plantations and recently deforested areas are left to regenerate naturally. The Copperbelt vegetation is dominated by *Brachystegia-Julbernardia* woodland.

The 2022 census estimates the population of the Copperbelt Province at 2,768,192 people. The population of Copperbelt is concentrated in the urban towns of Ndola, Kitwe, Chingola, Luanshya,

Mufulira, Kalulushi and Chililabombwe due to mining activities. However, in the rural districts of Lufwanyama, Mpongwe and Masaiti the population is predominantly rural, with livelihoods based mainly on rain-fed agriculture, livestock, fishing, informal trade and charcoal production. The Lamba are the historically dominant ethnic group. However, due to the mining activities in the province, people from other regions especially the northern part of Zambia migrated into the province. The influx of people into the province largely influenced the demographics of the province with Bemba being a widely spoken language in the province at the expense of the local language with Lamba being relegated to rural districts of the province. Customary land tenure is common in rural areas, while statutory leasehold is more prevalent in urban areas.

Rural poverty remains high, and vulnerable groups include women, female-headed households, youth, persons with disabilities, elderly persons and households with limited access to productive land, water, finance or extension services. Women play a central role in agriculture and household food security but often face constraints in land ownership, decision-making, credit and access to agricultural inputs and services.

Access to health, education and social services is more limited in the remote rural communities. The province experiences public health concerns including malaria, HIV/AIDS, malnutrition and waterborne diseases, which may be exacerbated by poor WASH conditions, seasonal flooding, drought-related food insecurity and long distances to facilities.

4.2.5 Luapula province

Mansa District is the provincial headquarters of Luapula Province. The region features extensive water bodies, including the Luapula River, Lake Bangweulu and Lake Mweru, and receives the highest annual rainfall in Zambia (1,000–1,500 mm). This environment supports robust agriculture and fishing, though it faces challenges with water pollution and biodiversity loss.

Approximately 40% of the province consists of wetlands, swamps, and major lakes (Mweru and Bangweulu), alongside the Luapula River. Altitude ranges from 900m in the valley to 1,300m on the Kawambwa plateau. While the province features rich aquatic biodiversity, studies indicate moderate ecological impairment with seasonal water quality fluctuations caused by turbidity, iron, and faecal coliforms.

The wetlands and forests in the province support diverse animal species. Lake Bangweulu is famous for its rare shoebill stork, while the Bangweulu Wetlands host endemic fish and bird species. The nearby Kasanka National Park, bordering Luapula, offers sightings of sitatungas, elephants, and the iconic bat migration, the largest mammal migration in the world.

The population estimated at 1,519,478 people (2022 census) is predominantly rural, with livelihoods based mainly on rain-fed agriculture, livestock, fishing, informal trade and charcoal production. The dominant ethnic group in the province are Lunda, Ushi, Bemba and other groups. Customary land tenure is common in rural areas, while statutory leasehold is more prevalent in commercial farming areas.

Rural poverty remains high, and vulnerable groups include women, female-headed households, youth, persons with disabilities, elderly persons and households with limited access to productive land, water, finance or extension services. Women play a central role in agriculture and household food security but often face constraints in land ownership, decision-making, credit and access to agricultural inputs and services.

Access to health, education and social services is more limited in remote rural communities. Key public health concerns include malaria, HIV/AIDS, malnutrition and waterborne diseases, which may be exacerbated by poor WASH conditions, seasonal flooding, drought-related food insecurity and long distances to facilities.

4.2.6 Northern province

The Northern Province lies mainly on the great southern African plateau which has been uplifted to an elevation around 1200 metres above sea level. Rift valleys extend clockwise around the province from the north-west to the south. These rift valleys are sometimes outside the borders of the province, as in the case of the Luapula-Mweru valley to the north-west and the Lake Rukwa and Lake Malawi rift valleys to the north east; but the escarpments of the Lake Mweru-wa-Ntipa-Lake Tanganyika rifts in the north, and the Luangwa Valley rift in the east and south-east are just within the province. In places the rift valleys have pushed up highlands: around Kambole and Mbala above Lake Tanganyika, the Muchinga escarpment above the Luangwa valley, and the highlands along north-eastern border with Tanzania and Malawi which culminate in the Mafinga Hills and Nyika Plateau.

These features produce a diverse landscape that varies and poses different challenges, particularly to highway construction, as one moves from one part to another. The Mafinga Hills, which include the highest point in the country at 2301 metres above sea level, once formed a formidable barrier between the Northern and Eastern Provinces that few but the best 4-wheel drive vehicles dare to cross, especially during the rainy season. The shortest road link between the two provinces is now eased by the rehabilitation of the Isoka-Muyombe Road, which traverses their lower slopes.

The Northern Province in Zambia experiences a high-rainfall, heavily vegetated agro-climate, and abundant freshwater resources. However, the area faces rising ecological pressures, including significant deforestation, localized soil degradation, and seasonal flooding, though it remains less vulnerable to drought than the southern regions.

The province accounts for roughly 16% of the entire SADC region's surface water reserves. It is anchored by Lake Tanganyika and crisscrossed by a high volume of rivers including the Chambeshi River and its tributaries. The abundant waterways allow for robust year-round wetland agriculture.

Land clearing for agricultural and charcoal production has resulted in an estimated loss of tens of thousands of hectares of forest annually, directly contributing to micro-climate changes and erratic weather events. While droughts are rare, the extremely high precipitation creates challenges with waterlogging and seasonal flooding along the Chambeshi and Luangwa valleys, which often leave roads impassable. Poor farming practices (chitemene) lead to localized soil acidification and nutrient loss.

Like the in other rural provinces, the population in Northern Province is predominantly rural, with livelihoods based mainly on rain-fed agriculture, livestock, fishing, informal trade and charcoal production. Northern Province has a population of 1,623,853 people (2022 census). The Bemba are the dominant ethnic group, alongside Mambwe, Lungu and other groups. Customary land tenure is common in rural areas, while statutory leasehold is more prevalent in commercial farming areas.

Rural poverty remains high, and vulnerable groups include women, female-headed households, youth, persons with disabilities, elderly persons and households with limited access to productive land, water, finance or extension services. Women play a central role in agriculture and household food security but often face constraints in land ownership, decision-making, credit and access to agricultural inputs and services.

Access to health, education and social services is more limited in remote rural communities. The province grapples with public health problems such as high malaria prevalences, HIV/AIDS, malnutrition and waterborne diseases, which may be exacerbated by poor WASH conditions, seasonal flooding, drought-related food insecurity and long distances to facilities.

4.2.7 Eastern province

Eastern Province is the easternmost of Zambia's ten provinces, encompassing approximately 52,056 square kilometres of territory characterized by plateaus and the Luangwa Valley, with Chipata serving

as its capital and administrative hub. The Province features diverse topography spanning a gently rolling plateau (900m to 1,200m) and the lower-lying Luangwa Valley.

The environment is a recognized climate hotspot, balancing rich biodiversity with intense environmental challenges driven by global climate shifts. Generally warm, with average monthly highs ranging from 21°C to 26°C in September and October, dipping to 15°C during the cooler June and July months. Rainfall averages about 800mm to 1,000mm annually, primarily concentrated between December and March. The region experiences high climatic variability, alternating between severe dry spells (or droughts) and heavy downpours that cause flash flooding in lower-lying areas like the Luangwa Valley and sections of districts like Petauke, Katete, and Chadiza.

Soils are mostly well-drained but porous loamy-sands and sand Alfisols, interspersed with clay and loam Luvisols. These soils have low water and nutrient-holding capacities. The landscape is often characterized by seasonally waterlogged, low-lying areas known locally as dambos.

The Luangwa River constitutes the primary hydrographic feature of Eastern Province, Zambia, flowing southwestward for approximately 800 kilometers from its headwaters near the Malawi border to its confluence with the Zambezi River. As one of Zambia's four major rivers, it forms the core of the province's drainage system, channeling surface runoff from surrounding plateaus and valleys into the broader Zambezi basin. Key tributaries, such as the Lukusashi River originating in the Mafinga Hills, augment its flow and contribute to the network of seasonal streams that characterize the region's hydrology.

While the province is endowed with dense indigenous woodlands, it faces ongoing deforestation driven by agricultural expansion, illegal logging, charcoal production, and uncontrolled bushfires. According to Simute et al., (1998) among the important food-producing trees in Eastern Province are *Hibiscus* (leaves), *Cordyla africana* (fruit, seeds are cooked), *Tamarindus indica* (fruit), *Moringa oleifera* (leaves and flowers) and cashew nut (fruit, nuts are roasted). Increased cultivation or protection of such species and use in agroforestry systems would ensure continued good access to food and many other products. Other common trees in the province include *Pterocarpus angolensis* (Mlombe), *Pericopsis angolensis* (Muwanga), and *Azelia quanzensis* (Mpapa, Mupapa).

Several national parks and privately-owned conservation areas exist in Eastern Province. National parks include the South and North Luangwa National Parks, Luabambe National Park and the Lukusuzi National Parks which host a variety of wildlife. However, poaching is rampant, particularly in the Luangwa Valley's protected areas, where illegal hunting for bushmeat and trophies disrupts ecosystems despite partial mitigation. Persistent snaring and firearm use have reduced wildlife populations over decades, with anthropogenic pressures compounding habitat fragmentation from deforestation.

The population in Eastern Province is estimated at 2,462,682 people (2022 census) and is predominantly rural, with livelihoods based mainly on rain-fed agriculture, livestock, fishing, informal trade and charcoal production. The Chewa are the dominant ethnic group, alongside Ngoni, Nsenga, Tumbuka and other groups. Customary land tenure is common in rural areas, while statutory leasehold is more prevalent in commercial farming areas.

Rural poverty remains high, and vulnerable groups include women, female-headed households, youth, persons with disabilities, elderly persons and households with limited access to productive land, water, finance or extension services. Women play a central role in agriculture and household food security but often face constraints in land ownership, decision-making, credit and access to agricultural inputs and services.

Access to health, education and social services is more limited in remote rural communities. Key public health concerns include malaria, HIV/AIDS, malnutrition and waterborne diseases, which may be exacerbated by poor WASH conditions, seasonal flooding, drought-related food insecurity and long distances to facilities.

4.2.8 Muchinga province

Muchinga Province whose provincial capital is Chinsali District experiences a highly diverse environment, categorized primarily by Agro-Ecological Zones II and III, offering reliable, high-precipitation farming conditions and vital biodiversity hotspots. However, the region faces mounting environmental degradation such as deforestation and water quality threats driven by human activities. Temperatures are generally warm, featuring maximums ranging from 25°C to 32°C during the rainy season, dropping to cool, sometimes windy lows of about 6°C to 16°C during the dry, colder months. Highly reliable rainfall patterns, with annual averages ranging from 974mm to over 1,100mm, making the province a highly productive agricultural hub.

The province is marked by dramatic landscapes, including the Muchinga Escarpment, rolling plateaus, and the mountainous Mafinga Hills (which rise near the Malawian border). The Luangwa River (a major Zambezi tributary) and the Chambeshi River (which drains into the Congo basin) provide crucial aquatic ecosystems and support local agriculture and livestock.

Mafinga Hills (Mafinga mountain) are found in Mafinga district of Muchinga province in the North-Eastern part of Zambia. The mountain range extends to about 23,000 hectares (230Km²). Around 67% of the mountain range is designated as a protected forest reserve hosting dozen of endemic plant and bird species. On a global scale, the Mafinga hills are designated as a Key Biodiversity Area (KBA).

The Mafinga hills belong to an ecoregion known as tropical and subtropical savannas and grasslands. The Mafinga Hills are a critical landscape to the hydrology of the Luangwa river headwaters as they host the source of the river which drains Muchinga Eastern and part of Northern provinces. Downstream, the Luangwa River is a major (and in some cases the only) source of water for domestic use and irrigation. The river is also a wildlife “sanctuary” in Zambia as it hosts some of the world’s endangered animal species and is home to the highest population of hippos in the world (Chisanga et al., 2015).

According to Fanshawe, 1973 the highest parts of the mountains are predominantly covered by montane grassland. Hill miombo woodland covers most slopes, sometimes up to the crests. Some ridges are almost completely bare or with a sparse cover of montane scrub. Where the valleys begin to flatten out riparian forest is bordered by a narrow fringe of secondary chipya, reduced almost to a very luxuriant scrub of shrubs and tall herbs. Montane forest can be vaguely differentiated into a moister submontane forest along the streams and a drier montane forest as a fringe.

Three national parks are located in the province. There are Lavushi Manda National Park, North Luangwa National Park, and South Luangwa National Park. The latter is shared with Eastern and Central Provinces.

Muchinga Province has the smallest population estimated at 922,213 by the 2022 census of population and housing. The population in Muchinga Province is predominantly rural, with livelihoods based mainly on rain-fed agriculture, livestock, fishing, informal trade and charcoal production. The Namwanga are the dominant ethnic group, alongside Bisa, Bemba, and other groups. Customary land tenure is common in rural areas, while statutory leasehold is more prevalent in commercial farming areas.

Rural poverty remains high, and vulnerable groups include women, female-headed households, youth, persons with disabilities, elderly persons and households with limited access to productive land, water, finance or extension services. Women play a central role in agriculture and household food security but often face constraints in land ownership, decision-making, credit and access to agricultural inputs and services.

Access to health, education and social services is more limited in remote rural communities. Key public health concerns face by the province includes malaria, HIV/AIDS, malnutrition and waterborne

diseases, which may be exacerbated by poor WASH conditions, seasonal flooding, drought-related food insecurity and long distances to facilities.

4.2.9 Central province

Central Province, Zambia experiences a tropical, monsoonal climate characterized by three distinct seasons: a warm-wet season (Nov–Mar), a cool-dry season (Apr–Aug), and a hot-dry season (Sep–Oct). The environment faces critical challenges including deforestation, soil degradation, and vulnerability to severe climate impacts. Temperatures range from cool minimums of 14°C to 20°C in the winter months, to hot maximums exceeding 30°C to 33°C in the summer and hot-dry months. The region is highly vulnerable to climate-induced hazards like severe droughts and flash floods. These extreme conditions significantly impact agricultural productivity and local food security.

The province hosts the Lukanga Swamp, a major Ramsar wetland site, and the Kafue River. Aquatic ecosystems face notable threats from industrial pollution, heavy metal contamination, and climate variability.

The province features highly fertile soils ideal for maize and cotton. However, clearing land for agriculture and charcoal production are primary drivers of localized deforestation and soil degradation.

The 2022 census of population estimates the population of Central Prince at 2,261,336. The population in Central Province is predominantly rural, with livelihoods based mainly on rain-fed agriculture, livestock, fishing, informal trade, and charcoal production. The Lala and Swaka are the dominant ethnic groups and other groups. Customary land tenure is common in rural areas, while statutory leasehold is more prevalent in commercial farming areas.

Rural poverty remains high, and vulnerable groups include women, female-headed households, youth, persons with disabilities, elderly persons and households with limited access to productive land, water, finance or extension services. Women play a central role in agriculture and household food security but often face constraints in land ownership, decision-making, credit and access to agricultural inputs and services.

Access to health, education and social services is more limited in remote rural communities. Key public health concerns include malaria, HIV/AIDS, malnutrition and waterborne diseases, which may be exacerbated by poor WASH conditions, seasonal flooding, drought-related food insecurity, and long distances to facilities.

4.3 Social Baselines

4.3.1 Land tenure and ownership patterns in Zambia

Zambia's land tenure system is a blend of customary and statutory law recognized by the constitution and land policy which govern land in all parts of the Country, with customary land making up about 94% of the country's land. This land is managed by traditional authorities, such as chiefs, who allocate land use rights to individuals or families. Customary land is often passed down through generations within a family, and it cannot be bought or sold in the open market. State land, which constitutes about 6% of the land, is under the management of the Zambian government and can be leased, bought, and sold on the formal real estate market. The Lands Act of 1995 recognizes both customary rights and formal ownership, but it does not significantly alter the system.

Zambia has a dual land tenure system recognized by the constitution and land policy which govern land in all parts of the Country. The dual land tenure system in Zambia presents challenges such as tenure insecurity, land disputes, and the need for reforms to promote an efficient and effective land alienation system. The system is also affected by urbanization, speculation, and conversion to state land, which can exclude marginal populations from accessing land resources.

In 2021, a new land policy was launched in Zambia with a 50% provision of land to all women. The new land policy aims at gender equality in land ownership in line with the Southern African Development Community (SADC) and African Union (AU) protocols. This policy deals specifically with the requirement of allocating land to women, the youth and disabled people. Even under statutory land, gender inequalities still remain persist despite policy pronouncements intended to deal with gender inequalities in land ownership which is a serious problem among poor women in all the ten provinces. In all these provinces, women are the minority in terms of land ownership in both urban and rural communities.

4.3.2 Women's access to land, irrigation, finance, and markets

In Zambia, women constitute the backbone of rural agriculture, making up a substantial portion of the labor force and playing a key role in household food production and rural livelihoods. Despite their critical contribution, women face persistent barriers in accessing productive resources, including land, finance, and extension services. This challenge is compounded by the broader structural limitations of Zambia's agriculture sector, which, although contributing about 40% to national GDP and employing over 80% of the population, remains underfunded and heavily reliant on smallholder, rain-fed farming systems. Notably, financial exclusion continues to be a major constraint. Less than 10% of formal bank lending targets agriculture, with rural and women farmers particularly underserved due to weak infrastructure and limited outreach. As a result, many farmers increasingly rely on informal community-based financial mechanisms specifically known as Village Savings and Loan Associations (VSLAs) or village banks, although robust empirical evaluations of their effects on credit access and welfare outcomes are still lacking.

Though the country is susceptible to adverse weather conditions, the adoption of sustainable agricultural practices (SAPs) among smallholder women farmers is relatively low. A critical barrier is the lack of access to relevant and timely information. Traditional extension approaches, such as the "Training and Visit" system, are often prohibitively expensive and unsustainable given budgetary constraints. Moreover, agricultural extension services suffer from weak political support, resulting in limited coverage and inadequate reach, particularly among small-scale farmers in low and middle-income settings. Geographic isolation further compounds the challenge, as vast rural areas remain underserved. Even when extension services are available, a mismatch often exists between the information disseminated and the actual needs and contexts of farmers, reducing the relevance and effectiveness of advisory services. These systemic challenges collectively constrain the widespread adoption of sustainable practices in smallholder systems.

Information and Communication Technologies (ICTs) have witnessed substantial penetration across various regions, emerging as crucial tools for empowering smallholder farmers by enhancing decision-making capabilities to improve yields, incomes, and resilience. This shift is particularly important as traditional farming approaches, relying on farmers' experience, indigenous knowledge, and guesswork, are proving insufficient to address the growing complexities of modern agricultural challenges. While the adoption of digital tools has provided farmers with more accurate and timely access to information, enhancing their capacity to respond to changing conditions, digital agricultural initiatives in the Zambia are largely driven by non-state actors. These initiatives often suffer from limited coordination and insufficient government support, which reduces their scalability and impact.

4.3.3 Youth participation in agriculture, including vulnerable and disadvantaged groups

A study conducted by Trevor and Kwenye (2025) in Kitwe, Zambia shows that rural youth involvement in agriculture serves as a source of income generation and provides the much-needed labor force in critical farming activities among others. The study also revealed that rural youth involvement in agriculture is characterized with constraints that include lack of access to capital, poor storage facilities, poor road networks, poor access to agriculture insurance for farm produce, and lack of technical assistance. Further, despite the youths being some of the targeted recipients of subsidized inputs through Farmers Input Support Program (FISP), the subsidies are accessed through youth associations, requiring

formalization and membership fees that are beyond many poor households. Youths also lack land ownership rights as the land is owned by their parents thereby limiting their access to collateral.

Policymakers and donors increasingly rely on farmer organizations (FOs) when providing support to farmers. However, research findings suggest that targeted groups such as poorer households tend to participate less in FOs than richer ones. The physical capacity of the elderly and people living with disabilities as a disadvantaged group of farmers limits their performance and participation in agricultural activities.

4.3.4 Existing irrigation governance structures

Under the Irrigation Support Development Project (IDSP), the irrigation schemes are governed by the Community Land Trust (CLT) registered with the Registrar of Societies. The membership of the CLT comprises the site-specific irrigation scheme of beneficiaries with several committees within the structure. The Executive Committee (EXCO) is the summit of the CLT leadership drawn from the elected members consisting of the Chairperson, Secretary, and committee members. The mandate of the EXCO is to superintend over the affairs of the schemes on behalf of the beneficiaries. Within the EXCO are subcommittees including GRM and resettlement. The CLT also encompasses the water user groups (WUGs) that manage the usage of irrigation water, collect water user fees from the project beneficiaries within their membership and pay the fees to the Executive Committee of the CLT. The water user fees are used to maintain the irrigation water infrastructure.

Other irrigation schemes like the Manyonyo and Magobo, have adopted a cooperative governance structure to manage the affairs of the schemes.

The above governance structures are essential in rallying and organizing the beneficiaries around the common goals of the schemes as well as obtaining financial and technical support unlike the unregistered irrigation schemes.

4.3.5 Water sharing arrangements and downstream users.

The downstream water users will have the following rights:

- The right to receive a continuous flow of water, maintaining flow consistency;
- The right to water quality standards to prevent pollution and contamination; and
- Rights to access adequate water volume for agricultural, animal watering, domestic use or industrial purposes.

The project will ensure that water usage does not disadvantage the downstream users. This will be done through strict adherence to the water volumes allocation to be stipulated in Water Permits to be obtained from WARMA. Adequate measures will be implemented to prevent water pollution in conformity with the permit conditions from ZEMA and international best practices.

5. Potential Environmental and Social Risk, Impacts and Mitigation Measures

5.1 Overview of Key Risks and Impacts

5.2 Table 4 below highlights an overview of key E&S risks and impacts.

Table 4: Overview of Key Risks and Impacts

No.	Environmental Risks and Impacts	Social Risks and Impacts
1.	Water pollution	Community health and safety risks
2.	Soil erosion and siltation of surface water bodies	Physical and economic displacement risks
3.	Reduced environmental releases downstream	Financial/social exclusion of the vulnerable groups due to elite capture
4.	Deterioration in air quality due to dust generation and gaseous emissions	GBV/SEA/SH risks
5.	Waste generation of all types	OHS risks
6.	Human health risks due to use of pesticides	Livelihood impacts due to changes in land and water use patterns
7.	Climate change risks due to greenhouse gas emission from the burning of fossils.	Labor influx risks
8.	Biodiversity/habitat loss due to vegetation clearing	Cultural heritage risks associated with earthworks
9.	Road traffic risks.	Public health risks including water borne, air borne and vector borne diseases
10.	Noise and vibrations	HIV/AIDS and STIs
11.	Soil contamination and loss of fertility due to improper disposal of waste and overapplication of inorganic fertilizers	Ergonomic risks
12.	Exposure to asbestos-containing materials	Drowning risks
13.	Eutrophication of surface water bodies due to surface runoff loaded with nutrients	Exposure to open excavations and trenches (tripping hazards)

The project has proposed mitigation measures against the identified E&S risks and impacts as tabulated in Table 5 below:

Table 5: Environmental and Social Risks and Mitigation Measures

Preparation Phase			
Risks and Impacts	Mitigation measures	Performance Indicator	Responsible
Lack of integrating E&S aspects in subproject design and planning.	• Conduct site screening of all subprojects. • Determine E&S instruments to be prepared.	• All target sites screened. • E&S instruments prepared and cleared.	MoA
Design fault and construction of sub-standard infrastructure.	• Use of qualified staff: supervising engineers, contractors, and workers. • Workers to be certified with the Engineering Institution of Zambia and National Council for Construction. • Ensure adherence to road construction standards through enhanced supervision of works of inclusion in the testing of materials for construction. • Use of approved designs.	• Improved and approved designs against WB EHSs • Records of staff qualifications • Records of material testing schedule and results	MoA
Poor project design resulting in high water and energy consumption (inefficiency resource use), waste of materials, increased waste generation, and high carbon footprints.	• Include irrigation designs with renewable energy (solar, wind, hydropower) for pumping and operational energy needs. • Promote green infrastructure as alternatives to carbon-intensive concrete lining works in irrigation systems. • Promote FLID approaches, which can deliver lower GHG footprints while maintaining or improving service quality.	• Number/percentage of irrigation schemes designed with gravity-fed systems; number/percentage of schemes connected to renewable energy sources; • Number/percentage of approved designs with green infrastructure • Number of FLID applicants with approaches to reduce GHG footprint	MoA

Construction Phase			
Risks and Impacts	Mitigation measures	Performance Indicator	Responsible
Water pollution.	• Conduct adequate site screening to avoid severely impacting on wetlands. • Waste Management Plan for managing wastes has been developed. • Provide adequate waste receptacles and facilities at project sites/camp sites. • Train and provide awareness on safe waste disposal in all site construction camps for all workers. • Final disposal of waste should be at dumpsites approved by ZEMA. • Waste oil from vehicles and equipment will be collected and temporarily stored in drums or containers at site for recycling to oil marketing companies or agents approved or recognized and have the capacity to undertake oil disposal. • Dispose of faecal sludge via septic tanks that will be emptied regularly. • Develop and implement the Asbestos Waste Management Plan. • E-waste to be collected from the generation points securely stored under lock and key pending final disposal in accordance with the Environmental Management (Licensing) Regulations (Statutory Instrument No. 112 of 2013). • Monitor water quality regularly.	• Wetlands protected. • Waste management plans for all waste type implemented. • Waste receptacles and facilities at project sites/camp sites provided. • Training and awareness on safe waste disposal in all site construction camps for all workers done. • Final disposal of waste carried out in accordance the Environmental Management (Licensing) Regulations (Statutory Instrument No. 112 of 2013). • Zero occurrence of water pollution. • Water quality monitoring reports. • Water borne toilets provided for the workers.	Contractor and MoA

Reduced environmental flows downstream	• Implement water abstraction controls to avoid depletion. • Sustain environmental flows downstream. • Conduct ecological assessments downstream to monitor trends in the downstream ecosystem. • Implement water conservation to balance supply needs with ecosystem and socio-economic requirements.	• Waster abstraction records and schedules. • Environmental releases monitoring records. • Periodic ecological assessment reports for downstream ecosystems.	Contractor and MoA
Soil erosion and siltation of surface water bodies	• Carry out excavation works in dry season to reduce on soil erosion and deposition of eroded soil into the surface water bodies. • Avoid discharge of sediments into water bodies to prevent siltation. • Rivers, watercourses and other water bodies shall be kept clear of felled sediments, trees, vegetation cuttings and organic waste and debris. • Restrict project activities to the actual footprint. • Installation of sediment traps along water drainages, including, silt fences, and vegetation traps. • Store sediments away from the riverbanks.	• Excavation works carried out in dry season. • Water resources clear of sediments and other debris. • Availability of sediment traps. • Absence of sediments from riverbanks.	Contractor and MoA
Deterioration in air quality due to dust generation and gaseous emissions	• Watering down dust using a water bowser. • Ensure that trucks carrying construction materials such as sand, quarry dust, laterite etc. have the buckets covered with tarpaulin or appropriate polythene material from or to project site. • Install speed limits to slow down moving vehicles to reduce dust generation. • Include clean energy such as solar in the energy mix to reduce overreliance on fossils. • Switch off idle construction machinery.	• Records of dust suppression using a water bowser. • Trucks carrying construction materials such as sand, quarry dust, laterite etc. have the buckets covered with tarpaulin or appropriate polythene material from or to project site • Speed limit signage installed on access roads and around the work sites.	Contractor and MoA

	• Open air burning is not allowed. • Air quality management plan should be developed as part of the CESMP.	• Proportion of clean energy included in the energy mix. • Idle machines switched off always. • Number of open-air burning cases recorded. • Air quality management plan developed as part of the CESMP.	
Waste generation of all types	• Implement the Waste Management Plan • Provide adequate waste receptacles and facilities at project sites/camp sites. • Train and provide awareness on safe waste disposal in all site construction camps for all workers. • Final disposal of waste should be at dumpsites approved by ZEMA. • Waste oil from vehicles and equipment will be collected and temporarily stored in drums or containers at site for recycling to oil marketing companies or agents approved or recognized and have the capacity to undertake oil disposal. • Dispose of faecal sludge via septic tanks that will be emptied regularly. • Dispose of asbestos waste in line with the hazardous waste management regulations of ZEMA. • Develop and implement the Asbestos Waste Management Plan. • E-waste to be collected from the generation points securely stored under lock and key pending final disposal in accordance with the Environmental Management (Licensing)	• Waste management plans for all waste type implemented. • Waste receptacles and facilities at project sites/camp sites provided. • Training and awareness on safe waste disposal in all site construction camps for all workers done. • Final disposal of waste carried out in accordance the Environmental Management (Licensing) Regulations (Statutory Instrument No. 112 of 2013). • Water borne toilets provided for the workers.	Contractor and MoA

	Regulations (Statutory Instrument No. 112 of 2013). • Adequate sanitation facilities will be available for workers.		
Biodiversity/habitat loss due to vegetation clearing	• Limit vegetation clearing to absolute necessary. • Carry out afforestation activities to offset the vegetation loss. • Revegetate disturbed areas not to be by the scheme especially laydown areas.	• Percentage of areas remain undisturbed. • Number of degraded areas identified and afforested. • Number of disturbed areas revegetated.	Contractor and MoA
Road traffic risks	• Install speed limits on access roads and around work sites. • Train drivers on the need to observe traffic rules. • Carry out competent tests for drivers. • Only roadworthy machines and vehicles to be allowed on the road. • Construction vehicles to be fitted with reversing alarms and use of banksmen.	• Speed limits installed on the access roads and around the work sites. • Number of drivers trained in traffic rules and subjected to competent tests. • Copies of machine or vehicle roadworthiness certificates. • Reversing alarms fitted on the construction vehicles. • Banksmen deployed onsite.	Contractor and MoA
Public health risks including water borne, respiratory and vector borne diseases	• Maintain high standards of hygiene in the construction camp. • Encourage high standards of personal hygiene among the construction workers. • Monitor disease prevalence among the construction workers. • Provide first level medical services at the construction to treat incipient ailments among the construction workers. • Emergency Preparedness and Response Plan has been developed.	• Good housekeeping and hygiene in the construction camp and among the construction workers. • Disease prevalence records • First aid services available at the construction site. • Emergency Preparedness and Response Plan implemented.	Contractor and MoA
Noise and vibrations	• Provided PPE to the affected workers • Lubricate construction machinery and vehicles regularly to reduce friction.	• Records of PPE issued to employees.	Contractor and MoA

	• Switch off idle construction equipment and vehicles.	• Number of times the construction machines and vehicles lubricated. • Idle machines and vehicles always switched off.	
Soil contamination due to improper disposal of waste	• Waste Management Plan for managing wastes has been developed. • Provide adequate waste receptacles and facilities at project sites/camp sites. • Train and provide awareness on safe waste disposal in all site construction camps for all workers. • Final disposal of waste should be at dumpsites approved by ZEMA. • Waste oil from vehicles and equipment will be collected and temporarily stored in drums or containers at site for recycling to oil marketing companies or agents approved or recognized and have the capacity to undertake oil disposal. • Dispose of faecal sludge via septic tanks that will be emptied regularly. • Dispose of asbestos waste in line with the hazardous waste management regulations of ZEMA. • Develop and implement the Asbestos Waste Management Plan. • E-waste to be collected from the generation points securely stored under lock and key pending final disposal in accordance with the Environmental Management (Licensing) Regulations (Statutory Instrument No. 112 of 2013). • Monitor soil quality regularly.	• Waste management plans for all waste type implemented. • Waste receptacles and facilities at project sites/camp sites provided. • Training and awareness on safe waste disposal in all site construction camps for all workers done. • Final disposal of waste carried out in accordance the Environmental Management (Licensing) Regulations (Statutory Instrument No. 112 of 2013). • Zero occurrence of soil contamination. • Soil quality monitoring reports.	

	• All construction vehicles to be fueled at fuel stations or designated areas at the workers' campsite. • Ensure that fuel dispensing points have drip pans and contain fuel tanks/drums in an impervious bund of sufficient capacity. • Spills should be cleaned up immediately by removing the spillage together with the polluted soil and by disposing of them at a recognized facility and in line with the hazardous waste management plan. • Ensure availability of spills kit on site.		
Drowning risks	• Barricade all access points to dam reservoirs to restrict access. • Install signage to warn the employees and visitors of drowning risks around the dam reservoir areas.	• Access points to dam reservoirs barricaded. • Signage to warn the employees and visitors of drowning risks installed around the dam reservoir areas installed.	Contractor and MoA
Exposure to open excavations and trenches (tripping hazards)	• Barricade all excavation areas to restrict access. • Install signage to warn the employees and visitors of tripping risks around the excavation areas. • All open trenches and excavated areas will be backfilled as soon as possible after construction has been completed.	• Access points to excavation areas barricaded. • Signage to warn the employees and visitors of tripping risks around the excavation areas installed.	Contractor and MoA
Physical and economic displacement risks	• Conduct adequate site screening to influence site selection in order to avoid physical and economic displacements. • Where unavoidable, site specific ARAP/RAP/LRP to be prepared and approved by the Bank and relevant authorities.	• Site screening conducted. • Site specific ARAP/RAP/LRP prepared and implemented for the unavoidable risks and impacts.	Contractor and MoA

Financial/social exclusion of the vulnerable groups due to elite capture	• Include/consult with the vulnerable groups in the execution of the subproject activities.	• Number of vulnerable persons involved in the implementation of the subproject activities.	Contractor and MoA
GBV/SEA/SH risks	• Conduct sensitizations on the dangers of GBV/SEA/SH and the consequences of perpetuating these social ills. • Enforce CoC to guide worker behavior.	• Number of sensitization on GBV/SEA/SH conducted. • Signed copies of CoC.	Contractor and MoA
Labor and OHS risks	• Conduct age screening using NRC to determine age eligibility during recruitment. • Workers provided with written Contracts of employment. • Implement accessible worker GRM. • Enforce SOPs including specific task instructions. • Conduct regular tool box talks. • Provide appropriate PPE to the affected workers. • Emergency and Preparedness Response Plan.	• Copies of NRC for the recruited workers. • Copies of Contract of employment. • Worker GRM implemented. • Copies of SOPs. • Number of tool box talks conducted. • Manuscripts of PPE issued. • Emergency and Preparedness Response Plan implemented.	Contractor and MoA
Cultural heritage risks associated with earthworks	• Protect and preserve cultural sites/relics if any. • Report any discoveries of any artifacts, relics or objects of cultural significance to NHCC.	• Cultural sites protected and preserved. • New discoveries of any artifacts, relics or objects of cultural significance reported to NHCC.	Contractor and MoA
HIV/AIDS and STIs	• Provide condoms to the construction workers. • Conduct sensitization on the dangers of HIV/AIDS and STIs and how to avoid or prevent infections or reinfections. • Provide psychosocial counselling support to the affected persons.	• Frequency of distribution of condoms to the workers. • Sensitizations on how to prevent infections or reinfections conducted. • Psychosocial counselling support provided to the affected persons.	Contractor and MoA

Inequality among project beneficiaries especially women, youth and PwDs	• A SEP with accessible GRM has been developed and publicly disclosed. • Identify disadvantaged/vulnerable (D/V) persons or groups and assess disproportionate risks. • Proactively identify, consult with, and reach out to disadvantaged and vulnerable groups and households (through surveys, consultations, focus group discussions, or other means, as appropriate). • Ensure that the grievance/beneficiary feedback mechanism is accessible by disadvantaged and vulnerable groups through raising awareness among these groups and in relevant local languages, providing different intake channels, etc. • Integrate gender considerations and local cultural norms into risk analysis.	• A SEP with accessible GRM implemented. • Disadvantaged/vulnerable (D/V) persons or groups that can be exposed to assess disproportionate risks identified. • Gender considerations and local cultural norms integrated into risk analysis.	Contractor and MoA
Operational and Maintenance Phase			
Risks and Impacts	Mitigation measures	Performance Indicator	Responsible
Soil contamination and loss of fertility due to improper disposal of waste	• Develop and Implement the Waste Management Plan • Provide adequate waste receptacles and facilities at project sites/camp sites. • Train and provide awareness on safe waste disposal for all workers. • Final disposal of waste should be at dumpsites approved by ZEMA. • Waste oil from vehicles and equipment will be collected and temporarily stored in drums or containers at site for recycling to oil marketing companies or agents approved or recognized and have the capacity to undertake oil disposal.	• Waste management plans for all waste type implemented. • Waste receptacles and facilities at project sites/camp sites provided. • Training and awareness on safe waste disposal for all workers done. • Final disposal of waste carried out in accordance the Environmental Management (Licensing) Regulations (Statutory Instrument No. 112 of 2013).	MoA

	• Dispose of faecal sludge via septic tanks that will be emptied regularly. • Dispose of asbestos waste in line with the hazardous waste management regulations of ZEMA. • Develop and implement the Asbestos Waste Management Plan. • E-waste to be collected from the generation points securely stored under lock and key pending final disposal in accordance with the Environmental Management (Licensing) Regulations (Statutory Instrument No. 112 of 2013). • Adequate sanitation facilities will be available for workers. • Ensure that fuel dispensing points have drip pans and contain fuel tanks/drums in an impervious bund of sufficient capacity. • Spills should be cleaned up immediately by removing the spillage together with the polluted soil and by disposing of them at a recognized facility and in line with the hazardous waste management plan. • Ensure availability of spills kit on site.	• Waste receptacles and facilities at project sites/camp sites provided. • Training and awareness on safe waste disposal in all site construction camps for all workers done. • Water borne toilets provided for the workers.	
Soil contamination and loss of fertility due to overapplication of chemical fertilizers	• Develop and implement IPMP • Monitor soil quality.	• IPMP developed and implemented.	
Human health risks due to use of pesticides	• Implement an IPMP	• IPMP implemented.	MoA
Reduced environmental flows downstream	• Implement water abstraction controls to avoid depletion. • Sustain environmental flows downstream.	• Water abstraction records and schedules. • Environmental releases monitoring records.	MoA

	• Conduct ecological assessments downstream to monitor trends in the downstream ecosystem • Implement water conservation to balance supply needs with ecosystem and socio-economic requirements.	• Periodic ecological assessment reports for downstream ecosystems.	
Water pollution	• Develop and implement a waste management plan. • Provide adequate waste receptacles and facilities at project sites/camp sites. • Training and awareness on safe waste disposal in all site construction camps for all workers. • Final disposal of waste should be at dumpsites approved by ZEMA. • Waste oil from vehicles and equipment will be collected and temporarily stored in drums or containers at site for recycling to oil marketing companies or agents approved or recognized and have the capacity to undertake oil disposal. • Dispose of faecal sludge via septic tanks that will be emptied regularly. • Dispose of asbestos waste in line with the hazardous waste management regulations of ZEMA. • E-waste to be collected from the generation points securely stored under lock and key pending final disposal in accordance with the Environmental Management (Licensing) Regulations (Statutory Instrument No. 112 of 2013). • Monitor water quality regularly.	• Waste management plans for all waste type developed and implemented. • Waste receptacles and facilities at project sites/camp sites provided. • Training and awareness on safe waste disposal workers done. • Final disposal of waste carried as per the Environmental Management (Licensing) Regulations (Statutory Instrument No. 112 of 2013). • Zero occurrence of water pollution. • Water quality monitoring reports. • Toilets provided for the workers. • Implement IPMP.	MoA

	• Regular inspection and maintenance of permanent erosion and runoff control structures. • Do not convey road and ditch runoff to the nearest stream using the most direct route instead direct it into the vegetative filter area, allowing for infiltration and ground water recharge. • Minimize use of pesticides as prescribed in the integrated pest management plan (IPMP).		
Soil erosion and siltation of surface water bodies	• Construct silt traps in designated areas especially downslope to trap silt. • Avoid discharge of sediments into water bodies to prevent siltation.	• Silt traps constructed downslope. • No discharge occurrence of silt into the water bodies.	MoA
Road traffic risks	• Install speed limits on access roads and around work sites. • Train drivers on the need to observe traffic rules. • Carry out competent tests for drivers. • Only roadworthy machines and vehicles to be allowed on the road. • Construction vehicles to be fitted with reversing alarms and use of banksmen.	• Speed limits installed on the access roads and around the work sites. • Number of drivers trained in traffic rules and subjected to competent tests. • Copies of machine or vehicle roadworthiness certificates. • Reversing alarms fitted on the construction vehicles. • Banksmen deployed onsite.	MoA
Noise and vibrations	• Provided PPE to the affected workers • Lubricate construction machinery and vehicles regularly to reduce friction. • Switch off idle farm implements and vehicles.	• Records of PPE issued to employees. • Number of times the construction machines and vehicles lubricated. • Idle machines and vehicles always switched off.	MoA, supervising engineers/contractor/project beneficiaries
Drowning risks	• Barricade all access points to dam reservoirs to restrict access.	• Access points to dam reservoirs barricaded.	MoA, supervising engineers/contractor

	• Install signage to warn the employees and visitors of drowning risks around the dam reservoir areas.	• Signage to warn the employees and visitors of drowning risks installed around the dam reservoir areas installed.	
Financial/social exclusion of the vulnerable groups due to elite capture	• Include/consult with the vulnerable groups in the execution of the subproject activities.	• Number of vulnerable persons involved in the implementation of the subproject activities.	MoA
GBV/SEA/SH risks	• Conduct sensitizations on the dangers of GBV/SEA/SH and the consequences of perpetuating these social ills. • Enforce CoC to guide worker behavior.	• Number of sensitization on GBV/SEA/SH conducted. • Signed copies of CoC.	MoA, supervising engineers/contractor
Labor and OHS risks	• Conduct age screening using NRC to determine age eligibility during recruitment. • Workers provided with written. Contracts of employment. • Implement accessible worker GRM. • Enforce SOPs including specific task instructions. • Conduct regular tool box talks. • Provide appropriate PPE to the affected workers. • Emergency Prepared and Response Plan has been developed.	• Copies of NRC for the recruited workers. • Copies of Contract of employment. • Worker GRM implemented • Copies of SOPs. • Number of tool box talks conducted. • Manuscripts of PPE issued. • Emergency Preparedness and Response Plan implemented.	MoA, supervising engineers/contractor
HIV/AIDS and STIs	• Conduct sensitization on the dangers of HIV/AIDS and STIs and how to avoid or prevent infections or reinfections • Provide psychosocial counselling support to the affected persons.	• Frequency of distribution of condoms to the workers. • Sensitizations on how to prevent infections or reinfections conducted. • Psychosocial counselling support provided to the affected persons.	MoA supervising engineers/contractor
Vector breeding and water-related diseases around	• Prevent stagnant water through design and maintenance; repair leaks; monitor water quality and vectors; coordinate disease	• Drainage and maintenance records; vector and disease	MoA, scheme operators, and contractors.

reservoirs, canals, drains and irrigated fields.	surveillance; implement community awareness and integrated vector management.	surveillance results; community outreach records.	
Work at height, confined spaces, electrical systems, pressure pipelines, lifting operations and work near water.	Implement task risk assessments and permit-to-work systems; use trained workers; isolate energy; provide fall protection, atmospheric testing, ventilation, lifting plans, life jackets, rescue plans and competent supervision.	Valid permits and competency records; inspection logs; rescue drills; incidents investigated.	MoA/Contractors, supervision engineers, facility and scheme operators.
Extreme floods, drought, heat, lightning, erosion and wildfire affecting infrastructure and operations.	Use climate-resilient design and hydrological criteria; provide spillway, drainage and erosion protection; establish drought rules; protect electrical systems; implement heat, flood, lightning and wildfire procedures; periodically review climate performance.	Climate-risk assessment and design approval; emergency plans and drills; inspection and monitoring records.	MoA, design engineers, contractors and scheme operators.
Indebtedness, unaffordable contributions, unfair commercial terms and exclusion under matching grants and productive alliances.	Use transparent selection; assess affordability and viability; clearly disclose obligations; provide independent business and legal advice; tailor contribution arrangements for vulnerable groups; monitor benefit distribution; provide appeal and grievance mechanisms.	Published criteria; affordability assessments; signed informed agreements; disaggregated beneficiary data; appeals resolved.	MoA, grants team, financial and technical service providers.
Land-tenure, water-allocation and intra-community disputes linked to scheme boundaries and benefit allocation.	Undertake participatory mapping and rights verification; document agreements; consult all user groups; establish transparent membership and allocation rules; resolve disputes before works; apply ESS5 instruments where impacts remain.	Verified land records and maps; consultation and agreement records; disputes closed before construction.	MoA local authorities, traditional authorities, WARMA and water-user organizations.
Child and public safety during operation of canals, reservoirs, pump stations, processing facilities and project traffic.	Fence or guard hazards; provide safe crossings, signage, lighting and access control; separate pedestrians and vehicles; conduct school and community awareness; maintain rescue equipment and emergency contacts; investigate incidents.	Safety inspections; barriers and signage maintained; awareness records; incident trends reviewed.	Scheme and facility operators, contractors, local authorities and MoA.
Induced land-use change and indirect habitat conversion from improved	Assess impacts beyond project footprints; apply critical-habitat exclusions; condition	Land-cover monitoring; compliance records; no	MoA, forestry and wildlife authorities, local authorities and beneficiaries.

irrigation, roads and market access.	support on land-use compliance; monitor encroachment and habitat conversion; coordinate enforcement and restoration.	project-supported conversion of excluded habitats; restoration records.	
Worker heat stress and exposure to severe weather.	Schedule work in cooler periods; provide shade, water, rest and acclimatization; train workers; monitor conditions; provide first aid; suspend work during dangerous heat, storms, lightning or floods.	Heat and weather logs; rest and hydration provisions; training and incident records.	Contractors, employers, facility and scheme operators.

5.3 Risks and Mitigation Measures Specific to Disadvantaged and Vulnerable Groups

Table 6: Risks and Mitigation Measures Specific to Disadvantaged and Vulnerable Groups

Vulnerable group	Risks and Impacts	Mitigation Measures
Persons with Disabilities (PwDs)	- Social exclusion and discrimination within farmer groups, water user associations. - Limited access to project benefits such as irrigation infrastructure, agricultural inputs, training, extension services, and livelihood opportunities. - Limited access to project information and GRM because communication channels are not accessible. - Occupational health and safety risks during operation of irrigation schemes.	- Mainstream disability inclusion within project governance structures, sensitize communities and project staff, ensure representation of PwDs on relevant committees. - Establish inclusion criteria that prioritize vulnerable households, adapt appropriate training materials and ensure the delivery method is responsive to the needs of PwDs. - Disseminate information and provide alternative communication using methods such as sign language interpretation or Braille to ensure inclusive participation in project activities. Establish accessible grievance channels which include assisted reporting mechanisms. - Install warning signs, ensure emergency response procedures consider persons with disabilities and conduct community safety awareness campaigns to protect PwDs.
Women and the Youth	- Traditional norms that promote exclusion of women and youth in actively participating in the project; - Low literacy levels affecting access to information, limiting leadership opportunities in the water user groups and the adoption of improved irrigation practices. - GBV, SEA/SH.	- Adopt gender-transformative and culturally sensitive measures to encourage women and youth participation. Secure support from communities, traditional leaders, and households. - Provide tailored literacy training specifically targeting women and youths to bridge the literacy gap. - Implement a robust and responsive GRM and provide information on GBV/SEA/SH support services.

6 Environmental and Social Risk Management Procedures

The environmental and social risk management procedures will be implemented through the Project's subproject selection process. In summary, the procedures aim to do the following:

Table 7: Project Cycle and E&S Management Procedures

Project Stage	E&S Stage	E&S Management Procedures
a. Assessment and Analysis: Subproject identification	Screening	- During subproject identification, ensure subproject eligibility by referring to the Exclusion List in table 8 below. - For all activities, use the Screening Form in Annex 1 to identify and assess potential environmental and social risks and impacts, and identify the appropriate mitigation measures for the subproject. - The screening process will include cumulative impact assessments, especially where multiple subprojects may have combined impacts in an area. - Identify the documentation, permits, and clearances required under the government's Environmental Regulation.
b. Formulation and Planning: Planning for subproject activities, including human and budgetary resources and monitoring measures	Planning	- Based on Screening Form adopt and/or prepare relevant environmental and social management procedures and plans. - For activities requiring ESMPs and other instruments, submit the draft instruments to the World Bank for prior review and no objection prior to submission to ZEMA approval and initiating bidding processes (for subprojects involving bidding processes) and/or launching activities (for subproject activities not subject to bidding). - Ensure that the contents of the E&S instruments are shared with relevant stakeholders in an accessible manner and consultations are held with the affected communities in accordance with the SEP. - Complete all documentation, permits, and clearances required under the government's Environmental Regulation. - Train staff responsible for implementation and monitoring of plans. - Incorporate relevant E&S procedures and plans into contractor bidding documents; train contractors on relevant procedures and plans.
c. Implementation and Monitoring: Implementation support and continuous monitoring for projects	Implementation and monitoring	- Ensure implementation of plans through site visits, regular reporting from the field, and other planned monitoring. - Track grievances/beneficiary feedback. - Continue awareness raising and/or training for relevant staff, volunteers, contractors, communities.
d. Review and Evaluation: Qualitative, quantitative, and/or participatory data	Completion and evaluation	- Assess whether plans have been effectively implemented. - Ensure that physical sites are properly restored.

collection on a sample basis.		
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6.1 Subproject Assessment and Analysis – E&S Screening

As a first step, all proposed subproject activities shall be screened to ensure that they are within the boundaries of the Project's eligible activities, and they are not considered as activities listed on the E&S Exclusion List in the table below.

Table 8: Exclusion List

• Support of production of any hazardous good, including alcohol, tobacco, and controlled substances. • Any construction in protected areas or priority areas for biodiversity conservation, as defined in the national law. • Activities that have the potential to cause any significant loss or degradation of critical natural habitats, whether directly or indirectly, or which would lead to adverse impacts on natural habitats. • Activities that involve extensive harvest and sale/trade of forest resources (post, timber, bamboo, charcoal, wildlife, etc.) for large-scale commercial purposes • Activities involving changing forestland into agricultural land or logging activities in primary forest. • Purchase or use of banned/restricted pesticides, insecticides, herbicides, and other dangerous chemicals (banned under national law and World Health Organization (WHO) category 1A and 1B pesticides). • Activities that may cause or lead to forced labor or child abuse, child labor exploitation or human trafficking, or subprojects that employ or engage children under the age of 18, in connection with the project in a manner that is likely to be hazardous or interfere with the child's education or be harmful to the child's health or physical, mental, spiritual, moral, or social development. • Any activity on land that has disputed ownership or tenure rights.

As a second step, the MoA will use the E&S Screening Form in Annex 1 to identify and assess relevant environmental and social risks specific to the activities and identify the appropriate mitigation measures and plans to be prepared (such as ESIAs/ESPBs/ESMPs). The MoA will also identify the documentation, permits, and clearances required under the national E&S legislation and regulations

6.2 Overview of Sub-project categorization

The subprojects activities will include civil works during the construction or rehabilitation of the irrigation schemes, upgrading of the temporary irrigation structures to permanent weirs, rehabilitation of the irrigation research station in Chikankata District. Based on the level of their inherent environmental and social risks and impacts, the sub-projects have been classified as *Substantial Risk*. This categorization is part of the screening process to be carried out for the sub-projects as shown in table 9 below as a guide.

Table 9: Risk Categories and Classification

Risk Category	Nature of Risk and Impact	Examples of Activities
Low Risk	Activities that do not have a physical footprint. These will not require E&S instrument preparation, however, E&S clauses in the contract are recommended (to be prepared by the contracting agency prior to bidding process)	• Communication and translations; • Training and workshops; and • TA
Moderate Risk	Activities rated <i>moderate</i> risks have E&S risks and impacts that are site-specific, temporal and reversible in nature. In addition to the E&S clauses in the contract, these activities may require a simplified or detailed ESMP. Contractors will also be required to prepare a C-ESMP.	• Rehabilitation or construction of small-scale irrigation. • Activities with no land and resettlement implications.
Substantial Risk	Activities that have substantial E&S risks and impacts, including those that are not as complex as high-risk projects, and more predictable and potentially reversible. This category includes risks of social conflict; impacts that are medium in magnitude, medium to low probability of serious adverse effects to human health and/or environment.	• Rehabilitation or construction of irrigation schemes, upgrading the temporary structures to permanent weirs • Activities leading to involuntary resettlement, land acquisition and restrictions to land use; and • Activities that may trigger inter-communal conflicts.
High Risk	Subprojects that contain significant environmental and social risks impacts.	• Construction/ rehabilitation activities in critical habitat and protected areas; and • Projects involving significant amount of land, quantities of hazardous substances.

6.3 Subproject Formulation and Planning – E&S Planning

The MoA will prepare E&S instruments as needed and submitted to the World Bank for prior review and no objection before submission to ZEMA for approval. The MoA will also complete the documentation, permits and clearances required in line with national environmental regulations before any project activities begin.

At this stage, staff who will be working on the various subproject activities will be trained in the environmental and social management plans relevant to the activities they work on. The MoA will provide such training to field staff.

The MoA will also ensure that all selected contractors, subcontractors, and primary suppliers understand and incorporate environmental and social mitigation measures relevant to them as standard operating procedures for civil works. The ministry is required to provide training to selected contractors to ensure that they understand and incorporate environmental and social mitigation measures; and plan for cascading training to be delivered by contractors to subcontractors and primary suppliers. MoA to further ensure that the entities or communities responsible for ongoing operation and maintenance of the investment have received training on operations stage environmental and social management measures as applicable.

6.4 Procedures for Preparation of Site-Specific Instruments

6.4.1 ESIA / ESPBs/ESMPs

Preparing an ESIA involves identifying, predicting, and evaluating the potential environmental and social risks and impacts of a proposed project. The ESIA process typically follows the structured procedure below:

Screening - Preparation of the ESIA will involve identification of a Consulting firm with relevant experience and a team of experts among them the environmental and social specialists. The tasks involved include site screening to identify potential E&S risks and impacts of the project activities, E&S screening will be undertaken early in subproject preparation and design to identify potential risks and impacts, determine the appropriate risk classification, and establish applicable legal and institutional requirements. The screening will guide the selection of proportionate assessment and management instruments and define required mitigation, monitoring, stakeholder engagement, grievance management, budgeting, implementation, and reporting measures. Screening results will be documented and updated when project activities, locations, designs, or risk conditions change.

Scoping – After screening and ESIA is determined as the appropriate instrument to be prepared, the scoping report and terms of reference (TOR) will be prepared and submitted to the Bank for prior review and no objection and ZEMA for final approval. This step defines the assessment boundaries. Following the approval of the scoping report and TOR the consultant will proceed with conducting relevant studies according to the approved TOR and prepare the first draft ESIA. The scoping will be done in consultation with the Project stakeholders including target project beneficiaries, local communities, NGOs, ZEMA, WARMA, traditional authorities etc.

Baseline Studies – The Consultant will gather data on the existing physical, biological, and socio-economic conditions of the project area. This will establish a "before-project" reference point against which future changes can be measured.

Impact Prediction & Evaluation – The consulting team of experts will systematically analyze the proposed project activities to predict their magnitude and significance. This will evaluate how the project will affect both natural resources (air, water, biodiversity) and human populations (health, livelihood, cultural heritage).

The assessment of impacts is an iterative process underpinned by four key questions: **Prediction:** what change to the physical, chemical or social environment will occur if the project is implemented? **Evaluation:** what are the consequences of this change? How significant will its impact be on human and biological receptors; **Mitigation:** if it is significant, can anything be done about it? **Residual Impact:** is it still significant after mitigation? Where significant residual impacts remain, further options for mitigation will be considered and where necessary impacts are reassessed until they are reduced.

Mitigation & Management Planning - This stage will involve formulating measures with the mitigation hierarchy to avoid, minimize, restore or compensate for any negative risks and impacts. It will culminate into an ESMP detailing how these mitigation efforts will be applied and funded.

Public Consultation & Disclosure - Stakeholder engagement will be carried out throughout the ESIA process. Interested and Affected parties will be informed about the project, and their feedback will be integrated into the assessment and design of the project.

Review & Decision –. The draft ESIA will be submitted to the Bank for prior review and no objection and ZEMA for final approval. Stakeholder consultation will be carried out throughout the ESIA process and in accordance with ESS10 and the national law.

Monitoring & Auditing – E&S monitoring and auditing is a systematic, documented, and objective review of a project's compliance with applicable E&S laws, permits, financing requirements, the ESMF, site-specific management instruments and contractual obligations. Its objectives are to verify that mitigation, monitoring, stakeholder engagement, labor, occupational and community health and safety, grievance management, and incident-reporting measures are effectively implemented; assess the adequacy of institutional arrangements, resources, documentation, and contractor performance; identify non-compliance, emerging risks, and management weaknesses; and recommend time-bound corrective actions that strengthen accountability, informed decision-making and continual improvement in environmental and social performance. Project post-approval monitoring will be undertaken to ensure compliance with the mitigation measures. E&S compliance monitoring will be conducted by E&S specialists while audits will be performed by third parties.

6.4.2 RAP / ARAP

Preparing a RAP in Zambia involves a highly structured process to mitigate physical or economic displacement caused by developmental projects. It must align with the Zambian law including Lands Acquisition Act CAP 189, Environmental Management Act CAP 204 and the Revised National Resettlement Policy.

Broadly, the project has been screened for potential land acquisition, restrictions on resource access, or physical/economic displacement. Likelihood of economic and/or economic displacement exists. However, the extent of the displacement is unknown pending feasibility studies to determine the scope that will subsequently inform the level of resettlement planning to be carried out. The scope of resettlement impact will inform the type of instrument to be prepared i.e. whether RAP or ARAP.

When it is established that a RAP/ARAP is required, firstly, a Census Survey will be carried out to enumerate all Project Affected Persons (PAPs), document household sizes, demographics, and vulnerabilities (e.g., female-headed households, the elderly). Secondly, an Asset Inventory will be conducted to map and record all structures, farmlands, crops, and trees of economic value. GPS coordinates and photographic evidence of each affected asset will be captured. Thirdly, a Cut-Off-Date will be established to announce the completion date of the census. Any structures or assets built after this date are generally ineligible for compensation.

After determining the Cut-Off Date, Replacement Costs will be decided by calculating compensation rates to ensure affected individuals receive the exact amount required to replace lost assets and cover transaction costs, without depreciation. The project will utilize local, industry or GRZ-approved valuation approaches, including direct capital comparison, depreciation replacement cost, or investment methods. This will be followed by establishing an Entitlement Matrix that outlines exact compensations for specific losses (e.g., land for land, cash for crops, or transition allowances). If physical relocation will be required, new land (resettlement land) will be identified in consultation with the PAPs, host community, traditional and local authorities. The project will ensure that the replacement land is of equal or superior productive potential, located nearby, and provided free of transaction costs. Further, the project will develop livelihood restoration programs (e.g., skills training, agricultural support) to ensure affected households can re-establish or improve their standard of living.

The project will hold continuous consultations with the PAPs, local chiefs, host community and local authorities and document all meeting minutes, concerns raised, and agreements signed to ensure transparency and accountability. Stakeholder engagement will be supported by a grievance redress mechanism (GRM) that will establish a structured, accessible process to handle complaints and disputes regarding land boundaries or compensation amounts. This will involve forming local grievance committees that include community representatives, traditional leaders, and project officers.

Lastly, the project will compile a detailed financial plan (budget) factoring in direct asset compensation, livelihood restoration, administrative costs, and contingencies. Further, the project will align and synchronize RAP/ARAP implementation with the overarching project's engineering and civil works

timeline to avoid delays. Relocation and compensation will be carried out before the project construction phase. The project will also establish internal monitoring and external evaluation indicators to track the progress of restoration and report to regulatory bodies. The compiled RAP/ARAP will be submitted together with the ESIA/ESMPs to World Bank clearance and ZEMA for approval.

6.4.3 Labour Management Procedures (LMP)

Preparing Labour Management Procedures (LMP) in Zambia involves aligning the workforce practices with the Employment Code Act, CAP 268 and national OHS standards. The core process requires defining worker categories, outlining terms of employment, establishing a grievance mechanism, and ensuring strict compliance.

The ISAT project has identified and categorized the types of workers the project will be recruit as follows:

- Direct Workers: Employees to be directly hired by the project;
- Contracted Workers: Third-party workers to be engaged through subcontractors or service providers;
- Primary Supply Workers: Personnel from core suppliers who will provide essential goods or materials; and
- Community Workers: Individuals employed or engaged on a community-led project basis.

The LMP will ensure that Contracts of Employment are provided to all categories of employees in accordance with the Employment Code Act, CAP 268 and the World Bank ESS2. The project will ensure that all contracts lasting 6 months or more must be in writing. Oral contracts will be strictly limited to shorter terms and will be subjected to comprehensive record-keeping. Wages and Benefits will include calculating statutory allowances (e.g., housing allowance at 30% of basic pay). Working Hours and Leave will be defined by the daily standard working hours, overtime compensation, annual leave, maternity/paternity leave, and sick leave in line with the Code.

The project will also establish a Code of Conduct (CoC) that will be clear, accessible, applicable to all employees and contractors. It will explicitly prohibit SEA/SH and will not engage in employment of children and young persons (under 18). A worker GRM will be developed to allow workers to raise concerns, lodge complaints, or report workplace issues. The procedure will allow receipt of anonymous complaints, outline specific timeframes for investigation and resolution, protect whistleblowers from retaliation and have clear escalation pathways to the Ministry of Labour and Social Security (MLSS) if internal solutions fail.

The LMP will incorporate Occupational Health and Safety OHS that will set out the procedures for maintaining a safe and healthy working environment, including: Provision of free, adequate Personal Protective Equipment (PPE), risk assessments and the establishment of on-site first aid, emergency protocols, and sanitation facilities, guidelines on reporting workplace accidents/incidents and induction programs for all new hires and contractors to train them on the LMP, GRM, and OHS rules as well as regularly track contractor compliance, worker turnover, and grievance resolution times.

6.4.4 GBV/SEA/SH Action Plan

Preparing a SEA/SH Action Plan requires a survivor-centered, preventative, and contextualized approach. The goal is to identify risks, prevent incidents, and ensure safe, confidential response protocols.

The following core procedural steps will be used to develop a robust plan:

- Assess Risks - Conduct risk assessments to evaluate project-specific and community-level risks (e.g., labor influx, power dynamics, community vulnerabilities).

- Map Service Providers to identify and assess local service providers (medical, psychosocial, legal, and police) to ensure survivors have access to safe, ethical, and confidential care. The project will develop a CoC explicitly prohibiting SEA/SH and that ensure that all project personnel, contractors, and subcontractors read, sign, and understand the CoC. Include clear reporting protocols and ensure all relevant institutional policies are widely distributed and understood.

The plan will align with the project GRM, including SEA/SH-sensitive reporting and referral pathways with multiple safe and confidential entry points. It will ensure survivor-centered handling of complaints, including confidentiality, informed consent, protection from retaliation, and ongoing SEA/SH awareness training for project personnel, contractors, and community liaisons. Further, the plan will inform local communities about project-related risks, their rights, the CoC, and the available survivor referral pathways. Lastly, the plan will define roles, responsibilities, and dedicated budgets for implementing the SEA/SH Action Plan and include the need for regular audits to ensure effectiveness of the plan, track compliance, and adapt to emerging risks throughout the project lifecycle.

6.4.5 Chance Find Procedures (Cultural Heritage)

A Chance Find Procedure (CFP) is a legally and socially mandated protocol used to manage previously unknown cultural, archaeological, or historical artifacts uncovered during project construction or operations. It is designed to prevent site damage while minimizing project delays. Developing a robust CFP will entail outlining specific protocols across several distinct phases:

1. Preparation & Design Steps

- Aligning with Legislation to ensure the procedure conforms with the National Heritage Conservation Commission Act, CAP 173 and the World Bank ESF.
- Clearly designate the on-site point of contact (e.g., Construction Manager, HSE Coordinator) who will receive immediate reports. Establish a contract or retainer with a qualified archaeologist or heritage expert who can be called on-site during an event of a discovery.
- Set communication chains and map out the exact flow of communication during a discovery. The standard chain is: Discoverer → Site Foreman → Environmental Manager → External Heritage Expert → Competent National/Local Authority.

2. Immediate Response Protocols (The "Action" Phase)

- **Stop Work Immediately:** In an event of a discovery, the project will cease all construction or ground-disturbing activities within the immediate vicinity of the find.
- **Delineate and Secure the Area:** Cordon off the area with safety tape, fencing, or barriers. If the objects are easily removable or highly sensitive, assign a night guard until authorities take charge.
- **Document the Find:** The Environmental Specialist will record the location (GPS coordinates), depth, and take clear digital photographs and create an initial incident report.
- **Do Not Touch:** Never remove, clean, or excavate the artifacts, as this can cause irreparable damage to the archaeological context.

3. Assessment & Mitigation

- **Expert Evaluation:** The procedure will require that the retained archaeologist will inspect the area and the material to determine the scientific and historical value of the chance find.
- **Notify Authorities:** The project will officially notify the National Heritage Conservation Commission (NHCC) within the timeframe mandated by law (often 24 to 72 hours).
- **Determine the Action Plan:** NHCC will dictate the next steps, which generally include: Avoidance which entails redesigning the project plans to completely avoid the resource, Preservation in situ by leaving the site undisturbed and modifying the immediate construction technique.
- **Salvage Excavation:** Controlled excavation and retrieval of the artifacts by a qualified expert prior to resuming work.

4. Training and Implementation

- **Worker Induction:** Every site worker and contractor will undergo cultural heritage awareness training so that they know exactly what archaeological materials (e.g., pottery shards, bones, old foundations) generally look like and the immediate steps to take.
- **Documentation:** Keep physical copies of the CFP on-site, easily accessible to all foremen and supervisors.

The Integrated Pest Management Plan, Waste Management Plan and Resettlement Policy Framework have been attached to this ESMF in the annex section.

6.5 Generic Mitigation Measures

Preparing generic mitigation measures against negative environmental and social (E&S) risks requires following a sequential mitigation hierarchy (avoid, minimize, mitigate, and compensate).

Avoidance: The project will need to anticipate and avoid risks and impacts completely. For example, changing a project's location to stay away from sensitive habitats or indigenous territories.

Minimization: Where avoidance is impossible, reduce the magnitude and duration of impacts to acceptable levels. Examples include limiting heavy construction to daylight hours to reduce noise.

Mitigation: The project will need to implement proactive or reactive actions to reduce adverse impacts. Examples include dust suppression.

Compensation/Offsetting: If significant residual impacts remain after applying mitigation measures, the project will be required to compensate for or offset them where technically and financially feasible. Examples include identifying a degraded and bare land and plant trees on it to replace the trees that will be cleared during the construction of the irrigation schemes or replacement-cost compensation for lost land.

6.6 Implementation and Monitoring – E&S Implementation

MoA will be responsible for the implementation of E&S. All E&S instruments copies will be retained at each subproject site to guide contractors, subcontractor and primary suppliers if any on the implementation of E&S and provide progress reports to PIU on the E&S performance. During implementation, the PIU will conduct regular monitoring visits, describe the mechanisms, responsible parties, and the frequency for project supervision. Contractors and matching grant and other subproject beneficiaries implementing subproject activities will be responsible for implementing the mitigation measures in the E&S risk management documents, with MoA oversight.

The MoA working to implement the project will ensure that monitoring practices include the E&S risks identified in the ESMF and site-specific E&S instruments and will monitor the implementation of E&S risk management mitigation plans as part of regular project monitoring.

At a minimum, the reporting will include:

- The overall implementation of E&S risk management instruments and measures;
- Any environmental or social issues arising as a result of project activities and how these issues will be remedied or mitigated, including timelines;
- OHS performance (including incidents and accidents);
- Community health and safety;
- Stakeholder engagement updates, in line with the SEP;
- Progress on the implementation and completion of project works;
- Regular audits of contractor compliance with E&S safeguards;
- Monthly reporting from contractors on OHS, waste management, and community health and safety measures; and
- Summary of grievances/beneficiary feedback received, actions taken, and complaints closed out, in line with the GRM. Reports from the local levels will be submitted to the MoA at the

national level, where they will be aggregated and submitted to the World Bank on a quarterly or biannual basis.

Throughout the Project implementation stage, the MoA will continue to provide training and awareness raising to relevant stakeholders, such as staff, selected contractors, subproject beneficiaries and communities, to support the implementation of the E&S risk management mitigation measures.

The MoA will also track grievances/beneficiary feedback (in line with the SEP) during project implementation to use as a monitoring tool for implementation of project activities and environmental and social mitigation measures.

Lastly, if the MoA becomes aware of a serious incident in connection with the project, which may have significant adverse effects on the environment, the affected communities, the public, or workers, it will notify the World Bank within 48 hours of becoming aware of such incident. Fatality is automatically classified as a serious incident, as are incidents of forced or child labor, abuses of community members by project workers. SEA/SH requires within 24 hours reporting of becoming aware of such incident. The PIU will be responsible for notifying the World Bank, stabilizing the risk, investigating, verifying that recurrence risks are actually controlled and take immediate measures to prevent recurrence.

6.7 Review and Evaluation – E&S Completion

Upon completion of project activities, the MoA will review and evaluate progress and completion of project activities, and all required environmental and social mitigation measures. Especially for civil works, the MoA will monitor activities regarding site restoration and landscaping in the affected areas to ensure that the activities are done to an appropriate and acceptable standard before closing the contracts, in accordance with measures identified in the ESMPs and other plans. The sites must be restored to at least the same condition and standard that existed prior to commencement of works. Any pending issues must be resolved before a subproject is considered fully completed. The MoA will prepare the completion report describing the final status of compliance with the E&S risk management measures and submit it to the World Bank.

6.8 Technical Assistance Activities

The MoA will ensure that the consultancies, studies (including feasibility studies, if applicable), capacity building, training, and any other technical assistance activities under the Project are carried out in accordance with Terms of Reference acceptable to the Bank, that are consistent with the ESSs. They will also ensure that the outputs of such activities comply with the Terms of Reference.

7 Implementation Arrangements and Capacity Building

7.1 Roles and Responsibilities for ESMF Implementation

The Project Implementation Unit (PIU) within the MoA will have qualified staff and resources to support management of E&S risks and impacts of the Project including qualified Social Specialist and Environmental Specialist. The ISAT-PIU will lead and coordinate MoA activities and provide E&S risk management oversight as the coordinate, supervise and monitor the implementation of project activities. The PIU will provide guidance and oversight in the preparation and implementation of E&S documents by the project beneficiaries and be accountable for reporting to both the World Bank and MoA on all activities and project progress.

The MoA will also ensure that all selected contractors, subcontractors, and vendors understand and incorporate E&S mitigation measures relevant to them as standard operating procedures for works. The MoA shall provide training to selected contractors to ensure that they understand and incorporate E&S mitigation measures; and plan for cascading training to be delivered by contractors to subcontractors and vendors. The MoA through the project PIU will carry out regular audits of contractor compliance with E&S requirements and risk management. The PIU will require monthly reporting from contractors on OHS, waste management, and community health and safety measures. The MoA will further ensure that the entities or communities responsible for ongoing operation and maintenance of the investment have received training on environmental and social management measures as applicable during the operations stage. This training will help ensure that the sustainability of the project's benefits is maintained and that any potential environmental and social risks during the operation phase are effectively managed.

Additionally, the PIU will lead implementation of the project's sub-components and oversee core project-related fiduciary functions, including financial management (FM), procurement, and project-related M&E. It will also consolidate overall project reporting, working closely with all stakeholders. The E&S specialists including the OHS experts with requisite qualifications and experience will be replicated at the contractor level. The project will ensure that the technical experts hired transfer their knowledge and provide hands-on training to the mainstream MoA staff to ensure sustainability after project completion.

Table 10 below summarizes the roles and responsibilities regarding the implementation arrangements for environmental and social management.

Table 10: Implementation Arrangements

Level/ Responsible Party	Roles and Responsibilities
National/PIU	• Provide support, oversight, and quality control to field staff working on environmental and social risk management. • Collect, review, and provide quality assurance and approval to Screening Forms and ESMPs as relevant. Keep documentation of all progress. • Oversee overall implementation and monitoring of environmental and social mitigation and management activities, compile progress reports from local levels/subprojects, and report to the World Bank on a quarterly or biannual basis. • Train central and field staff and contractors who will be responsible for implementing the ESMF. • If contracting is managed centrally, ensure that all bidding and contract documents include all relevant E&S management provisions per screening forms, ESMPs.

Regional/local field staff	• Ensure project activities do not fall under the Exclusion List. Fill out Screening Forms for relevant subproject activities and submit forms to the national level. • If relevant, complete site-specific ESMPs for subproject activities and submit forms to the national level. • Oversee daily implementation and monitoring of environmental and social mitigation measures, and report progress and performance to the national level on a monthly basis. • Provide training to local contractors and communities on relevant environmental and social mitigation measures, roles, and responsibilities. • If contracting is managed regionally, ensure that all bidding and contract documents include all relevant E&S management provisions per screening forms, including approval of Contractor ESMPs.
Supervising engineers	• Supervise contractors on the implementation of E&S requirements in all subprojects. • Ensure enforcement and regular reporting on OHS, waste management, and community health and safety measures by contractors.
Local contractors	• Comply with the Project's environmental and social mitigation and management measures as specified in ESMPs and contract documents, as well as national and local legislation. • Take all necessary measures to protect the health and safety of workers and community members, and avoid, minimize, or mitigate any environmental harm resulting from project activities. • Provide monthly monitoring reports on ESHG performance in accordance with the metrics specified in bidding documents and contracts. • Disseminate and create awareness within contractor workforce on environmental and social risk management and compliance thereof for effective implementation. • Report on E&S compliance and any incidents to the PIU and provide documentation as required. • Promptly notify the PIU and World Bank of any incident or accident related to the Project which has, or is likely to have, a significant adverse effect on the environment, the affected communities, the public or workers. Major issues (fatal accidents, injuries) will be reported to the PIU within 24 hours of occurrence and Bank within 48 hours.

Figure 3 below shows the organogram for the ESMF implementation.

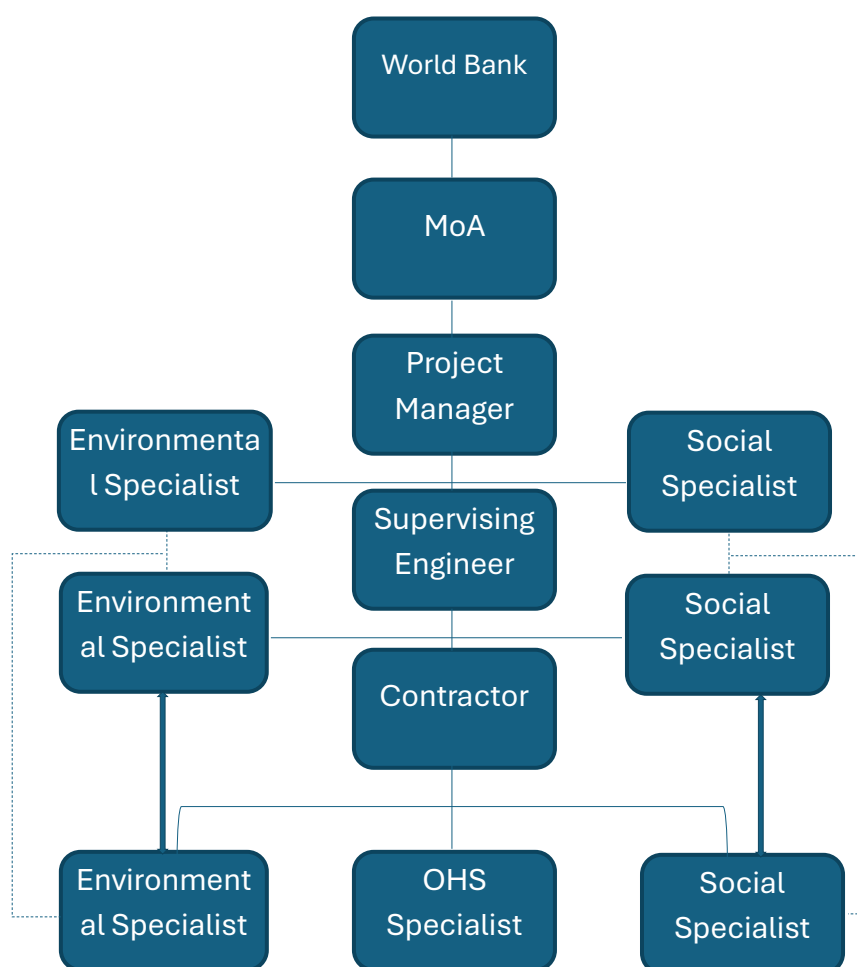


Figure 4: Organogram for ESMF implementation

7.2 Proposed Training and Capacity Building

Table 11: Proposed Training and Capacity Building Approach

Level	Responsible Party	Audience	Topics/Themes that May Be Covered
National level	PIU E&S Specialists	PIU staff responsible for overall implementation of ESMF	ESMF and approach: • Identification and assessment of E&S risks • Selection and application of relevant E&S risk management measures/instruments • E&S monitoring and reporting • Incident and accident reporting • Application of LMP, including Code of Conduct, incident reporting, SEA/SH, • Application of SEP and the grievance/beneficiary feedback mechanism

Site level	PIU E&S Specialists	Regional MoA staff Supervising engineers Contractors	ESMF and approach: • Identification and assessment of E&S risks • Selection and application of relevant E&S risk management measures • E&S monitoring and reporting • Incident and accident reporting • Application of LMP, including Code of Conduct, incident reporting, SEA/SH, • Application of SEP and the grievance/beneficiary feedback mechanism
Community level	Local project structures	Community members Community Workers	• Basic OHS measures and Personal Protective Equipment • Community health and safety issues • Worker Code of Conduct • SEA/SH issues, prevention, measures] • Grievance redress • Workers' grievance redress

7.3 Estimated Budget

The following table lists estimated cost items for the implementation for the ESMF, which have been included in the overall project budget:

Table 12: ESMF Implementation Budget

Activity/Cost Item	Potential Cost (USD)
Trainings for staff (venue, travel, refreshments etc.)	10,000.00
Trainings for contractors (venue, travel, refreshments, etc.)	10,000.00
Printing of awareness raising materials / grievance redress materials	5,000.00
Preparation of site-specific ESIA/ESMPs (31 sites approx.)	500,000.00
Cost of obtaining clearances or permits	50,000.00
GBV/SEA/SH Action Plan implementation	100,000.00
External monitoring or supervision consultant	50,000.00
TOTAL	625,000.00

8 Stakeholder Engagement, Disclosure, and Consultations

8.1 Stakeholder Identification and Analysis

The first step in the process of stakeholder engagement is stakeholder identification to determine who the project stakeholders are, their key groupings and sub-groupings. Some stakeholder groups might be pre-determined through regulatory requirements. This is followed by stakeholder analysis, a more in-depth look at stakeholder group interests, how they will be affected and to what degree, and what influence they could have on the project. The answers to these questions will provide the basis from which to build the stakeholder engagement strategy.

Not all stakeholders in a particular group or sub-group will necessarily share the same concerns or have unified opinions or priorities. When identifying affected stakeholders, the project will use a systematic approach by identifying those directly affected by the project and those having an interest in the project. A quick and practical technique for undertaking this type of stakeholder mapping exercise to be used by the project is "impact zoning". Mapping the sphere of influence of different types of environmental and social impacts, will enable the project to identify distinct groups by impact area, and from this prioritize stakeholders for consultation.

While priority will be given to individuals and groups in the subproject areas who will be directly and adversely affected, drawing the line between who will be affected and who will not can be challenging. This is because communities lying just outside of the designated subproject impact area can “perceive” impacts or feel they have been arbitrarily excluded from project benefits. For these reasons, the project will avoid defining stakeholders too narrowly.

8.2 Consultation Framework

Consultation is a two-way process of dialogue between the project and its stakeholders. Stakeholder consultation is about initiating and sustaining constructive external relationships over time in order to obtain “social license to operate.” Consultation will not be a single conversation but a series of opportunities to create understanding about the project among those it will likely affect or interest, and to learn how these external parties view the project and its attendant risks, impacts, opportunities, and mitigation measures. Listening to stakeholder concerns and feedback will be a valuable source of information that can improve project design and outcomes and help the project to identify and control external risks. It can also form the basis for future collaboration and partnerships. For stakeholders, the project’s consultation process is an opportunity to get information, as well as to educate project staff about the local context in which a project will take place, to raise issues and concerns, ask questions, and potentially help shape the project by making suggestions for the company to consider and respond to.

The Consultation Framework will consist of the following five steps for iterative consultation:

Plan ahead

Before beginning a stakeholder consultation process, it will be useful to think about who needs to be consulted, over what topics, and for what purpose? Getting clear answers for these questions up front can save the project time, reduce costs, and help keep expectations in check.

Consulting using basic principles of good practice

Given its nature, the consultation process will always be context-specific. This means that techniques, methods, approaches and timetables will be tailored for the local situation and the various types of stakeholders to be consulted.

Incorporate feedback

Consulting people entails an implicit “promise” that, at a minimum, their views will be considered during the decision-making process. The project will clearly explain to the stakeholders about which aspects of the project will still be open to modification based on their input, and which are not. The project will also take the feedback it will receive during the consultation process seriously and making best efforts to address issues raised through changes to project design, proposed mitigation measures, or development benefits and opportunities.

Document the process and results of consultation

The project will document when, where, consultation meetings take place, with whom, topics and themes covered and results. All commitments made to the stakeholders during or as a result of these consultations, these too will be documented.

Report back

As a good practice and common courtesy, the project will follow up with the consulted stakeholders, to let them know what has happened and what the next steps in the process will be. This will also enable the project to double check information, and test or refine proposed approaches and mitigation measures before implementing them. Further, reporting back to the stakeholder provides an opportunity for the project to explain which of their concerns will be addressed and how, as well as explaining what

suggestions were not taken on board and the reasons why, so as to establish credibility, manage expectations, and reduce consultation fatigue or cynicism.

The following project activities against their stages/timelines will guide when consultations will be conducted.

No.	Timelines when consultations will be conducted	Stakeholders to be consulted
1.	Before screening of activities	ZEMA, WARMA, ZABS and other regulatory bodies
2.	During site specific ESIA studies/Feasibility studies	Traditional authorities, Local Authorities, NGOs, Project beneficiaries and surrounding communities.
3.	During implementation and feedback reporting to communities.	Seed, fertilizer and agrichemicals suppliers, crop off takers (markets), Traditional authorities, Local Authorities, NGOs, Project beneficiaries and surrounding communities.

8.3 Information Disclosure Arrangements

Disclosure is a formal-sounding term for making information accessible to interested and affected parties. Communicating such information in a manner that is understandable to the stakeholders is an important first (and ongoing) step in the process of stakeholder engagement. All other activities, from consultation and informed participation to negotiation and resolution of grievances, will be more constructive if stakeholders, including affected communities, have accurate and timely information about the project, its impacts, and any other aspects that may have an effect on them.

The ESCP and SEP have been prepared for this project and publicly disclosed on the National Authorising Office of the European Development Fund and Ministry of Agriculture Websites on 04 and 05 May, 2026 respectively to allow for stakeholder consultations.

9 Grievance Redress Mechanism (GRM)

For projects with E&S risks and impacts, grievances are a fact of life. How a project responds (or is perceived to be responding) when such grievances surface is important and can have significant implications for project performance. Therefore, a grievance mechanism should be scaled to fit the level of risks and impacts of a project.

9.1 GRM Structure and Procedures

A GRM is a locally based, formalized way to accept, assess, and resolve concerns or complaints. The GRM is an essential part of the E&S instruments that intends to address complaint concern and complaints related to project implementation promptly and effectively. The project GRM will be gender responsive, culturally appropriate and readily accessible to all segments of the complaint persons. Community will be made aware of their rights to access the GRM.

The project will ride on the existing GRM committees established under IDSP and for new project sites, new committees will be established at subproject level. The third-party activities to be supported by the such as aggregators and associated value chains will also be encouraged to establish GRM committees to handle complaints. The GRM committees will be composed of the local community members to ensure accessibility and transparency of the GRM.

The scope of the issues to be addressed in project GRM will be all complaints arising from subproject activities. Any person within project target who has a complaint(s) regarding subprojects activities

during preparation/designing, implementation and operation phases shall have access to the Mechanism. The GRM will also handle anticipated grievances that may arise due to benefits sharing, farmer selection complaints, irrigation management disputes, exclusion complaints and other community grievances, including how these could possibly be addressed.

The GRM guideline will include the procedures, focal persons and time frame at each level of the administrative hierarchy. Awareness creation training will be given to all the community members. Communities will be aware of the mechanism (their rights, where to apply) and any person within targeted project areas who has complaint(s) regarding the activities of the project during preparation/designing, construction and operation phases will have access to the mechanism and get responses. The complaints recorded, resolved and referred will be reported quarterly in the E&S progress report.

The GRM procedures will entail:

1. A register of grievances is established and held at each subproject site by the GRM committee as guided by the PIU Social Specialist and/or as any other person(s) appointed by the Grievance Committee;
2. Receipt of grievances will be acknowledged within stipulated timeframes for handling of complaints, through convenient means of communication such as written letters, in-person and email;
3. The grievance will be reviewed by the respective Grievance Committee and corrective action will be implemented. Should the complainant disagree on the prescribed actions, the matter will be escalated as per prescribed referral pathway. The preferred course of action will be discussed with the affected person to ensure consensus in the resolution of the grievance; and
4. Relevant details of grievances, with outcomes, will be made available to the affected parties including an explanation of the approach and methodology used to resolve the grievance.

9.2 Handling of SEA/SH-Related Complaints

Based on the SOPs of Zambia on GBV, victims have the right to disclose the incident to anyone they choose. Any service provider or GRM recipient who receives a report should follow the following disclosure guidelines:

- Provide support and assistance, and give honest and complete information about the response services available, a timeline within which services can be anticipated, and information on how to access these services and the necessary support to do so.
- Respect the wishes of the victim as to where or with whom to seek help.
- All information should always be kept confidential and can only be shared with the consent of victims and on a need-to-know basis.
- All actors and stakeholders should not attempt to actively identify victims of GBV, as this can lead to stigma and put victims at risk.
- When dealing with disclosure of GBV incidents, it is essential to respect the safety, dignity, and rights of the victim. A survivor-centered approach should be well-known to all relevant staff.
- Non-specialized actors should not interview victims or respond directly.

In the establishment of referral pathways, the following issues are to be considered:

- Service mapping: At each location conduct service and capacity mapping or assessments. Available services should be documented and monitored to ensure quality and maintain the minimum standards of care.
- Locate leading actors, such as health, psychosocial, legal/justice or other actors for each thematic area of response.

- Consult with women, girls and other community members on entry points to services.
- Establish transparent reporting and referring system for incidents in each location or context.
- Referral pathways should be kept up to date.
- Groups of people who face additional barriers to accessing services, including victims with disabilities, implement specific access adaptations.
- Provide information about referral pathways so that as many people as possible know where to seek help.

9.3 Monitoring and Reporting of Grievances

Monitoring and reporting grievances will involve tracking complaints through the grievance register to ensure accountability, timely resolution, and continuous improvement. This process will be centralized at PIU in order to log issues, monitor resolution times, and generate reports that will help the project identify root causes and mitigate operational risks.

Grievance monitoring and reporting framework will rely on following:

The Intake and Tracking System - To ensure complainants can easily reach out, the project will use multiple access channels including suggestion boxes, hotlines emails, written letters and in- person.

Monitoring Progress – The project will continuously track the grievances received to prevent complaints from falling through the cracks (overlooked, missed, or neglected) and to keep stakeholders informed

Annexes

Annex 1: Generic Environmental and Social Screening Form

This form must be used by the environmental and social specialists at the PIU or their equivalent at local level to screen for the potential environmental and social risks and impacts of a proposed subproject. It will help the PIU establish an appropriate E&S risk rating for these subprojects and specify the environmental and social assessment required, including specific instruments/plans. This form must allow the PIU to form an initial view of a subproject's potential risks and impacts. It is not a substitute for project-specific E&S assessments or specific mitigation plans. If form is filled out by the local project team, it must be sent to PIU for review.

A. General Project Information:

Name of the project:	
Name of the sub-project and area:	
Executing entity:	
Contact details of the executing entity:	
Start/Completion Date:	
Please provide information on the type and scale of the activity.	
Describe how the subproject activities will be carried out, including support/activities and resources required to operate it e.g. roads, disposal site, water supply, energy requirement, human resources etc.	

B. Risk Category and Classification

Risk Category	Nature of Risk and Impact	Examples
Low Risk	Activities that do not have a physical footprint. These will not require E&S instrument preparation, however, E&S clauses in the contract are recommended (to be prepared by the contracting agency prior to bidding process)	• Communication and translations. • Training and workshops; and • TA
Moderate Risk	Activities rated <i>moderate</i> risk are site-specific, temporal and reversible in nature. In addition to the E&S clauses in the contract, these activities may require a simplified or detailed ESMP. Contractors will also be required to prepare a C-ESMP.	Rehabilitation or construction of irrigation schemes) with no land and resettlement implications
Substantial Risk	Activities that have substantial E&S risks and impacts, including those that are not as complex as high-risk projects, and more predictable and potentially reversible. This category includes risks of social conflict; impacts that are medium in magnitude, medium to low probability of serious adverse effects to human health and/or environment.	• Rehabilitation or construction more complex irrigation • Activities leading to involuntary resettlement, land acquisition and restrictions to land use; and • Activities that may trigger inter-communal conflicts.

High Risk	Subprojects that contain significant environmental and social risks impacts.	• Construction/ rehabilitation activities in critical habitat and protected areas; and • Projects involving significant amount of land, quantities of hazardous substances.
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C. Questionnaire

	Yes	No	Additional comments
ESS2: Occupational health hazards			
Will the works require large number (e.g., more than 100) of staff and laborers from outside the local area?			
Will the infrastructure works require a worker's camp? If "Yes", how many workers are expected to occupy the camp?			
Are the works activities prone to hazards, risks and could result injuries, death to workers during construction?			
Will the works include the removal of asbestos and related OHS risks?			
Will the sub-project include excavation or demolition works and related risks?			
Is there a risk of forced or child labor being deployed during works?			
ESS3: Noise and Dust Pollution during Construction and Operations			
Will the subproject activities result in emission of significant amounts of dust?			
ESS3: Contamination and Pollution Hazards			
Is there a possibility that the works will lead to any contamination and degradation of water bodies?			
Is there a risk of agrochemical runoff through increased fertilizers and pesticides for irrigated crops?			
Can the activity lead to the contamination of water in the reservoir as a result of poor farming?			
ESS3: Degradation and/or depletion of resources during construction and operation			

Will the subproject activities involve use of considerable amounts of natural resources (construction materials, trees) or may lead to their depletion or degradation at points of source?			
Is there a risk of erosion and sedimentation through the activity?			
Is there a risk of soil disturbance and erosion through earthworks?			
Is there a risk of natural hazards during the operational phase of the activity?			
Can the activity disrupt natural drainage and reduce downstream water flow or cause flooding?			
Is there a risk of salination due to the activity?			
Does the activity pose a risk of groundwater depletion?			
ESS3: Solid and/or Liquid Wastes and/or Hazardous Wastes			
Will the works generate domestic waste?			
Will the works generate construction waste?			
Is there a risk of the generation of hazardous waste (fuels, lubricants, etc)?			
Will the activity generate e-waste?			
Is there a risk of water depletion through the activity?			
ESS4: Beneficiary Selection and Social Dynamics and Community Health			
Could the subproject lead to discrimination of certain societal groups, e.g. exclude women?			
Could the subproject lead to conflicts between local groups over access to water?			
Is the sub-project located in a conflict area?			
Could the beneficiary selection be contested?			
Are there community safety risks in the vicinity of the works?			
Is there a risk of asbestos impacting human health?			
Are there public health risks due to stagnate water?			

Does the activity include risks of drowning for the public?			
Is there a risk of embankment failure?			
ESS5 and ESS6: Block of access and routes or disrupt normal operations in the general area			
Can the activity lead to disruptions of livelihoods for farmers , fishers or downstream water users?			
Will the works interfere with or block access, routes etc. or traffic routing and flows?			
ESS5: Resettlement and/or land Acquisition			
Will the subproject activities or any other project activities result in the permanent or temporary loss of crops, fruit trees, infra-structure etc?			
Will the activity require any involuntary resettlement?			
Could the activity lead to conflicts over land ownership or usage?			
ESS6: Natural habitats, Environmentally sensitive areas or threatened species			
Could the activity lead to soil degradation and reduced fertility?			
Is there a risk of biodiversity/habitat loss through altered water regimes in wetlands and riparian zones?			
Is the activity likely to impact terrestrial and aquatic species?			
Is there a likelihood of ecosystem disturbance through temporary dewatering or altered river flow affecting downstream aquatic life, fish migration and water quality?			
Is the subproject area (or components of it) located within/adjacent to any protected areas designated by government (national park, national reserve, world heritage site etc.)?			
Is the site considered to be habitats of endangered/threatened or endemic species for which protection is required?			
ESS8: Historical, archaeological or cultural heritage site			
Could the works alter any historical, archaeological, cultural heritage traditional (sacred, ritual area) site or require excavation near same?			
ESS10: Stakeholder engagement			

Has input from community members and those who may be affected by the works or any other project activities been sought?			
Has the subproject received overall stakeholder support including from vulnerable individuals and marginalized groups?			
Has the stakeholder engagement process considered vulnerable individuals and marginalized groups?			
Do the benefits of the activity reach low income or female farmers?			

Annex 2: Integrated Pest Management Plan

Objectives

The Integrated Pest Management Plan (IPMP) is aligned with the World Bank's ESS3 on Resource Efficiency and Pollution Prevention and Management. The main objective of the IPMP is to ensure that pest management is environmentally sound, socially acceptable and economically viable, while minimizing risks to human health and the environment.

The purpose of plan is to provide a basis for the integration of pest management considerations in the planning and implementation of the activities to be implemented within the project specifically on activities that will involve use of fertilizers and pesticides for crop production or involved in livestock farming. Use of pesticides can constitute increased risks to human health and environment. The IPMP promotes safe, effective and sustainable control of pests to:

- Reduce reliance on chemical pesticides;
- Encourage biological and ecological pest control methods; and
- Prevent adverse impacts on human health, biodiversity, soil, and water quality associated with pesticide use in irrigation-supported agriculture.

Environmental and Social risks and impacts of Pesticides

The potential adverse effects of pesticide use in the project will include among others:

- Pollution and contamination of surface and underground water bodies through pesticide runoff or leaching into surface and groundwater;
- Contamination of rivers, irrigation ponds and wetlands and harming the aquatic life;
- Accumulation of pesticide residues in soils, reducing soil fertility and microbial diversity;
- Impact on terrestrial fauna due to contamination, such as beneficial insects and non-target species (fish, birds, and amphibians);
- Human and animal health related hazards due to indiscriminate exposure to pesticides;
- Overuse or misuse of pesticides may lead to pest populations developing resistance, resulting in greater chemical dependence; and
- Human health and safety risks, including through farmer and workers exposure, community exposure and improper handling and disposal.

All the pesticides banned or under restriction in Zambia will not be used in the project. Wherever possible, non-chemical means of pest control will be exercised, in keeping with the promotion of Integrated Pest Management (IPM). IPM can in some cases facilitate agricultural pest protection without the application of chemical-based pesticides. Some IPM tactics that could be considered by subproject activities that reduce pest risk include:

- Biological control methods
- Natural physical methods, such as picking of ticks • Mechanical/manual control of pests
- Growing of pest resistant crops.

IPM Planning, Design & Implementation

This sub-section describes the typical methods that should be used by the project when preparing IPM for activities specifically when environmental and social screening determines that pesticides will be utilized and or their use will be promoted in the specific project activity.

IPM is a sustainable approach to managing pests by combining cultural, physical/mechanical, biological, and chemical tools in a way that keep pests below their economic injury levels and minimizes economic, health and environmental risks. Fundamentally, IPM aims to maximize the use of biological control as they play a supportive rather than a disruptive role. Every activity under the project that includes pest management will require the preparation of a site-specific IPM Plan (site specific IPMP) and the sections below outline the proposed approach in developing site specific IPMPs. The project will utilize its E&S specialists and trained professionals with expertise in agricultural science and pest management to prepare these site- specific IPMPs.

The following are preconditions for an IPMP approach, which will be adopted by all project activities that will be screened and found to require pesticide use:

- Understanding of the ecological relationships within a farming system (crops, plants, pests, organisms) and factors influencing their development;
- Understanding of economic factors within a production system (infestation, loss);
- Understanding of socio-cultural decision-making behavior of the farmers (traditional preferences, risk behavior);
- Involvement of the farmers in the analysis of the pest problems and their management; and
- Successive creation of a legislative and agricultural policy framework conducive to a sustainable IPM strategy (plant quarantine legislation, pesticides legislation, pesticide registration, price policy).

This Project IPMP has been developed following and applying the key elements of IPM, namely:

- Ensuring that activities/subprojects under the project use available, suitable, and compatible methods which include resistant varieties, cultural methods, biological control, safe pesticides, etc. to maintain pests below levels that cause economic damage and loss;
- Ensuring that activities/subprojects under project conserve the ecosystem to enhance and support natural pollinators;
- Ensuring that activities/subprojects under project integrate the pest management strategies in the farming systems; and
- Ensuring that activities/subprojects under project conduct analysis based on pests and crop loss assessments.

Setting up IPM

Planning is at the core of any IPM. Every irrigation farm has pests that need to be considered. Waiting until problems arise will increase reliance on pesticides more and more. Good IPM has four parts and all the site-specific IPMPs that will be prepared under the project will have to follow these parts:

- Identifying problems;
- Selecting tactics;
- Considering economic and environmental factors; and
- Evaluating the program.

A. Proper Identification of Problems

The correct IPM approach promotes “proactive” rather than “reactive” management. Correct identification is the first and most important step in controlling a problem. This first step is critical to future success, since an incorrect diagnosis leads to mismanagement. Scouting is, in fact, the key feature of any IPM. By scouting, the ability to detect potential problems early is increased. The earlier a problem is discovered, the better the chances of avoiding economic losses. Primary beneficiaries of the project will use pesticides or promote use of pesticides and will be trained in scouting techniques to identify pests early to promote the proactive approach in pest management as described above. To scout effectively, the above-mentioned primary beneficiaries of the project will be encouraged and trained to:

- Identify the cause of the problem to find out what kind of pests they are dealing with;

- Contact agricultural extension officers if they encounter something that they cannot identify;
- Determine the stage of growth of the pests and crops. This is essential for proper timing of control methods;
- Decide whether the infestation is increasing or decreasing;
- Assess the condition of the crops;
- Map out problem areas. It may be possible to limit the area that needs treatment; and
- Use the right scouting method for the specific pest.

B. Select Tactics

Once the problem has been identified, considerations on how to control it will have to be made. The goal in selecting control tactics is to use methods that are effective, practical, economical, and environmentally sound. To select the best control tactics, there is a need to:

- Understand the life cycle and habits of the pests. Some control methods will work only if they are used at the right time.
- Decide whether the infestation is serious in terms of economic loss.
- Compare the costs and benefits of various control methods.
- Make plans for the future. Not every part of IPM can be put into effect immediately.

Sampling to determine the extent of the problem: Once the pest is correctly identified, the next question which will need to be answered will be, Is there a risk of significant loss? Is the problem occasionally seen? Localized? Or commonly found throughout? What is the extent of the damage? Is the problem a growing threat? Correct sampling will help to eliminate the guesswork in pest control by providing a means to quantify an old problem or discover a new one. Sampling knowledge and information on pests and crop biology should be used to make better management decisions.

Analysis to assess problem importance: This step in the pest management process entails analyzing the identification and sampling information and evaluating the need for a pest control action to make a determination on how bad the problem really is. There is need to assess whether the potential control measures are more costly than the damage potential? There is need to weigh economic, environmental, and times concerns and assess the impact of the current pest control decision on future management decisions.

Selection of appropriate management alternative: The action plan needed must entail a strategy that fits with the short- and long-term plans, labor force, capital, equipment, and finances of the farm. Therefore, an evaluation of the costs, benefits, and risks of employing various management options is needed. Opportunities to integrate different pest control strategies must be considered.

C. Choosing Controls

There is no such thing as a completely safe and natural pesticide. Pesticides can vary greatly in their level of toxicity to non-target organisms such as people, pets or beneficial insects. Even organically approved pesticides can pose a danger to people and the environment if they are not used properly.

Pesticides are grouped into various types or categories. For example, there are fungicides, insecticides, herbicides (for weeds), nematicides (for nematodes) and miticides (for mites).

While many pesticides control specific problems, there are still some broad-spectrum controls. In addition, there are many products that are only effective if they are used at a specific growth stage of the pest, so timing is critical.

It is never wise to use blanket applications of pesticides on large areas or to use them based on a calendar alone. The improper use of pesticides can pose a risk to the applicator, family, plants, beneficial organisms and the environment. There are times when pesticides are needed to prevent major losses. The judicious

and proper use of pesticides can occur with a sound IPM program. The following are examples of management tactics which can be employed:

- Biological - Parasites, predators, pest;
- Chemical - Pesticides, pheromones, baits, attractants; and
- Physical/Mechanical.

Consider Economic Factors: Know When It Pays to Use a Pesticide Despite efforts to avoid using chemicals, there are times when only pesticides can control the damage. Even so, it may not pay to use them. Pesticides should be used in an IPM program only when the benefits (yield, quality, aesthetic value) exceed the costs of control. Otherwise, time and money are wasted. It's not easy to figure out when it pays to use pesticides. There are many variables: the pest population, variety, and growth stage, weather, and cost of the control.

D. Evaluate IPM

Evaluation means deciding how effective a program is and whether any changes are needed. All subprojects that will prepare site-specific IPMPs will have to evaluate IPM, and should:

- Monitor fields and keep records: Each time field visits are made, a note of crops and pest conditions, record yields and quality and record any counts on pest populations.
- Record control measures: Records should include dates, weather conditions, pest levels, application rates and timing, and costs. Good records are a guide if the same problem occurs.
- Compare effectiveness: Whatever control tactics are chosen, use a different method on some strips. That way comparison can be made, which worked better, taking into account costs and environmental impacts.

Reporting and Performance Review Requirements: The MoA through the PIU will integrate pesticide use activities within the regular project specific quarterly progress E&S reports for all subprojects, including site-specific IPMPs for submission to the World Bank specifically for identified sub-projects during the feasibility study phase of the sub-projects following detailed screening.

Pest Management for Agriculture Subprojects:

Project activities may involve strengthening existing practices, introducing, diversifying or the intensification of crop production. Support for the development of large, medium, and small-scale irrigation may lead to the introduction or increased use of pesticides and other agricultural chemicals such as herbicides and fertilizers. Pests are organisms that compete with humans, domestic animals, or crops for nutritional resources. They include species of insects, mites, nematodes, mollusks, plant pathogens, vertebrates and weeds. Fertilizers are used to promote crop growth. It is critical that appropriate planning, design and management be adopted for the handling, use, and management of all agricultural chemicals to avoid potential negative environmental and social impacts. If appropriate for the irrigation sub-projects, the site-specific pest management plan should address the following issues:

- Proper use of agricultural chemicals such as fertilizers to avoid reduction in soil and groundwater quality.
- Prevent fertilizer run-off into surface water sources to avoid negative impacts on aquatic environments.
- Proper use of pesticides and herbicides to avoid contamination of crops, soils and water.
- Proper use, handling and storage of all agricultural chemicals to avoid adverse health impacts on the rural population.
- Ensure that banned or unauthorized agricultural chemicals are not used.
- Proper handling and disposal of unused agricultural chemicals and packaging materials (i.e. sacks, plastic containers, etc.).

Guideline for site-specific Integrated Pest Management Plan for Irrigation Sub-projects

Pest Management Approach

- Current and anticipated pest problems relevant to the project: Describe common pest problems and estimated economic impact.
- Current and proposed pest management practices: Describe current and proposed practices, including non-chemical preventative techniques, biological and chemical control. Is optimum use being made of agro-ecosystem management techniques to reduce pest pressure and of available non-chemical methods to control pests? Do farmers and extension staff get sufficient information about IPM approaches that reduce reliance on chemical control?
- Relevant IPM experience within the project areas or country describe existing IPM practices, projects/programs, research;
- Assessment of proposed or current pest management approach and recommendations for adjustment, where necessary. Where the current or proposed practices are not consistent with the principles of an IPM approach, the discrepancies should be discussed, and a strategy should be proposed to bring pest management activities into line with IPM.

Pesticide Management

- Describe present, proposed and/or envisaged pesticide use and assess whether such use is in line with IPM principles. Provide purpose of pesticide use, type of products used, frequency of applications, and application methods. Does pesticide use part of an IPM approach and is it justified? Justification of pesticide use under the project should (a) explain the IPM approach and the reason why pesticide use is considered, (b) provide an economic assessment demonstrating that the proposed pesticide use would increase farmers' net profits, or for public health projects, provide evidence that the proposed pesticide use is justified from the best available (probably WHO supported evidence) public health evidence.
- Indication of type and quantity of pesticides envisaged to be financed by the project (in volume and monetary value) and/or assessment of increase in pesticide use resulting from the project.
- Circumstances of pesticide use and the capability and competence of end-users to handle products within acceptable risk margins (e.g. user access to, and use of, protective gears and appropriate application equipment; user's product knowledge and understanding of hazards and risks; appropriateness of on-farm storage facilities for pesticide).
- Assessment of environmental, occupational and public health risks associated with the transport, storage, handling and use of the proposed products under local circumstances, and the disposal of empty containers.
- Pre-requisites and/or measures required to reduce specific risks associated with envisaged pesticide use under the project (*e.g.: protective gear, training, upgrading of storage facilities, etc.*).
- Selection of pesticides authorized for use, taking into consideration: (a) criteria set at national (if there is any) or international, (b) the hazards and risks and (c) the availability of newer or less hazardous products and techniques (e.g. bio-pesticides, traps).

Monitoring and Supervision

- Description of activities that require local monitoring during implementation.
- Description of activities that require monitoring during supervision visits (e.g. regarding effectiveness of measures to mitigate risks; progress in strengthening regulatory framework and institutional capacity; identification of new issues or risks arising during implementation).
- Monitoring and supervision plan, implementation responsibilities, required expertise and budget.

Annex 3: Waste Management Plan

This Waste Management Plan (WMP) presents the activities to be conducted to support the safe handling of waste of ALL type during the project implementation in compliance with Zambian laws and the World Bank Group general EHSs on Waste Management.

This plan will assist in the development of activity or site-specific Waste Management Plans. The plan has been prepared to explain the management of the different types of waste that are likely to be generated during the implementation of subproject activities. The likely wastes are excavation and earthwork waste (excavated soil, rock, overburden, cuttings, spoil from foundation works); solid wastes from construction, such as concrete rubble, masonry, bricks, tiles, broken blocks and asphalt; timber, vegetation and organic waste; reservoir dredging and siltation spoil; hazardous waste like asbestos, diesel, gasoline, hydraulic oil, lubricants, waste oil filters, solvents, paints, adhesives, contaminated expired agrochemicals, rags, batteries; domestic waste from construction sites, such as packaging, plastics, paper, cans etc; and solid wastes from O&M activities, including worn spare parts, broken pumps, filter cartridges, tyres, batteries, metal scraps.

The WMP will reduce the risks of destroying and/or polluting the environment. It therefore expresses the commitment to prevent any adverse impacts to the local environmental conditions from any construction activities that generate waste by the implementation of waste management principles and best practice strategies.

Types of Waste and Management

Waste can be categorized into biodegradable and non-biodegradable waste. Biodegradable waste includes any organic matter which can be broken down into carbon dioxide, water, methane, compost, humus, and simple organic molecules by micro-organisms. Non-biodegradable waste is those that cannot be decomposed or dissolved by natural agents. During the site activities, waste will be generated from sources such as the project construction camps and worksites.

Table 1: Waste Generated and Proposed Management Method

Type of Waste	Waste items	Management Measures
Excavation and earthwork waste	Excavated soil, rock, overburden, cuttings, spoil from dam/drainage foundation works	Reuse for embankment construction or backfill; avoid dumping in waterways
Construction solid waste	Concrete rubble, masonry, bricks, tiles, broken blocks, asphalt	Reuse for road-base or riprap; segregate on site
Timber, vegetation and organic waste (But not including drained electrical equipment (transformers, etc.) refer to <i>hazardous substances</i>).	Trees, brush cleared for reservoir and canals, crop residue	Reuse timber; remove large logs from reservoir area before impoundment; avoid open burning
Reservoir dredging and siltation spoil	Silt, sediment removed from intake channels or reservoir during operation	Controlled dewatering and stabilization or dredged material; use for land reclamation or embankment material
Hazardous wastes	Diesel, asbestos, gasoline, hydraulic oil, lubricants, waste oil filters, solvents, paints, adhesives, contaminated rags, batteries, expired agrochemicals.	Separate storage in banded areas; use hazardous waste contractors for disposal or recycling; on site spill kits and training; collect used oils for recycling; never bury or discharge to water.

Construction site domestic waste	Food waste, packaging, plastics, paper, cans	Provide segregated bins; regular collection; composting of food waste; recycling where possible
Solid waste from O&M	Worn spare parts; broken pumps; filter cartridges; tyres; batteries; metal scrap	Establish recycling routes; take-back routes; maintain inventory to minimize waste; safe storage of used parts; contractual responsibility of suppliers to take-back

Waste Management Strategy

Waste Management Process: Any existing unidentified waste exposed or uncovered on site prior to the initialization of site activities will be brought to the attention of the implementer. All wastes identified pre-project will be clearly documented, and pictorial evidence taken if necessary.

Waste Avoidance and Minimization: The opportunity for avoidance and minimization of waste production identified can be summarized as follows:

- Order and use materials optimally to avoid waste, i.e. the project will only procure and use materials in the exact quantities required;
- Non-hazardous or low toxicity materials/products will be selected instead of hazardous material/products, whenever feasible;
- As far as possible, it must be ensured that all materials are stored and handled correctly to minimize damage to the materials which will render it unusable; and
- Minimization of waste will also include the reduction of waste toxicity. This may be performed by selecting low toxic chemicals used during the Project.

Waste Collection Points: The main waste collection points will be designated in an easily accessible area within the project activity area. The waste collection point will be selected, taking into consideration the prevailing wind direction, surface runoff patterns, topography and visual context and will as far as possible, cause the minimum of nuisance to adjacent properties. It will be ensured that the waste disposal area will not be located near any drainage areas, wetlands or wells and boreholes.

The selected waste bay will comprise of a cordon-off and contained area. The waste bay will make provision for the segregation of waste into non-hazardous and hazardous waste. Non-hazardous waste will further be divided into organic and non-organic waste. Organic waste will consist of general domestic food waste and other green waste.

All waste containers on site (bins, skips, drums, etc.) will be clearly labelled with visible signs to indicate which wastes it contains.

Waste Treatment and Disposal: If waste produced cannot be reused or recycled, the waste will be disposed of at a waste disposal facility as guided in accordance with the Solid Waste Regulation and Management Act No. 20 of 2018 and Local Authority Bye-Laws.

Table 2: Waste Disposal Methods

Waste	Disposal Method
METALS: Scrap metal, tins, cans, foil	Separate Bin - Metals
Plastic bottles and polythene	Separate Bin – Plastics Empties of water etc.
Cardboard boxes and papers	Separate Bin – Card & Paper
Bottles and Glass	Separate Bin - Glass

Procedure for Handling and Storage of Waste

Waste Handling: All personnel who are involved in the handling of non-hazardous waste will undergo specific training in:

- The procedure to be followed to ensure adequate segregation;
- Waste handling (and PPE requirements) including collection;
- Waste storage; and
- Correct waste disposal procedures.

Waste from litter bins will be collected from the site on a weekly basis or as required. Accumulated hazardous waste will be removed from the site daily and will be transported to the main waste collection point. Waste will be removed from site on a monthly/weekly basis. The frequency of waste collection will be determined based on the rate at which the waste accumulates during the construction activities.

Temporary Waste Storage

Waste Storage Area: All waste produced during activities at site and servicing activities and camps shall be collected using appropriate personnel protective equipment and they shall be sorted out and temporarily stored in special containers at the camp.

The waste storage areas are to be indicated on relevant site procedures and will be located at least 100m from any watercourses. Wastes will be stored in a manner to prevent:

- Accidental spillage or leakage, contamination of soils and groundwater, loss of integrity from accidental collisions or weathering by provision of suitable secondary containment and/or roofing;
- Corrosion or wear of containers both from the weather, by protecting waste storage areas, and from the wastes themselves, by selecting containers suitable for storage of intended waste,
- Theft by people by storing waste within site camp perimeter; and
- Scavenging by animals by storing putrescible waste in closed bins before composting.

The waste storage containers used will be appropriate in terms of volume, composition, shape and opening for the material that is being stored. Only containers in good condition will be utilized. Lids will be securely fastened, or other forms of covering shall be provided. No containers will be used that are susceptible to reaction with the waste, which may lead to the release of harmful substances. All hazardous waste will be strictly segregated. Only one category of hazardous waste may be placed in any one container. Solid and liquid waste will not be mixed, as well as hazardous waste of incompatible nature.

Best Waste Management Practices

These include the following:

- The Implementer / contractor to obtain permits regarding waste management from relevant authorities.
- The Implementer/contractor provides handling containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the project.
- The Environmental management personnel to be responsible for matters of managing the environment including being responsible for implementing, monitoring, and reporting status of this procedure and shall be full-time on worksites throughout the project.
- All workers, subcontractors, and suppliers to be trained in proper waste management plans, as appropriate for the work occurring at Project Site(s). Information, Education and Communication (IEC) materials shall be distributed and/or made available to everyone concerned and to all entities when they first begin work.
- To provide specific designated and labeled areas on project site(s) necessary for separating materials that are to be recycled, reused, donated, and sold. Recycling and waste bin areas are to be kept neat, and clean, and clearly marked to avoid contamination of materials and.

- Hazardous wastes to be separated, stored, and disposed of according to local regulations and according to the Waste Management Plan and should not be included in management of the other waste streams.

Community Safety

The primary goal of waste management planning is to protect members of the community in which the activity is executed from harm and to effectively manage waste, debris and all waste materials generated. While the amount of waste varies between sub-projects, the generated waste is often greater than the amount of waste many communities handle each year. Additionally, projects may generate waste streams, which typically are not handled by communities or waste management facilities due to insufficient capacity. Some of these wastes are absorbed or processed through natural resources outlets like air and water. In order to manage the project wastes in such a manner that does not negatively impact the surrounding communities, the Project will need to prepare the community by disclosing the types of potential wastes that will be generated and how it will be managed through sensitization campaigns.

Performance Monitoring

Inspections: Sites inspections will be performed by the Health, Safety and Environment (HSE) or Environmental Specialist of the contractor on weekly basis. Waste quantity shall be recorded (as number of 200L waste bins collected and disposed of per week). These inspections will ensure that all commitments in this plan are being enforced and that specific waste management elements are verified.

Data collection: Waste material register should be maintained to ensure the measurement of eliminated waste and of residual matter sent for reuse, recycling and others.

Audit: Six months since commencement of the project, a waste management audit should be performed, on sites all waste data collected, to identify waste streams and fate and develop ways to reduce waste production.

The Asbestos Management Plan

Introduction

The Asbestos Management Plan (AWP) is a guidance document that will be used to prepare a site-specific AWP when the site screening process reveals that asbestos roof tops will be removed for subject project activities under rehabilitation and expansion of schools and health facilities. The AWP has been prepared to outline the proper handling and disposal of asbestos containing material. Asbestos is a known carcinogen and requires the implementation of strict and specific management measures to protect the human health and the environment. Therefore, this AMP also details the correct personal protective equipment (PPE), operating procedures, incident management and record keeping requirements.

1.1 Objectives

- Provide guidance on how to manage asbestos and asbestos contaminated material (ACM) if discovered on site.
- Ensure appropriate procedures are in place for safe removal, handling, packaging, transportation, storage, and disposal of asbestos.
- Provide guidance to manage incidents related to inappropriate management of asbestos.
- Ensure the appropriate record keeping for asbestos' disposal and incidents.

1.2 Legislation Guidelines

The regulations and guidelines considered in the preparation of the AWP include the following:

- National Policy on the environment
- Environmental Management Act No. 12 of 2011 read with (Amendment) Act No.8 of 2023
- Environmental Management Licensing Regulations (SI.112 of 2013)
- The Occupational Health and Safety Act No. 36 of 2010
- The World Bank Environmental and Social Standards (ESSs)
- The World Bank Group Environmental, Health, Safety Guidelines (ESHGs) for Construction Materials Extraction

1.3: Definitions

Asbestos	Asbestos is a naturally occurring mineral that occurs in rock and soil composed of long, thin, needle like fibrous crystals. .
Asbestos Containing Material (ACM)	Any material, object, product or debris that contains asbestos.
Bonded ACM	Asbestos containing material containing a bonding compound reinforced with asbestos fibers.
Un Bonded ACM	Asbestos containing material that does not contain a bonding compound reinforced with asbestos fibers.
Friable ACM	Un-bonded asbestos containing material that, when dry, is or may become crumbled pulverized or reduced to powder by hand pressure
Fixed	This is asbestos that is attached or secured in position such as asbestos cement sheet screwed or nailed.
Foreman/Project Manager	Also means contractor and sub-contractor
Installed	Where it has been specifically placed for a purpose such as asbestos containing refractory bricks placed on top of each other or loose asbestos containing insulation blown into a ceiling space.
Removal	Asbestos removal work requires the appointment of a Principal Contractor authorized by ZEMA because asbestos removal work is a high-risk construction activity.
Asbestos Material Report	A report by an appropriately qualified person (Principal Contractor or ZEMA Inspector) which states: • Where and what the types of materials that were found. • The form of the materials. • The condition of the material (i.e., friable, poorly bonded, unstable). • The potential health risks to site workers. • Where the asbestos has been disposed.
Asbestos Register	A register that must be kept by the owner of the site and which must: • Contain information, including any changes/updates, from the Asbestos Report. • Be available for inspection by any person requiring inspection. • Be available to all site workers. • Be available to any contractors.

Competent Person	A competent person is a person who possesses adequate qualifications, such as suitable training and sufficient knowledge, experience, or skill, to perform a specific task safely
ESHG	Environmental Safety and Health Guidelines
GIIP	Good International Industry Practices
Hygienist	A person having attained training and experience to undertake Occupational Hygiene services to the Asbestos removal industry
HEPA	High Efficiency Air Filters
RTSA	Road Transport and Safety Agency
PPE	Personal Protective Equipment
ZEMA	Zambia Environmental Management Agency

1.3 Health Impacts

Asbestos is a known carcinogen that can cause mesothelioma, lung cancer and asbestosis. Asbestos fibres inhaled deep into the lungs can result in damage to mesothelial cells in the body and lead to the development of a type of cancer called mesothelioma. Lung cancer, which differs from mesothelioma and specifically affects the lungs, can also result from asbestos exposure. Asbestosis, a non-cancerous condition, caused by the scarring of the lung tissue from asbestos fibres, which results in a reduced ability of the lungs to transfer oxygen to the blood. The latency periods range between 35-40 years for mesothelioma, 20-30 years for lung cancer and 15-20 years for asbestosis.

1.4 Classification of asbestos

Asbestos is classified as friable and non-friable. Friable asbestos is that which can easily be crumbled, pulverized or reduced to powder. Examples of friable asbestos are tiles, clutch plates, and pipe insulation. Non-friable asbestos is a common form of asbestos that is held together with a strong binder e.g., roofing sheets. Asbestos fibres in non-friable asbestos may be released through damage, mishandling or weathering. Asbestos material in a non-friable state is less toxic than the crushed one. It is therefore, advised not to disturb the asbestos containing material that is in stable state.

1.5 Proposed Activities under the Asbestos Management Plan

The following proposed activities should be considered as conducted as part of the asbestos management plan:

- Asbestos roofs/pipes should only be removed when necessary and as informed by technical assessment. The mitigation hierarchy needs to apply as part of the management plan. Where feasible, avoid the removal of the asbestos containing material.
- Prepare a site-specific asbestos management plan prior to commencement of works.
- Ensure that a contractor engaged to handle asbestos material has a valid hazardous waste license for the from ZEMA.
- Identify a suitable and licensed dump site for disposal of the Asbestos Containing Material (ACM) with guidance from ZEMA.
- Conduct due diligence and site visit on the contractor identified to handle the asbestos and dump site and ensure that they are fully licensed with ZEMA and have the required capacity for transportation and disposal of the asbestos containing material.
- Identify resources including financial requirements for disposal of the asbestos roofing sheets.
- If there is no suitable dump site in Zambia for disposal of the asbestos roofing sheets, consider the export option, in line with ZEMA requirements and the Rotterdam Convention and the Basel Convention on the Control of Trans-Boundary Movement of Hazardous Waste and their Disposal to which Zambia is a Party.

1.6 Procedures for Asbestos Removal

The project should ensure that the contractor follows the procedures that have been outlined in this AMP for removal, transportation, and disposal of the asbestos roofing sheets. The E&S Specialists from the Satellite PMU should oversee the handling and final disposal of the asbestos roofing sheets.

1.6.1 Personal Protective Equipment and Clothing

The Personal Protective equipment (PPE) shall meet the asbestos related requirement of the ZABS Standards, ZS 009:19773: Asbestos Cement Insulating Board and ZS006:1973: Asbestos Cement Flat Sheets: Semi and Fully Composed, ISO standards prEN ISO 13982-1, the World Bank Environmental Health and Safety Guidelines (ESHGs) and Good International Industry Practices (GIIP). The requirements of the World Bank ESHG and GIIP have taken precedent since they have a higher standard. All personnel must ensure appropriate PPE is worn when handling asbestos. PPE must be put on in the following order:

Safety Goggles

Safety goggles are a type of Personal Protective Equipment (PPE) that are worn on the eye for its protection. The goggles essentially fit tightly to the eye, with suction, and are secured with a strap that goes around the back of the head. The safety goggles will be used to protect workers from damage to the eye against asbestos particles that may strike the eye. For this AMP, the purpose of safety goggles is to protect the worker from particulate asbestos fibres that may strike the eye.

Respirator or Mask

A Respirator mask is a device designed to protect the wearer from inhaling hazardous atmospheres that includes fumes, vapors, gases and particulate matter such as dusts and airborne pathogens such as viruses. There are two main categories of respirators: the air purifying respirator, in which respirable air is obtained by filtering a contaminated atmosphere, and the air supplied respirator, in which an alternate supply of breathable air is delivered. Within each of these categories, different techniques are employed to reduce or eliminate noxious airborne contaminants. For this AMP, the purpose of respirators is to protect the worker inhaling particulate asbestos fibres that may penetrate and impregnate the body, through lack of appropriate PPE when handling asbestos roofing sheets.

Disposable coveralls

Disposable coveralls are an item of personal Protective equipment (PPE) designed to cover the body and other clothing to protect against dirt and other contaminants. Coveralls are one piece and loose fitting for ease of movement, with sleeves, full legging and often with a hood to cover the head. For this AMP, the purpose of disposable coveralls is to offer protection from exposure to hazardous asbestos fine fibres particles that may penetrate and impregnate the skin, through lack of proper PPE when handling the asbestos roofing sheets.

Disposable gloves

Disposable gloves are gloves that are used once and thrown away. The recommended disposable gloves for asbestos handling are Ideal Grip gloves, 7.0 mil, 240mm long sleeves. The Ideal Grip Gloves are made using specifically formulated nitrile, offering superior strength and comfort stretch whilst maintaining levels of dexterity. For this AMP, the purpose of disposable coveralls is to offer protection from exposure to hazardous asbestos fine fibres particles that may penetrate and impregnate the skin, through lack of proper PPE when handling the asbestos roofing sheets.

Disposable overshoes or washable boots

(i) Disposable overshoes

Disposable overshoes are single use soft, lightweight and durable protective shoe covering that can be worn to prevent possible exposure to contamination carried on the feet. They are ideal for workplaces that have a potential to expose workers to hazardous environment. The disposable overshoes are designed to use only once and their prolonged use or more than a single use will minimize the functions for which it had been manufactured.

(ii) Washable boot

A boot that protects from asbestos handling and can be decontaminated and reused. The washable boots have a strong thermal, chemical and mechanical resistance, but are also gas tight. The washable boots are non-skid on steel and ceramic tile floors and can be decontaminated. They are also quick drying as they have no inner lining. They are tear resistant and have a better grip on the floors than disposable overshoes.

3 Disposal of Personal Protective Equipment (PPE)

The following procedures shall apply for disposal of overalls and coverall that shall be used during the disposal of asbestos roofing sheets:

(i) Disposal of overalls and coveralls

- All used overall and coverall used during asbestos disposal shall be disposed of as part of asbestos waste:
- Overall and coverall shall not be reused again due to potential contamination of asbestos:
- When the task is complete, the overalls and coverall shall be wrapped in a polythene plastic and disposed of together with the sheets.

(ii) Disposable Gloves

- All workers must wash their hands and fingers thoroughly after removal and disposal of gloves:
- All used disposable gloves should be disposed of as part of the asbestos waste.

(iii) Footwear

- All reusable footwear should be decontaminated and sealed in double polythene plastic bags:
- Any defect on footwear should be reported immediately for replacement or repair:
- All non-reusable footwear shall be sealed in double polythene plastic bags and disposed together with the asbestos roofing materials:
- All workers must wash their hands and fingers thoroughly after removal and disposal of footwear.

(iv) Used Asbestos PPE

- All used asbestos PPE should be wrapped in a polythene plastic for disposal a dumpsite together with the asbestos containing roof sheets.
- All workers must wash their hands and fingers thoroughly after removal and disposal of used PPE.

(v) Removal of PPE and Personal Decontamination

- A decontamination area shall be identified with water available to remove contaminated overalls and clean the boots with water:
- Separate work sections shall be provided for dressing up before and after work and this should include a facility for showering:
- Before removing the used PPE, any visible asbestos shall be removed from protective clothing using an asbestos vacuum or wet wiping:
- The removal of the PPE shall be as follows(a)Disposable overshoes and washable boots (b) Disposable coveralls (c)Disposable goggle and (d)Respirator or mask:
- Coveralls and overalls shall be removed by taking arms out of the sleeves and rolling the sleeves inside out and then rolling the coveralls down the body:
- Non disposable respirators should be thoroughly cleaned, and any contaminated filters removed for appropriate disposal:
- Used disposable PPE shall be placed in a sealed heavy duty 200µm (micrometers) (minimum thickness) polythene bag:
- The outside of the bag should be wiped down using a damp cloth:
- The bag shall be sealed with duct tape and labelled as “Asbestos Waste”:
- After disposing the PPE, the workers should thoroughly clean their face, hands, and fingers with soapy water.

1.7 Removal Process Responsibility

The Satellite PMU will have an oversight of the removal process with the following personnel:

(a) Site workers

- Attend Toolbox talks as required by the contractor.
- Wear appropriate PPE during the disposal of the asbestos roofing sheets.
- Alert the contractor of any new asbestos roofing sheets that may still be on site:
- Avoid at all costs entering the secured temporary storage where the asbestos roofing sheets are stored.

(b) Environmental Health and Safety Officer

- Implement, maintain and update the asbestos management plan:
- Ensure all workers on site are trained in the identification, handling, temporary storage, disposal of asbestos containing materials and are aware of the asbestos management plan:
- Ensure correct handling and disposal procedures are implemented:
- Maintain adequate supplies of appropriate PPE and ensure all workers have appropriate PPE:
- Maintain adequate supply of asbestos wrapping materials:
- Conduct Toolbox talks, briefings, training on to wear PPE correctly a procedure for handling and removal of asbestos roofing sheets namely wrapping the asbestos roofing sheets, handling the asbestos roofing sheets, incident management in case the PPE fails or the asbestos breaks:
- The Toolbox talks shall also include Health risks associated with asbestos, common sources of asbestos wastes and asbestos disposal procedures.

(a) Dump Site Operator

- Adhere to the requirement of the asbestos management plan:
- Wear appropriate PPE when handling asbestos roofing sheets:
- Ensure application of appropriate handling and disposal procedures:
- Maintain asbestos management register with clear traceability:

- Ensure the hazardous waste license is valid:
- Ensure the dump site is properly secured to avoid scavengers.

1.7 Packaging Procedure

The packaging of the asbestos roof sheets will be done using the following steps:

- Avoid breaking of the asbestos roofing sheets as much as possible during packaging:
- Line the base of the transporting vehicle with a polythene plastic:
- Place the packaging asbestos roofing sheets gently onto the transporting vehicle:
- Cover the packaged asbestos roofing sheets right round with polythene sheeting and seal with adhesive tape:
- Label the asbestos roofing sheets “Asbestos Waste, No unauthorized opening.
- Take a photo of the packaged asbestos roofing sheets:
- Complete the waste register and have it signed by both the contractor and ZRCP Environmental Specialist.
- The asbestos roofing sheets should be completely covered with a polythene plastic and clearly labelled “Asbestos Waste, No unauthorized Opening” in a lockable secured confinement:
- A fresh polythene plastic to be used to line the inside of the secured confinement.

1.8 Transportation of Asbestos

The transportation of hazardous waste such as the asbestos roofing sheets is regulated by ZEMA under the Environmental Management (Licensing) Regulations (S.I No.112 of 2013. The project will only engage a ZEMA licensed transporter as a subcontractor to, package and transport the asbestos roofing sheets to a dump site yet to be identified. The other requirements that the transporter must adhere to are:

- Use an enclosed vehicle that is easy to clean and lock.
- The vehicle should be lined with plastic material.
- All workers should wear appropriate PPE:
- The vehicle should be fully licensed with Road Traffic and Safety Agency (RTSA):
- The driver should be a holder of a valid driving license:
- The vehicle must ensure internal air circulation is used and windows are closed on arrival at the dump site:
- The driver must follow instructions of the dump site operator.

2.0 Asbestos Related Incidences

Asbestos related incidents include the spillage and escape of asbestos fibers or exposure to asbestos through lack of appropriate Personal Protective Equipment (PPE) and clothing.

The following measures shall be undertaken in the event of no compliance and these incidents occurs.

(i)Accidental Asbestos Friable Release

In the event there is a release of non-friable asbestos during the handling, loading and unloading, the following must be done:

- Clear the area or site personnel and vehicles:
- Notify the Site Engineer immediately:
- Trained workers wearing appropriate Personal Protective Equipment (PPE) should manage the broken roofing sheets:
- All asbestos and dust should be wet down with a fine mist:
- All broken ACM should be wrapped and rewrapped and properly sealed:
- All broken parts of the roofing sheets are to be sealed in plastic and clearly labelled “hazardous material”. This includes capturing and sealing of any small debris that may be found on the ground:
- The Site Safety Officer should complete an incident report and submit to the Satellite PMU within 24 hours:
- The National PMU shall in turn inform the World Bank on the presence of asbestos through an incident report within 24 hours of receipts of such from the contractor.
- The Satellite PMU through the national ESCP shall also inform ZEMA on the presence of asbestos at the site.
- The Incident report should include the following information:
 - Date
 - Personnel Involved
 - Quantity of asbestos
 - Description of incident

- Actions and management measures undertaken.
- Future preventative measures

4.3 Exposure to Asbestos

If a site worker is exposed to asbestos without the use of appropriate Personal Protective Equipment (PPE), the following decontamination procedures must be undertaken:

- Immediately went down the site worker affected with fine spray or mist of water:
- Avoid any water on the respiratory cartridge:
- The affected site worker must then walk to the onsite decontamination area nearest shower facility to avoid contamination of vehicles or machinery:
- Remove all disposable overalls and place them in a sealed bag that is clearly labelled "hazardous material":
- The affected worker should shower to remove all dust and asbestos fibers with particular focus on the hair, face, hands and fingernails.
- The affected worker must then change into clean clothing:
- The bag must be labelled with "Asbestos Hazardous Waste Material" and disposed of with the asbestos roofing sheets.

Electronic Waste Management Plan

1.0 Scope

The ISAT Project seeks to increase access to irrigation, enhance integration into agricultural value chains, and strengthen climate resilience in Zambia. Electronic and electrical equipment will be procured, installed, operated, replaced, and ultimately decommissioned across irrigation schemes, pumping and booster stations, research and demonstration facilities, aggregation and cold-chain infrastructure, processing and logistics facilities, and project management offices. Potential e-waste includes computers, tablets, phones, printers, networking and monitoring devices, digital extension equipment, control panels, pumps and drives, sensors, solar photovoltaic equipment, batteries, inverters, cold-storage controls, and associated cables and peripherals. This Electronic Waste Management Plan (EWMP), prepared in line with World Bank ESS3: Resource Efficiency and Pollution Prevention and Management, establishes measures to avoid, minimize, manage, monitor, and safely dispose of project-related e-waste. It applies to all ISAT Project components, implementing entities, contractors, service providers, grant beneficiaries, irrigation schemes, supported enterprises, and facilities. It is a living document and shall be updated as equipment inventories, specifications, quantities, sites, and disposal arrangements become known.

2.0 Consideration on Electronic Waste Management

The ISAT Project will manage environmental and social risks and impacts throughout the project life cycle in a systematic manner proportionate to the nature and scale of its investments. E-waste planning will cover design and procurement, construction and rehabilitation, operation and maintenance, equipment replacement, and decommissioning. Particular attention will be given to electrical and electronic systems associated with irrigation infrastructure, renewable-energy-powered water abstraction, agricultural research and digital dissemination, cold storage and processing, traceability and quality assurance, and project monitoring and administration.

Electronic waste management planning shall begin during subproject screening and procurement. The mitigation hierarchy will prioritize prevention, durable and energy-efficient procurement, repair, reuse, refurbishment, supplier take-back, and recycling before treatment or final disposal. E-waste shall be segregated from construction rubble, agricultural chemical containers, organic waste, and general solid waste. Management measures shall protect workers and communities, prevent soil and water contamination, support climate-resilient and low-carbon investments, and comply with applicable Zambian law, the World Bank Environmental, Health and Safety Guidelines, and Good International Industry Practice.

3.0 E-Waste Definitions

Electronic waste (E-waste) is a term used to cover items of all types of electrical and electronic equipment (EEE) and its parts that have been discarded, irreparable or at the end of life. Although E-waste is a general term, it is considered to cover laptops, desktops, tablets, TV's, mobile phones, registration equipment and household appliances. E-waste contains materials that, if mishandled, can be hazardous to human health and the environment, but, most importantly, also materials that are valuable and scarce.

3.1 Toxicity and Radioactive Nature of E-waste to the Human, Water, Soil, and Animals

Electrical and electronic equipment contain different hazardous materials, which are harmful to human health and the environment if not disposed of carefully. While some naturally occurring substances are harmless in nature, their use in the manufacture of electronic equipment often results in compounds, which are hazardous (e.g., chromium becomes chromium VI). Lead, mercury, cadmium, and polybrominated flame retardants are found in electronic equipment and are all persistent, bio-accumulative toxins (PBTs). They can create environmental and health risks when computers are manufactured, incinerated, landfilled, or melted during recycling. PBTs, are a dangerous class of chemicals that have longevity in the environment and bioaccumulate in living tissues. PBTs are harmful to human health and the environment and have been associated with cancer, nerve damage and reproductive disorders.

Environmental and Health Effects of E-waste

E-Waste may contain hazardous substances including arsenic, barium, beryllium, brominated flame retardants, cadmium, CFCs, chromium, dioxins, lead, mercury, PCBs, PVC and selenium that can persist in the environment, accumulate in living organisms, contaminate air, soil and water, and cause serious health effects such as cancer, organ and nervous-system damage, respiratory illness, reproductive harm and immune-system impairment, particularly when electronic equipment is burned, dismantled or disposed of improperly.

4.0 Electronic Waste Management Plan

4.1 Aim of Electronic Waste Management Plan

The aim of this EWMP is to provide practical requirements and procedures for preventing and managing e-waste generated by ISAT Project activities, including irrigation development, research and digital dissemination, market and value-chain investments, and project management.

4.2 Objective

The objectives are to: (i) identify electrical and electronic equipment expected under each project component and maintain an updated inventory; (ii) estimate e-waste types and quantities as procurement and subproject designs are finalized; (iii) prevent premature obsolescence through appropriate specifications, warranties, maintenance, repair, and supplier take-back arrangements; (iv) protect workers, communities, soil, water, and biodiversity from hazardous substances; (v) establish procedures for segregation, secure storage, data sanitization, transport, reuse, recycling, treatment, and disposal; (vi) ensure that only appropriately licensed service providers handle hazardous e-waste; (vii) define institutional responsibilities, training, monitoring indicators, reporting, and incident response; and (viii) promote equitable access to awareness and training, including for women farmers and supported enterprises.

4.3 Legal Framework

4.3.1 Zambian Environmental Law

The Environmental Management (Licensing) Regulations (SI. No 112 of 2013) implements the Environmental Management Act 2011 and concerns a wide variety of matters regarding environmental protection including air quality control, waste management, hazardous waste, and other substances harmful to the environment such as pesticides and ozone-depleting substances. E-Waste belongs to the fifth schedule, regulation 18 (1), list of hazardous wastes, 'Waste electronic or electronic assemblies' Any contractor that is contracted to treat, handle, transport, store, dispose of, transit, trade in shall hold a ZEMA hazardous waste license. Project related E-waste could end up in a landfill site. However, any hazardous waste disposal using this method, the landfill must be managed in accordance with the guidelines prescribed in the regulation's ninth schedule and in accordance with section 24. (2) the requirements of an operator at a hazardous waste disposal site. There will be no transboundary movement of project related hazardous waste.

4.3.2 Electronic Waste Management in Zambia

Legal and Policy Assessment of E-Waste Management in Zambia

Currently, Zambia does not have explicit regulations on e-waste. However, the regulations of e-waste are part of the Environmental Management (Licensing) Regulations, Statutory Instrument No.112 of 2013 (the Licensing Regulations), under the hazardous waste regulations. The definition of hazardous waste covered e-waste, which category had been specifically identified as a waste stream under the fifth to seventh schedules of the licensing Regulations. Part IV of the Licensing Regulations provided for licensing of the generation, transportation, storage, handling, pre-treatment, treatment, export, import, trade in transit and disposal of hazardous waste.

The extended Producer Responsibility Statutory Instrument (SI) No. 65 of 2018 is also used to regulate e-waste. The SI encourages reuse, recycling or recovery before disposal. The SI also extends the responsibility of the producer to the post-consumer stage of the product lifecycle. This offers an opportunity for both manufacturers and importers to take back and recycle the products placed in the national markets.

The Zambia Bureau of Standards (ZABS) is the body responsible for standards formulation, quality control, quality assurance, and import and export quality inspections. By June 2021, ZABS and the Energy Regulation Board (ERB)

supported by Africa Clean Energy Technical Assistance Facility (ACE TAF) adopted and gazetted the International Electrotechnical Commission (IEC) 62257-9-5 and 62257-9-8 Standards for both solar systems and solar home systems.

4.3.3 World Bank Environmental and Social Standards (ESS)

The project will follow national legislation, ESHG and GIIP for the management of E-waste. The project will avoid the disposal of E-waste by reuse, recycle and recover. Where E-waste cannot be reused, recycled, or recovered then the project will treat, destroy or dispose of E-waste in accordance with The Environmental Management (Licensing) Regulations (SI. No 112 of 2013). That is, when hazardous waste management is conducted by third parties, the project will use ZEMA license hazardous waste collectors, and all E-waste will be disposed of in hazardous waste landfill in accordance with the Environmental Management (Licensing) Regulations (SI. No 112 of 2013).

The WB ESHG promotes waste prevention, reuse, and recycling, good housekeeping, inventory control, avoidance of damage and institute procurement measures that allow the return of reusable material. It requires the segregation of hazardous type wastes from other waste, its appropriate storage (labelled containers) and record keeping. It allows collection, transport, and disposal in accordance with the Environmental Management (Licensing) Regulations (SI. No 112 of 2013). The ESHG also requires monitoring records for hazardous waste collected, stored, or shipped using the recommended procedures (see below).

4.3.4 Good International Industry Practice (GIIP)

The GIIP promotes the use of an obligation on distributors to offer to consumers a take-back system where electronic waste-items may be disposed of free of charge. There are two types of take-back systems, and that distributors of EEE items must offer one of these schemes to their customers. Examples include free in-store take-back scheme where distributors accept E-waste items from customers purchasing equivalent new items. Distributors take-back scheme where consumers can dispose of WEEE items free of charge at designated collection facilities. E-waste generators should manage and dispose of E-waste responsibly in ways already mentioned in the preceding paragraphs. In addition, when purchasing a new electrical item arrange with the retailer to collect the old one. Businesses and other users (i.e., schools, hospitals, and government agencies) of electrical and electronic goods (EEE) must ensure that all separately collected E-waste is treated and recycled.

5.0 Identification of Electronic Waste

5.1 Anticipated Electronic Waste Generation

E-waste may arise from equipment used across all project components. Component 1 may generate waste from electric pumps, booster stations, motors, variable-speed drives, control panels, meters, sensors, telemetry, irrigation controllers, solar-powered pumping systems, batteries, inverters, and associated cables. Component 2 may generate waste from research and demonstration equipment, computers, servers, laboratory and field instruments, digital extension devices, communications equipment, pumps, renewable-energy systems, and building electrical installations.

Component 3 may generate waste from solar-powered cold storage, refrigeration controls, temperature and humidity sensors, processing and packaging equipment, weighing and traceability devices, warehouse and logistics systems, and computers and communications equipment used by aggregators and supported enterprises. Component 4 may generate office ICT, printing, networking, data-storage, monitoring, security, and communications equipment. Construction and rehabilitation may also produce discarded wiring, fittings, damaged installations, lamps, circuit breakers, and other electrical components; these materials shall be separated from rubble and other construction waste.

Table 2 provides an indicative equipment inventory. Actual specifications, ownership, locations, quantities, expected service lives, warranties, and end-of-life routes shall be confirmed through procurement plans, matching-grant and results-based financing agreements, contractor records, asset registers, and subproject screening.

Table 2: Overview of Information Technologies Equipment (ICTs)

S/N	INDICATIVE EQUIPMENT / E-WASTE STREAM	PROJECT SOURCE
1	Electric pumps, motors, booster stations, drives, control panels and meters	Component 1 irrigation schemes; Component 2 research station
2	Irrigation controllers, sensors, telemetry and monitoring devices	Components 1 and 2
3	Solar photovoltaic modules, inverters, charge controllers and batteries	Renewable-energy water abstraction and solar-prioritized cold chain
4	Cold storage, refrigeration and environmental-control equipment	Component 3
5	Processing, packaging, weighing and quality-assurance devices	Component 3
6	Computers, tablets, phones, printers, servers, storage and networking equipment	Components 2, 3 and 4
7	Digital extension, traceability, communications and field data devices	Components 2 and 3

8	Electrical installations, lamps, cables, circuit breakers and fittings	Construction, rehabilitation and facility operation
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E-waste may be generated during rehabilitation and construction when worn-out electrical installations are removed, during operation when equipment fails or is upgraded, and at the end of project-financed assets' useful lives. Generation dates will therefore vary by equipment category and shall not be assumed to occur only after project closure.

Quantities are not yet available. Each implementing unit, contractor, irrigation scheme, research facility, grant beneficiary, aggregator, and supported enterprise shall record equipment received and retired, including asset identification, location, custodian, condition, hazardous components, warranty, expected service life, repair history, data-sanitization status, and approved end-of-life route. The EWMP and equipment inventory shall be updated as information becomes available.

Periodic environmental and social monitoring and the project completion audit shall verify asset inventories, storage conditions, chain-of-custody records, contractor licenses, recycling or disposal certificates, and implementation of corrective actions.

5.2 Proposed Mitigation Measures

This electronic waste management plan contains proposed mitigation measures through which electronic waste under the Irrigation Services and Agriculture Transformation (ISAT) Project may be managed in compliance with the Environmental Management Act No.12 of 2011 that is read together with the Environmental Management (Licensing) Regulation, Statutory Instrument No.112 of 2013.

The proposed mitigation measures have also adopted the World Bank Environmental and Social Standards (ESS) in particularly ESS3: Resource Efficiency and Pollution Prevention and Management, World Bank Environmental Safety and Health Guidelines (WB ESHG) and Good International Industry Practice.

The mitigation measures are intended to avoid, minimize and manage environmental and social risks arising from e-waste generated through ISAT Project activities. The table below identifies the principal risks, required controls, monitoring indicators, responsible parties and indicative budget arrangements.

Potential Risk and Impact	Proposed Mitigation Measures	Indicator for Monitoring	Responsibility	Budget (USD)
Air pollution and worker/community exposure Open burning, breaking or informal dismantling of cables, batteries, circuit boards, solar equipment and refrigeration components may release toxic fumes and dust.	Prohibit open burning and uncontrolled dismantling; segregate damaged equipment; provide safe handling procedures and PPE; use supplier take-back arrangements or ZEMA-licensed recyclers and hazardous-waste contractors.	No open-burning incidents; inspection records; PPE availability; quantities transferred to approved service providers; manifests and recycling or disposal certificates.	DPMM; environmental and social specialists; contractors; scheme operators; ZARI; grant beneficiaries; licensed service providers.	TBA; included in contracts and operating budgets
Soil and water contamination Leaks or releases from batteries, oils, capacitors, refrigeration equipment and damaged electronic components may contaminate irrigated land, canals, reservoirs, streams and groundwater.	Store e-waste in secure, roofed, labelled areas with impermeable floors and secondary containment where required; keep it away from watercourses and irrigation infrastructure; provide spill kits and response procedures; inspect storage areas regularly.	Number of compliant storage areas; inspection findings; spill incidents and response time; corrective actions closed; quantities safely removed.	Contractors; scheme operators; ZARI; facility managers; supported enterprises; environmental and social specialists.	TBA; site-specific ESMP and facility budgets
Fire, electrical and occupational health risks Damaged lithium or lead-acid batteries, solar systems, pumps, drives, control panels and cold-chain equipment may cause fire, electric shock or chemical exposure.	Isolate and de-energize defective equipment; restrict access; use trained personnel; follow manufacturer instructions; provide suitable fire protection and emergency procedures; never mix battery chemistries; promptly remove swollen, leaking or damaged batteries.	Training records; equipment isolation records; fire-protection availability; incident and near-miss reports; condition of battery storage; emergency drills.	Contractors; equipment suppliers; scheme and facility operators; occupational health and safety officers; DPMM.	TBA; contractor and facility operating budgets
Premature obsolescence and excessive e-waste generation Poor-quality or unsuitable irrigation, digital, solar, cold-chain, processing and office equipment may fail early or become difficult to repair.	Procure durable, energy-efficient, climate-resilient and repairable equipment from credible suppliers; require warranties, spare parts, maintenance plans, technical support and take-back provisions; verify compatibility	Percentage of procurements with warranties, maintenance and take-back clauses; supplier due diligence completed; equipment failure rate; repair versus replacement rate.	DPMM; procurement specialists; technical teams; ZARI; grant-selection and verification teams; beneficiaries.	Included in procurement and investment costs

	with site conditions and intended use.			
Informal disposal, unauthorized sale and loss of traceability E-waste from dispersed schemes, research sites, farmer-led investments, aggregators and supported enterprises may enter informal waste streams.	Maintain asset and e-waste registers; establish designated collection points at ISAT-supported facilities; prohibit unauthorized removal or sale; use documented chain-of-custody procedures; verify licenses before transport, recycling or disposal.	Updated asset registers; number of collection points; quantities generated, stored and transferred; complete manifests; valid licenses and certificates; discrepancies resolved.	DPMM; implementing units; contractors; scheme operators; ZARI; farmer organizations; aggregators; grant beneficiaries.	TBA; project management and operating budgets
Data security and confidentiality risks Computers, servers, phones, tablets, traceability devices and digital extension equipment may retain personal, commercial or project data.	Inventory data-bearing devices; restrict custody; securely erase or physically destroy data-storage media using approved procedures before reuse, recycling or disposal; retain sanitization records.	Percentage of retired data-bearing devices sanitized; sanitization certificates; custody records; reported data-loss incidents.	DPMM ICT function; data custodians; implementing units; approved service providers.	TBA; ICT and project management budgets
TOTAL				TBA

5.3 Procurement

Procurement documents, civil-works contracts, matching-grant agreements, and results-based financing arrangements shall incorporate life-cycle e-waste requirements. Specifications should favor durable, energy-efficient, climate-resilient, repairable and modular equipment; appropriate warranties and spare-parts availability; reduced hazardous substances; safe battery chemistry where feasible; supplier take-back or extended producer responsibility arrangements; and clear responsibilities for installation, maintenance, replacement and end-of-life management. Used or refurbished equipment shall only be procured where quality, remaining service life, warranty, safety, energy performance and legal compliance are demonstrably acceptable. Contractors shall inventory electrical items removed during rehabilitation and shall not mix them with rubble or general waste.

5.4 Awareness and Sensitization

DPMM and relevant implementing units shall provide role-appropriate awareness and training to project staff, contractors, scheme operators, ZARI personnel, farmer organizations, aggregators, grant beneficiaries, supported enterprises, and service providers. Training shall cover prevention, maintenance, recognition of hazardous components, safe handling, segregation, fire and spill response, secure storage, data sanitization, reporting, and approved handover routes. Materials and delivery methods shall be accessible to women farmers and other groups that may face barriers to information and participation.

5.5 Storage, Transport, Recycling and Disposal

The last option in the management of E-waste is disposal. All E-waste should be segregated from other waste, collected at a designated collection point at either the designated project office, scheme, research station, or supported facility, inventories, stored in a labelled container.

When preparing for shipment the following should be implemented:

- Name and identification number of the material(s) composing the E-waste.
- Physical state of the E-waste such as, solid, liquid, gaseous or a combination of one or more of these.
- Quantity in terms of kilograms or liters and number of containers.
- Waste shipment tracking documentation to include quantity and type, date dispatched, date transported, and date received, record of the originator, the receiver and the transporter name.
- Method and date of storing, repacking, treating or disposing at the facility, cross-referenced to specific manifest document numbers applicable to the E-waste.
- Location of each E-waste within the facility, and the quantity at each location.

Any contractor that is contracted to treat, handle, transport, store, dispose of, transit, trade in shall hold a ZEMA hazardous waste license because project related E-waste may end up in a landfill site. Should the E-Waste from the project be disposal a landfill, then the landfill must be managed in accordance with the guidelines prescribed in the regulation's ninth schedule and in accordance with section 24. (2), the requirements of an operator at a hazardous waste disposal site. There will be no trans-boundary movement of project related hazardous waste.

5.6 Electronic Waste Management Monitoring Plan and Indicators

6.0 Monitoring of Environmental and Social Indicators

The goal of monitoring is to measure the success rate of the project and determine whether interventions proposed to manage risks and impacts related to management of E-Waste have been successful, or whether further interventions are needed or monitoring extended to the two sites.

6.1 Project Monitoring

The Ministry of Agriculture (MoA) implementing this project will be responsible for overall monitoring and evaluation of this E-waste management plan. The results of the monitoring reports will be submitted to the Bank. The Irrigation Services and Agriculture Transformation (ISAT) Project will conduct regular monitoring and spot checks through the environmental and social specialist under the relevant implementing unit under the Irrigation Services and Agriculture Transformation (ISAT) Project.

6.2 World Bank Monitoring Support

The Bank will provide second line of monitoring compliance and commitments made in the E-Waste Management Plans through implementation support mission and spot check monitoring as and when need arises. In addition,

the MoA through the national and satellite PMU will submit monitoring reports to the Bank as part of its reporting on a quarterly, biannual and annual basis. The Bank support and supervision missions will review these reports and provide feedback.

7.0 Monitoring Roles and Responsibilities

7.1 Ministry of Agriculture and DPMM

The Ministry of Agriculture, through DPMM, will provide overall coordination, oversight, budgeting, consolidation of equipment and e-waste records, monitoring, reporting, and follow-up of corrective actions. DPMM shall ensure that procurement, matching-grant, results-based financing, civil-works, technical-assistance, and facility-management arrangements include applicable EWMP obligations.

7.2 Project Implementing Units and Beneficiaries

Implementing units, contractors, scheme operators, ZARI, farmer organizations, aggregators, grant beneficiaries, and supported enterprises shall maintain asset and e-waste inventories; prevent unauthorized removal, dismantling, dumping, burning, or sale; provide secure storage; promptly report incidents; and transfer e-waste only through approved channels. Environmental and social specialists shall conduct regular inspections and verify records, licenses, manifests, and certificates.

7.3 Zambia Environmental Management Agency

The Zambia Environmental Management Agency (ZEMA) is a statutory body that was formed under the Environmental Management Act, No 12 of 2011. Some of the functions of ZEMA include integrating environmental management, protecting and conservation of natural resources. The agency also ensures prevention and control of environmental pollution and environmental degradation by conducting environmental audit and monitoring.

Annex 4: Resettlement Policy Framework

A. Introduction

1. This document constitutes a simplified template for a Resettlement Policy Framework (RPF) prepared for a Low or Moderate Risk project, consistent with requirements of the World Bank Environmental and Social Framework. Its fundamental purpose is to establish terms of agreement between relevant authorities in Zambia and the World Bank regarding principles and procedures to be used in subsequent preparation of a Resettlement Action Plan (RAP) or Abbreviated Resettlement Plans (ARAPs). World Bank approval of a RAP (or ARAPs) is required before project authorities invite bids for any contracts in which works are expected to involve physical or economic displacement as a result of land acquisition or restrictions on access or use of natural resources.

2. The RPF is intended to avoid or minimize any adverse impacts associated with physical or economic displacement, and to ensure arrangements are in place to mitigate any adverse impacts that may occur. The MoA hereby agrees to apply the principles, procedures, and standards incorporated in ESS5 of the World Bank ESF if obtaining any sites for project use would cause economic displacement or physical displacement.

3. This RPF is intended to utilize the existing legal and policy framework of MoA, incorporating any supplementary measures necessary to achieve consistency with ESS5 principles and standards.

B. Project Objectives and Description

4. The objective of the Irrigated and Sustainable Agriculture for Transformation (ISAT) project is to promote irrigated and sustainable agriculture practices and market linkages in

targeted sites in Zambia.

5. The project has three components:

Component 1: Irrigation Development and Scale-up

Component 1 seeks to maximize impact and deliver scalable, sustainable results for smallholder farmers' access to irrigation by leveraging and scaling up existing infrastructure and institutional investments and promoting private sector investment in farmer led irrigation development (FLID). Key activities include:

- i. Developing and improving irrigation schemes around existing IDSP rehabilitated dams in the North-Western, Western, Southern and Eastern Provinces;
- ii. Accelerating access to Farmer-Led Irrigation through promotion of affordable and appropriate technologies, such as solar-powered and efficient motor pumps, and on-farm water application (drip/sprinkler), for both surface and groundwater sources;
- iii. Scaling up about 21 selected temporary irrigation infrastructure into permanent one for existing well-functioning schemes supported by the Japan International Cooperation Agency (JICA);
- iv. Enhancing performance of existing irrigation schemes including capacity building to Institutions and farmers on irrigation management;
- v. Implementing priorities identified in the Irrigation Master Plan;
- vi. Supporting the operationalization of the irrigation Special Purpose Vehicle (SPV), including setting tariff and fee collection systems for new irrigation schemes, and policy dialogue to resolve arrears and ensure budgetary provisions for water and O&M fees; and
- vii. Strengthening water governance for FLID. In collaboration with the Water Resources Management Authority (WARMA), the Water Users Associations (WUA) and the SPV, based on water assessments in target areas and abstraction guidelines to be developed under the project preparation grant and support catchment level permitting/allocation and compliance for smallholder irrigation to manage cumulative impacts.

Component 2: Knowledge Generation and Digital Dissemination

This component aims to support farmers' access to knowledge and build their capacity through digital solutions. Digital services would be designed and developed to provide market tools for farmers. Key activities will include:

- i. Providing support to ZARI to generate knowledge on irrigation and agriculture practices, including supporting rehabilitation of the irrigation scheme and associated infrastructure for irrigation practices demonstration purposes at the National Irrigation Research Station in Chicankata District;
- ii. Enhancing research and extension linkages;
- iii. Supporting digitalization of market tools;
- iv. Training of extension officers on sustainable agriculture and digital literacy curricula;
- v. Supporting the development of a performance-based extension services tool;
- vi. Developing a digital module for mapping farmers training; and
- vii. Developing skills of graduates, young researchers and extension officers (Brazil exchange program).

Component 3: Market Access and Value Chain Development

This component would promote agriculture product commercialization along key value chains by fostering private sector engagement to enhance farmers' economic outcomes.

Key activities will include:

- i. Supporting small-holders/farmers groups to develop capacity with on-farm irrigation practices, grouping, connecting with off-takers/agro-processing firms to ensure sustainable market access and strengthen supply chains to meet the quality and quantity requirements of agro-processing companies;
 - ii. Developing last-mile infrastructure: financing aggregation, cold-storage (including solar powered), processing (proven anchor firm models to link smallholders to value chains); and
 - iii. Strengthening producers' organizations' access to finance through establishing cohesive farming groups to improve communication, collaboration, and operational efficiency, training on financial management, governance, and contractual relationships with off-takers, and deployment of programs to enhance the functionality of the farmer groups (e.g. the IFC's Agri-business Leadership Program).
6. The following key activities may require physical displacement or land acquisition for project use.
- i. Developing and improving irrigation schemes around existing IDSP rehabilitated dams in the North-Western, Western, Southern and Eastern Provinces under **Component 1**;
 - ii. Scaling up about 21 selected temporary irrigation infrastructure into permanent one for existing well-functioning schemes supported by the Japan International Cooperation Agency (JICA) – **Component 1**;
 - viii. Providing support to ZARI to generate knowledge on irrigation and agriculture practices, including supporting rehabilitation of the irrigation scheme and associated infrastructure for irrigation practices demonstration purposes at the National Irrigation Research Station in Chicankata District – **Component 2**; and
 - iv. Developing last-mile infrastructure: financing aggregation, cold-storage (including solar powered), processing (proven anchor firm models to link smallholders to value chains) under **Component 3**;

However, the likely scale of land required for use is unknown pending the feasibility studies to determine the location and amount of land required for the subproject activities especially the irrigation schemes. Therefore, preparation of a site-specific RAPs/ARAPs is not technically feasible at the time the RPF is prepared.

C. Key Principles and Definitions

7. In World Bank-assisted projects, borrowers are expected to take all feasible measures to avoid or minimize adverse impacts from land acquisition and restrictions on land use associated with project development. The fundamental objective of ESS5 is to ensure that, if physical or economic displacement cannot be avoided, displaced persons (as defined below) are compensated at the replacement cost for land and other assets, and otherwise assisted as necessary to improve or at least restore their incomes and living standards.

8. Other ESS5 objectives include:

- To avoid forced eviction
- To improve living conditions of poor or vulnerable persons who are physically displaced, through provision of adequate housing, access to services and facilities, and security of tenure
- To conceive and execute resettlement activities as sustainable development programs, providing sufficient investment resources to enable displaced persons to benefit directly from the project, as the nature of the project warrants
- To ensure that resettlement activities are planned and implemented with appropriate disclosure of information, meaningful consultation, and the informed participation of those affected.

9. Displaced persons (ESS5, Para. 10) are defined as any persons subjected to project-related adverse impacts who (a) have formal legal rights to land or assets; (b) have a claim to land or assets that is recognized or recognizable under national law; or (c) who have no recognizable legal right or claim to the land or assets they occupy or use. The term incorporates all potential categories of persons affected by land acquisition and associated impacts; all of those adversely affected are considered “displaced” under this definition regardless of whether any relocation is necessary.

10. Replacement cost (ESS5, Para. 2, footnote 6) is defined as a method of valuation yielding compensation sufficient to replace assets, plus necessary transaction costs associated with asset replacement. Where functioning markets exist, replacement cost is the market value as established through independent and competent real estate valuation, plus transaction costs. Where functioning markets do not exist, replacement cost may be determined through alternative means, such as calculation of output value for land or productive assets, or the undepreciated value of replacement materials and labor for construction of structures or other fixed assets, plus all transaction costs associated with asset replacement. In all instances where physical displacement results in loss of substandard shelter, replacement cost must at least be sufficient to enable purchase or construction of housing that meets minimum community standards of quality and safety.

11. ESS5 also establishes key principles to be followed in resettlement planning and implementation. These include:

- All displaced persons are entitled to compensation for land and attached assets, or to alternative but equivalent forms of assistance in lieu of compensation; lack of legal rights to the assets lost will not bar displaced persons from entitlement to such compensation or alternative forms of assistance.
- Compensation rates refer to amounts to be paid in full to the eligible owner(s) or user(s) of the lost asset, without depreciation or deduction for fees, taxes, or any other purpose.
- Compensation for land, structures, unharvested crops, and all other fixed assets should be paid prior to the time of impact or dispossession.
- When cultivated land is to be taken for project purposes, the MoA seeks to provide replacement land of equivalent productive value if that is the preference of the displaced persons.
- Community services and facilities will be repaired or restored if affected by the project.
- Displaced persons should be consulted during preparation of the RAP/ARAP, so that their preferences are solicited and considered.
- The RAP/ARAP (in draft and final versions) is publicly disclosed in a manner accessible to displaced persons.

- A grievance mechanism by which displaced persons can pursue grievances will be established and operated in a responsive manner.
- Negotiated settlement processes are acceptable as an alternative for legal expropriation if appropriately implemented and documented.
- Land donation is acceptable only if conducted in a wholly voluntary manner and appropriately documented.
- The MoA bears official responsibility for meeting all costs associated with obtaining project sites, including compensation and other considerations due displaced persons. The RAP includes an estimated budget for all costs, including contingencies for price inflation and unforeseen costs, as well as organizational arrangements for meeting financial contingencies.
- Monitoring arrangements will be specified in the RAP, to assess the status and effectiveness of RAP implementation.

D. Legal and Regulatory Framework

The institutional framework for RAP/ARAP implementation conforms to the ISAT Resettlement Policy Framework document and will require a Resettlement and Compensation Committee with members taken from the District administration, Chief's administration and the Community Land Trust/Dam Committees to be established to handle community issues at the subproject site. Village headmen will be required to assure access to cultivable land before and during the construction period of the project. A Grievance Committee will be established at the level of the District Commissioner. The MoA Safeguard Specialist will be responsible for monitoring.

There is currently no specific law dealing with involuntary resettlement in Zambia. However, resettlement and/or compensation of voluntary or forced displaced persons are governed by the National Resettlement Policy of 2024. There is no doubt that the RAPs/ARAPs to be prepared where applicable will deal with an involuntary resettlement situation. MoA's approach to land acquisition and involuntary resettlement is based on the following broad policy objectives:

- Involuntary resettlement must be avoided where feasible, or minimized, exploring all viable project designs;
- Where it is not feasible to avoid resettlement activities must be conceived and executed to enable the persons displaced by the project to share in project benefits;
- Displaced persons must be meaningfully consulted and must have opportunities to participate in planning and implementing resettlement programs; and
- Displaced persons must be assisted in their efforts to restore or improve their standards of living to levels prevailing prior to the beginning of the project.

Since the subprojects will be implemented in rural Zambia whose land tenure is predominantly traditional, it is relevant to appreciate the role of Chiefs (traditional authorities) in land matters. In Zambia, Chiefs are custodian of traditional/ customary land which they have jurisdiction on within their chiefdoms. They give and allocate land to their subjects including outsiders in form of Rights of Use through Headmen who are their representatives. The Chiefs have discretionary powers to allocate land in the best interest of their subjects or communities and therefore, in times or situations where land becomes scarce or limited, Chiefs are able to reallocate based on need and equity. The Chiefs are part of Government system of governance in that they are constituent members of the House of Chiefs which is a quasi-legislative body under the Ministry of Local Government and Rural Development.

13. The MoA agrees to take all actions necessary to ensure full and effective implementation of RAPs prepared in accordance with the RPF, and to otherwise take actions necessary to achieve all relevant provisions of ESS5.

E. Preparing a Resettlement Plan

14. All projects causing physical or economic displacement through land acquisition or project-related restrictions on resource access or use are required to prepare a resettlement plan for World Bank approval. Responsibility for preparation and implementation of the RP (or RPs) rests with the MoA. As necessary, MoA will exercise its authority to coordinate actions with any other involved agencies, jurisdictions, or project contractors to promote timely and effective planning and implementation.

15. RAP/ARAP preparation begins once the physical footprint of a proposed investment has been determined, establishing that a particular site (or sites) must be acquired for project use. The MoA initially screens proposed sites to identify current usage and tenurial arrangements and identifies the site (or sites) that will minimize physical and economic displacement. The MoA subsequently carries out, or causes to be carried out, a census survey to identify and enumerate all displaced persons on the selected site (or sites) and to inventory and value land and other assets that are to be acquired for project use.

16. Each RAP/ARAP is based on the principles, planning procedures, and implementation arrangements established in this RPF, and normally includes the following contents:

- Description of the project (with appropriate maps and illustrations), including explanation for the necessity of acquiring particular sites for project use and efforts undertaken to avoid or minimize the amount of land acquisition or other potential impacts deemed necessary
- Results of a census survey of displaced persons and inventory and valuation of affected land and assets
- Description of any project-related restrictions on resource use or access
- Description of tenure arrangements, including collective, communal, or customary use or ownership claims
- Review of relevant laws and regulations pertaining to acquisition, compensation, and other assistance to displaced persons, and identification of gap-filling measures needed to achieve ESS5 requirements
- Description of land and asset valuation procedures and compensation standards for all categories of affected assets
- Eligibility criteria for compensation and all other forms of assistance, including a cutoff date for eligibility
- Organizational arrangements and responsibilities for RP implementation
- Implementation timetable
- Estimated budget and financial contingency arrangements
- Consultation and disclosure arrangements
- Description of grievance mechanism
- Arrangements for monitoring implementation progress.

The RAP/ARAP should be complemented by a separate set of individual compensation files for each displaced household or persons. These files are to be handled confidentially by the borrower to avoid any prejudice to displaced persons. In fragility, conflict, and violence (FCV) environments,

RAPs/ARAPs should also clarify procedures to be applied to ensure the security of displaced persons when they receive compensation payments.

Eligibility criteria for compensation and all other forms of assistance should be clearly summarized in a table that can be used for consultation with displaced persons (**see example provided in Annex**).

Additional planning measures must be incorporated into RAPs/ARAPs for projects causing physical displacement, or significant economic displacement, as described below.

17. For projects causing physical displacement, the RAP/ARAP should include planning measures relating to the following, as relevant for project circumstances:

- Description of relocation arrangements, including options available to displaced persons, and including transitional support for moving or other expenses
- Description of resettlement site selection, site preparation, and measures to mitigate any impacts on host communities or physical environment, including environmental protection and management
- Measures to improve living standards and otherwise address particular needs of relocating poor or vulnerable households, including measures to ensure that replacement housing is at least consistent with minimum community standards and is provided with security of tenure
- Description of project design measures to improve living standards, access to or functioning of community services or facilities, or for providing other project-related benefits
- Any measures necessary to address impacts of resettlement on host communities.

18. For projects causing significant economic displacement, the RAP/ARAP describes (as relevant):

- The scale and scope of likely livelihoods-related impacts, including agricultural production for consumption or market, all forms of commercial activity, and natural resource use for livelihoods purposes
- Livelihoods assistance options (for example, employment, training, small business support, assistance in providing replacement land of equivalent productive value, other) available to persons losing agricultural land or access to resources
- Assistance measures available to commercial enterprises (and workers) affected by loss of assets or business opportunities directly related to land acquisition or project construction
- Project measures to promote improvement of productivity or incomes among displaced persons or communities.

F. Consultation and Disclosure Arrangements

19. The RP summarizes results of measures taken to consult with displaced persons regarding the project, its likely impacts, and proposed resettlement measures. It also summarizes the meetings held with displaced persons (dates, locations, number of participants), including comments, questions, and concerns expressed by displaced persons during these meetings as well as responses provided to them. The MoA discloses a draft RP to the displaced persons (and the public) after Bank review and solicits comments from displaced persons regarding the proposed plan. Disclosure of the final RP occurs following consideration of comments received and following Bank acceptance.

G. Monitoring and Evaluation

20. MoA will make arrangements for monitoring implementation and will provide periodic monitoring reports to the Bank regarding the status of land acquisition and implementation of the RP. For projects with significant impacts, competent resettlement monitoring professionals will monitor implementation progress and provide advice on any necessary corrective actions and will conduct an implementation review when all mitigation measures in the RP are substantially complete. The implementation review evaluates the effectiveness of mitigation measures in achieving RP and ESS5 objectives and recommends corrective measures to meet objectives not yet achieved.

H. Grievance Mechanism

21. To ensure that displaced persons can raise complaints regarding the land acquisition process, calculation or payment of compensation, provision of assistance, or other relevant matters, the RP provides for an accessible and responsive grievance mechanism. The RP describes submission procedures, organizational arrangements, and responsive performance standards for handling grievances, and measures to be taken to inform displaced persons or communities about grievance initiation and response standards. The grievance mechanism does not preclude displaced persons from pursuing other legal remedies available to them.

22. The MoA keeps a record of all complaints referred to the grievance mechanism, including a description of issues raised and the status or outcome of the review process.

Annex A - Outline for Preparation of RAP/ARAP Entitlements Matrix

IMPACT	AFFECTED PERSONS	ELIGIBILITY CRITERIA	ENTITLEMENT IN PRINCIPLE	MITIGATION STANDARDS/MEASURES
A. Loss of agricultural land - Irrigated land - Rainfed land - Pasture - Groves - Fishpond - Other	Owners	(TBD)	Compensation in kind or at replacement cost	(TBD; usually unit of currency per unit of land)
	Users with legalizable claims	(TBD)	Compensation in kind or at replacement cost	(TBD; usually unit of currency per unit of land)
	Renters/Lesseees	(TBD)	Prorated compensation for remainder of term; assistance in finding suitable alternative	(TBD; usually unit of currency per unit of land)
	Other users (squatters, encroachers)	(TBD)	Compensation for improvements; assistance in lieu of land compensation	(TBD)
B. Loss of residential land	Owners	(TBD)	Compensation in kind or at replacement cost	(TBD; usually unit of currency per unit of land)
	Users with legalizable claims	(TBD)	Compensation in kind or at replacement cost	(TBD; usually unit of currency per unit of land)
	Renters/Lesseees	(TBD)	Prorated compensation for remainder of term; assistance in finding suitable alternative	(TBD; usually unit of currency per unit of land)
	Other users (squatters, encroachers)	(TBD)	Compensation for improvements; assistance in lieu of land compensation	(TBD)
C. Loss of commercial land	Owners	(TBD)	Compensation at replacement cost, commercial real estate value	(TBD; usually unit of currency per unit of land)
	Users with legalizable claims	(TBD)	Compensation at replacement cost, commercial real estate value	(TBD; usually unit of currency per unit of land)
	Renters/Lesseees	(TBD)	Compensation at replacement cost, commercial real estate value	(TBD; usually unit of currency per unit of land)
	Other users (squatters, encroachers,	(TBD)	Prorated compensation for remainder of term;	(TBD; usually unit of currency per unit of land)

	illegal businesses)		assistance in finding suitable alternative Compensation for improvements; assistance in lieu of land compensation	
D. Temporary loss of land	Owners, occupants, users	(TBD)	Compensation for duration of project use; restoration of land to prior condition	(TBD)
E. Loss of agricultural production - crops -fruit/nut trees -timber trees -aquaculture -forest produce -livestock forage -livestock	Producers	(TBD)	Opportunity to bring to market, or compensation at market value at maturity (or compensation at net present value for trees and livestock)	(TBD)
F. Loss of productive fixed assets -irrigation facilities -fencing -wells -troughs -sheds -barns -other	Asset owners/users	(TBD)	Compensation at replacement cost (non-depreciated value including labor and materials)	(TBD)
G. Loss of residential structures (Often categorized by major building material, fixed improvements, or other features)	Owners	(TBD)	Direct house replacement or compensation at replacement cost (non-depreciated value including labor and materials); transitional assistance	(TBD, usually specified as unit of currency per square meter of structure)
	Occupants with legalizable claims	(TBD)	Direct house replacement or compensation at replacement cost (non-depreciated value including labor and materials); transitional assistance	(TBD, usually specified as unit of currency per square meter of structure)
	Renters/Lessees	(TBD)	Prorated compensation for remainder of term; assistance in finding	(TBD)
	Illegal structures	(TBD)		(TBD)

			suitable alternative; transitional assistance Direct house replacement or compensation at replacement cost (non-depreciated value including labor and materials); transitional assistance	
H. Loss of commercial structures (Often categorized by major building material, function and capacity, fixed improvements, or other features)	Owners Occupants with legalizable claims Renters/Lessees Illegal structures	(TBD) (TBD) (TBD) (TBD)	Compensation at replacement cost for structures, fixed equipment and other improvements; transitional assistance Compensation at replacement cost for structures, fixed equipment and other improvements; transitional assistance Prorated compensation for remainder of term; compensation at replacement cost for fixed equipment and other improvements; transitional assistance Compensation at replacement cost for structures, fixed equipment and other improvements; transitional assistance	(TBD) (TBD) (TBD) (TBD)
I. Loss of agricultural livelihood	Affected agricultural producer	TBD, requires definition of significant impact caused by severity of loss or imposed changes in livelihood methods	In addition to compensation for lost lane and assets, persons whose livelihoods are significantly affected receive alternative employment, skills training, business development assistance, or other additional assistance linked to livelihoods restoration or improvement	(TBD)
J. Temporary loss of business income	Owner, enterprise	(TBD)	Payment of support for period of disruption	(TBD, based on prior reported profits or other forms of estimation)

K. Temporary loss of employment or wages	Employees	(TBD)	Payment of wages or unemployment support for period of disruption	(TBD, based on payment records or other forms of estimation)
L. Loss of public or community infrastructure, facilities or services	Public or private owners	(TBD)	Compensation at replacement cost for damage or destruction of infrastructure and facilities; assistance in restoring functionality and accessibility of services	(TBD)
M. Material assistance to vulnerable or disadvantaged	Displaced illegal residents, users or occupants Blind or otherwise disabled Occupants displaced from substandard housing	(TBD) (TBD) (TBD)	In addition to applicable forms of compensation and assistance, provision of defined security of tenure Project design provides features relating to safety and accessibility Arrangements for obtaining replacement housing meeting minimum legal or community standards	(TBD) (TBD) (TBD)]