



THE GOVERNMENT OF THE REPUBLIC OF MALAWI

SHIRE VALLEY TRANSFORMATION PROJECT

**Environmental and Social Management Plan for Proposed
Chikhambi/Mbenderana Irrigation Block: Mwana Alirenji Cooperative;
Chikwawa District**

SVTP II (KAMBADWE AND MWANA ALIRENJI SCHEMES ESMPS)

Chikhambi/Mbenderana Irrigation Block – Mwana Alirenji Cooperative
C/O Shire Valley Transformation Programme
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EXECUTIVE SUMMARY

Overview of the Project

The Government of Malawi, through the Ministry of Agriculture, has prepared this Environmental and Social Management Plan (ESMP) for the proposed Chikhambi/Mbenderana Irrigation Block to be managed by the Mwana Alirenji Cooperative under the Shire Valley Transformation Programme (SVTP-2). The Programme Development Objective (PDO) is to increase agricultural productivity and commercialization for targeted households in the Shire Valley and to improve the sustainable management and utilization of natural resources.

The primary goal of the Mwana Alirenji Cooperative is to establish a financially sustainable enterprise that generates consistent returns while securing the economic welfare of its members. The Cooperative seeks to enhance the socio-economic conditions of its members and surrounding communities by pooling productive resources and engaging in irrigation-based agriculture as a commercially viable venture, supported by modern irrigation systems and improved agricultural technologies. The specific objectives of the Cooperative are: (i) to maximise sustainable financial returns by achieving a minimum of 25 percent return on capital employed annually; (ii) to generate sustainable growth and operational excellence; (iii) to secure the economic welfare and well-being of members; (iv) to promote equitable ownership within the Cooperative; and (v) to achieve environmental sustainability.

The Cooperative comprises 791 members drawn from 12 villages, with a gender distribution of 51.7 percent male and 48.3 percent female, organized into five Business Centre Committees. The SOCFE model constitutes the central institutional vehicle for transitioning participating households from subsistence farming to commercially viable agriculture under the SVTP.

Project Components and Main Activities

The project involves the development of approximately 844.9 hectares of irrigable land in Group Village Headmen Mbenderana and Chikhambi, Traditional Authority Kasisi, Chikwawa District. The irrigation block has a Gross Land Area of 844.9 hectares, of which about 793 hectares (93.9 percent) is earmarked for irrigation development. The remaining land is allocated to essential infrastructure, environmental buffers, and support facilities such as drainage systems, access roads, and service areas. Center Pivot Irrigation method has been allocated 458 hectares, while Sprinkler Irrigation method has been allocated 335 hectares. Scheme Buildings have been allocated 6 hectares, tree planting 14 hectares, livestock 22 hectares, , and scheme roads 5 hectares.

The total estimated project cost is approximately MWK 14.2 billion (equivalent to about USD 8.4 million). The estimated cost of implementing environmental and social mitigation

and monitoring measures is approximately MWK 154,000,000 (equivalent to about USD 81,052.63), inclusive of a 10 percent contingency provision.

The project is expected to generate significant employment opportunities. Approximately 150 people are expected to be employed during the construction phase, while around 200 people will be employed during the operational phase. In line with national policies and international good practice, efforts will be made to ensure equitable employment opportunities, with a target of achieving gender balance. Priority will be given to local communities within Chikhambi/Mbenderana and the wider Chikwawa District, particularly for unskilled labour.

Main Activities by Phase:

- **Planning Phase:** Feasibility studies, ESMP preparation, market analysis, topographic and baseline surveys, stakeholder consultations.
- **Construction Phase:** Land clearing, excavation, earthworks, installation of irrigation infrastructure, development of access roads, waste management.
- **Operation Phase:** Irrigation management, crop production, maintenance of infrastructure, application of agricultural inputs, transportation of commodities.

Alternatives Considered

The following alternatives were assessed during project design, as documented in the ESMP. The parameters of the scheme are convincing in addressing the critical water-agriculture-nexus in Malawi. The without-project scenario would perpetuate the unsustainable livelihood scenario and poverty levels in Chikwawa and the Lower Shire, with long-term negative impacts on household food security and natural resource utilization. The technical design studies have been optimized from earlier versions developed over the years. Several options have been considered as part of the development of the design.

Alternative	Outcome	Rationale for Selection/Rejection
Without-project scenario	Rejected	Would perpetuate 72% poverty rate, 92% dependence on rain-fed agriculture, environmental degradation, and climate vulnerability in the Lower Shire. From a safeguards perspective, certain potential impacts associated with canal infrastructure and intensive agriculture would be avoided, but opportunities for addressing challenges in an integrated landscape approach would not be seized.

Alternative	Outcome	Rationale for Selection/Rejection
Irrigation method (surface, sprinkler, drip, hybrid)	Pressurized systems (center pivot, sprinkler) selected	Higher water efficiency, reduced losses through seepage and evaporation, suitability for terrain, operational feasibility under cooperative model. Surface irrigation systems were technically feasible but found to be less efficient and more prone to losses.
Command area size	Full 844.9 ha selected	Phased approach rejected as cost per hectare would dramatically increase, future expansions would be significantly compromised, and short-term benefits would be skewed towards existing commercial enterprises.

Project Site Description

The Mbenderana/Chikhambi Irrigation Block is located in Group Village Headmen (GVH) Mbenderana and Chikhambi, under Traditional Authority (TA) Kasisi in Chikwawa District. The project area is bordered by Kambadwe Cooperative to the north, Mantchombe Cooperative to the east, and Katunga-Maseya (KAMA) Cane Growers Association to the south. Chikwawa District is located within the Lower Shire Valley and forms part of the Great East African Rift Valley, with an average elevation of approximately 112 meters above sea level. The terrain is generally flat to gently undulating, situated within the floodplain of the Shire River.

The Shire River is the dominant watercourse and serves as the primary outlet for numerous tributaries within the district. Within the Mbenderana/Chikhambi Irrigation Block, the Manyumwa River forms part of the boundary and ultimately feeds into the Shire River. The Nsenjere River runs through the Mbenderana block and connects to the Mwana Alirenji River, which traverses the Chikhambi block.

Land Cover and Construction Site Maps: The ESMP includes Figure 2.4 (Land Cover Analysis) showing that 6.8 percent of the area is covered by open woodland requiring heavy site clearing. Figure 2.3 (Land Use Map Under Pressurized Irrigation Systems) shows allocation of land to commercial irrigation (793 ha, 93.9%), tree planting (14 ha), livestock (22 ha), scheme buildings (6 ha), and roads (5 ha). Figure 4.4 (Topographic Map) illustrates the flat terrain within the floodplain of the Shire River.

Baseline Conditions

The project area is characterized by a semi-arid climate with high temperatures during most months of the year. Rainfall is limited to the months of December to April and the long-term mean average is about 800 mm per annum. Rainfall is unreliable and often erratic. Due to high temperature, evaporation and evapotranspiration are also high

(approximately 2000 mm and 1780 mm per annum respectively). Effective rainfall is, on a yearly average, 48 percent lower than total rainfall, meaning that only 52 percent of rainfall is effective rain. The water balance only shows a surplus of water between February and April. In the dry season, soil moisture drops to zero. This persistent deficit is the primary justification for the development of irrigation infrastructure.

Vegetation within the project area is characterized by a mosaic of modified woodland, grassland, and shrubland systems, reflecting long-term human use of the landscape for agriculture and settlement. The area is predominantly dominated by Mfula, alongside a range of indigenous tree species including Mfungo (*Albizia harveyi*), Neen (*Dalbergia melanoxylon*), Njalu (*Diplorhynchus* spp.), Nsalu (*Pterocarpus lucens*), and Malambe (*Adansonia digitata*), as well as grasses, herbs, and scattered shrubs. None of the identified species are listed among protected tree species in Malawi.

The project area supports a range of fauna typical of modified rural landscapes, although the abundance and diversity of large wildlife species are relatively limited. Field observations indicate the occasional presence of species such as Gwape (antelope), Nkhanga (guineafowl), and Njiwa (wild doves). The area is also known to host a variety of snake species. The Shire River supports populations of hippopotamus and Nile crocodile, which occasionally come up to the scheme to forage on crops.

The soils range from deep, medium to fine textured, brown to very dark-grey in colour. Drainage varies from good to very poor. Sandy loam soils dominate among the groups with 48 percent, with clay loam as the least at 2.2 percent. The soil survey conducted indicated that the Mbenderana/Chikhambi Irrigation Block has a high percentage of sand, silt and clay respectively. Soil pH for the block ranges from 6.03 to 6.88, which is good and neither too acidic nor alkaline. The soil contains all of the major elements of soil nutrients required for crops.

The project area of influence encompasses the twelve villages whose members constitute the Mwana Alirenji Cooperative. Based on the SVTP Baseline Survey (2020) and Chikwawa District Social Economic Profile (2017-2022), the total population is estimated at approximately 8,700 people, distributed across approximately 1,600 households. The average household size is 5.4 persons. Children under 15 years constitute approximately 42 percent of the population, the working-age population (15 to 64 years) comprises approximately 54 percent, and persons aged 65 years and above account for approximately 4 percent. Female-headed households constitute approximately 28 percent of all households.

Chikwawa District ranks among the poorest districts in Malawi. According to the Fifth Integrated Household Survey (IHS5, 2019-2020), the district poverty rate is 68 percent, compared to the national average of 51 percent. Within the project area, the SVTP Baseline Survey (2020) estimated a poverty rate of approximately 72 percent and an ultra-

poverty rate of 36 percent. The average annual household income in the project area is estimated at MWK 420,000 (approximately USD 245 at 2020 exchange rates).

HIV prevalence in Chikwawa District is among the highest in Malawi. According to the Malawi Population-based HIV Impact Assessment (MPHIA, 2020-2021), the adult HIV prevalence (ages 15-49) in Chikwawa District is estimated at 12.4 percent, compared to the national average of 8.9 percent. Within the project area, the SVTP Baseline Survey (2020) estimated HIV prevalence at approximately 11.8 percent.

Access to safe drinking water in the project area is primarily through boreholes equipped with hand pumps. According to the SVTP Baseline Survey (2020), approximately 68 percent of households have access to an improved drinking water source within a walking distance of 500 meters or less. The SVTP Baseline Survey revealed that 74 percent of male-headed and 70 percent of female-headed households had toilet facilities in the project impact area.

The following table summarizes the baseline conditions:

Parameter	Baseline Condition
Climate	Semi-arid; annual rainfall ~800 mm (Dec-Apr); effective rainfall only 52% of total
Evapotranspiration	~1,780 mm/annum (exceeds rainfall for most of the year)
Vegetation	Modified woodland, grassland, shrubland; dominated by <i>Albizia harveyi</i> , <i>Dalbergia melanoxylon</i> , <i>Adansonia digitata</i> ; 6.8% open woodland requires clearing
Soils	Sandy loam (48%); pH 6.03-6.88 (favorable); balanced sand/silt/clay composition
Water Resources	Shire River (primary); Manyumwa, Nsenjere, and Mwana Alirenji Rivers (seasonal); 200m buffer zone incorporated into design
Population (project influence area)	~8,700 people; ~1,600 households; average household size 5.4 persons
Population age distribution	42% under 15 years; 54% working age (15-64); 4% over 65
Female-headed households	28% (above national average of 24%)
Poverty rate	72% (project area); 68% (district); national average 51%
Ultra-poverty rate	36% (project area); 32% (district); national average 21%
Average annual household income	MWK 420,000 (~USD 245 at 2020 rates)

Parameter	Baseline Condition
HIV prevalence (adults 15-49)	11.8% (project area); 12.4% (district); national 8.9%
Access to improved water	68% within 500m; 62% boreholes; 32% rely on unimproved sources
Sanitation (toilet ownership)	74% (male-headed); 70% (female-headed); predominance of traditional latrines
Primary economic activities	92% of households derive livelihood from rain-fed agriculture (maize, cassava, sorghum, beans, cotton, sesame)

Valued Environmental and Social Components (VECs)

The following Valued Environmental and Social Components were identified as critical for ecological integrity, human well-being, and socio-economic sustainability, forming the focus of the impact assessment in Chapter 5 of the ESMP:

VEC Category	Specific Components	Key Stakes/Threats (Without Project)
Water Resources	Shire River and tributaries; groundwater	Seasonal water scarcity; unreliable supply for agriculture; downstream user competition; pollution from existing agricultural runoff
Soils	Sandy loam soils; drainage systems	Erosion from bare soils (post-clearance); salinization risk from poor drainage; declining productivity
Biodiversity/Flora	Native woodland species (6.8% open woodland); buffer zone vegetation	Habitat fragmentation from agricultural expansion; loss of connectivity; no formal protection
Biodiversity/Fauna	Small mammals, reptiles, birds; hippopotamus and crocodile (Shire River)	Habitat disturbance; human-wildlife conflict (crop raiding, attacks); no compensation mechanism
Public Health	HIV/AIDS (11.8% prevalence); malaria; bilharzia; cholera; COVID-19; Mpox	Disease burden; limited health infrastructure (Chikwawa District Hospital, 3km away); seasonal outbreaks

VEC Category	Specific Components	Key Stakes/Threats (Without Project)
Livelihoods & Poverty	72% poverty rate; 92% dependent on rain-fed agriculture	Cyclical food insecurity; limited income diversification; no irrigation access
Land Tenure	Customary land; 791 cooperative members; shareholding based on land contribution	Land use conflicts; women's land rights (patrilineal system); compensation framework limited to asset valuation
Labour	Construction (~150 jobs); operation (~200 jobs)	Underemployment; child labour risk; limited OHS enforcement; GBV/SEA vulnerability
Cultural Heritage	Mang'anja and Sena traditional lands	Potential chance finds (pottery, human remains); no systematic pre-construction survey

Institutional and Legal Framework for Implementation of the Project

National Legal Framework

The ESMP aligns with the following Malawian legislation. The Environment Management Act (2017) is the principal legislation governing environmental management in Malawi, mandating that all projects with potential environmental and social impacts undergo environmental assessment and obtain approval from MEPA. The Land Act (2016) and Customary Land Act (2016) govern land administration and management, with the project being implemented primarily on customary land. The Lands Acquisition and Compensation Act (2017) provides for compulsory acquisition of land for public purposes and establishes procedures for compensation of affected persons. The Water Resources Act (2013) governs water abstraction and requires a water permit. The Occupational Safety, Health and Welfare Act (1997) provides for protection of workers from occupational hazards. The Employment Act (2000) governs labour relations and prohibits discrimination. The Public Health Act (1948) provides for sanitation, waste management, and control of communicable diseases. The National Construction Industry Act (1996) requires contractors to be registered with the CIRA. The Monuments and Relics Act (1990) governs protection of cultural heritage and chance finds.

The following table summarizes the key legal instruments:

Legal Instrument	Key Relevance to ESMP
Environment Management Act (2017)	Mandates ESMP approval from MEPA; environmental clearance required
Land Act (2016) & Customary Land Act (2016)	Governs customary land administration; requires engagement with Customary Land Committees
Lands Acquisition and Compensation Act (2017)	Provides for compulsory acquisition and asset-based compensation
Water Resources Act (2013)	Requires water abstraction permit; environmental flow provisions
Occupational Safety, Health and Welfare Act (1997)	Mandates PPE, safety training, risk assessments
Employment Act (2000)	Prohibits child labour; fair wages; non-discrimination
Public Health Act (1948)	Sanitation facilities; waste management; disease control
National Construction Industry Act (2025)	Contractor registration with CIRA; construction standards
Monuments and Relics Act (1990)	Chance find procedure; cultural heritage protection

Institutional Roles and Responsibilities

The institutional framework assigns clear responsibilities across the project lifecycle. The Ministry of Agriculture through the SVTP Programme Management Team (PMT) holds overall oversight, strategic direction, and compliance enforcement authority, including the power to impose contractual penalties, suspend works, or withhold payments for non-compliance. The Contractor serves as the primary implementer of all ESMP mitigation and enhancement measures at site level and is contractually required to prepare and submit for approval site-specific management plans. The Supervision Consultant provides independent technical monitoring and verification through scheduled and unannounced site inspections. The Malawi Environment Protection Authority (MEPA) provides independent regulatory oversight, including review of ESMP approval conditions, periodic inspections and audits, and enforcement of corrective measures. The Mwana Alirenji Cooperative and Water User Associations lead operational-phase management. Other stakeholders include the Chikwawa District Council, National Water Resources Authority, Department of Forestry, Department of Health, Department of Antiquities, Department of National Parks and Wildlife, and development partners (AfDB, OFID and World Bank).

The following table summarizes the institutional roles and responsibilities:

Institution	Role and Responsibility
Ministry of Agriculture (PMT)	Overall ESMP oversight; compliance enforcement (contractual penalties, suspension, withholding payments); review and approval of site-specific plans
Contractor	Primary implementer of mitigation measures; prepares detailed design, prepares CESMP, Waste Plan, OHS Plan, HIV/AIDS Policy, Code of Conduct, GRM procedures, Chance Find Procedure
Supervision Consultant	Independent monitoring and verification; monthly inspections; corrective action recommendations
MEPA	Regulatory oversight; ESMP approval; environmental clearance; audits and enforcement
Chikwawa District Council	Waste approvals; land use planning; local compliance monitoring
NWRA	Water abstraction permit; environmental flow compliance
Department of Health	Health-related mitigation (HIV/AIDS, malaria, cholera); disease surveillance
Department of Antiquities	Chance find management
DNPW	Human-wildlife conflict (hippo/crocodile) management
Mwana Alirenji Cooperative (SOCFE)	Operational-phase management; WUA coordination; community-level GRM
Local Communities and Traditional Authorities	Stakeholder engagement; land access facilitation; conflict resolution

AfDB Operational Safeguards, World Bank ESF and OFID ESG Policy – Gap Analysis and Alignment

The ESMP includes a gap analysis between AfDB Operational Safeguards and national legislation. For the AfDB, the project is required to meet the environmental and social safeguards of the African Development Bank as a financing partner. The AfDB's Integrated

Safeguards System comprises five Operational Safeguards (OS) that address environmental and social risks. The ESMP describes the relevance of each OS, compares applicable AfDB requirements with corresponding national legislation, identifies gaps, and provides recommendations for alignment. The hierarchy of standards is established: where a requirement of the AfDB Operational Safeguards differs from or is more stringent than the corresponding requirement of Malawian national legislation, the AfDB standard shall prevail.

AfDB OS	Requirement	Gap Identified	Alignment Measure
OS1 (Environmental and Social Assessment); ESS1 (Assessment and management of environmental and social risks and impacts); and Section XVII of 7.2.2 of OFID ESG Policy (environmental and Social Due Diligence)	Cumulative impacts; climate risk assessment	Cumulative impacts not mandated in national format	Addressed in Chapter 5; reference in ESMP implementation records
OS2 (Involuntary Resettlement); ESS5 (land Acquisition, restrictions on land Use and involuntary resettlement); 7.2.2 of OFID ESG Policy (Resettlement Planning Framework and Land Acquisition Resettlement Plan)	Livelihood restoration; vulnerable group measures	No livelihood restoration framework; no vulnerable group-specific measures	Prepare Resettlement Policy Framework or ARAP with livelihood restoration; vulnerability screening; GRM for land grievances
OS3 (Biodiversity and Ecosystem Services); ESS6 (biodiversity Conservation and sustainable management of living natural resources); and 7.2.2 of OFID ESG Policy (Biodiversity Action Plan)	Mitigation hierarchy (avoid→minimize→restore→offset) sequential	Mitigation hierarchy not statutory; no offset requirement in national law	Explicitly document hierarchy in ESMP implementation; 200m buffer zone enforced; reforestation offset (1.3M

AfDB OS	Requirement	Gap Identified	Alignment Measure
			trees) at 2:1 ratio
OS4 (Pollution Prevention and Control); ESS3 (Resource efficiency and pollution prevention and management); and Section 4.1 of OFID ESG Policy (Pollution Prevention and Resource Efficiency)	Site-specific IPM plans; hazardous waste management plans	No documented site-specific pollution prevention plans	Contractor to prepare IPM Plan and Hazardous Materials Plan before construction
OS5 (Labour and Working Conditions); ESS2 (Labor and Working Conditions); and Section 4.4 of OFID ESG Policy (Fair Treatment to Labour)	Code of Conduct with GBV/SEA provisions; worker-specific GRM	No mandatory CoC or worker-specific GRM	Prepare Labor Management Procedures with CoC (enforceable sanctions for GBV/SEA) and worker GRM; available in local languages
Stakeholder Engagement (cross-cutting)	Continuous engagement; stand-alone SEP	No continuous engagement mandate; no SEP requirement	Prepare Stakeholder Engagement Plan; integrate GRM; disclose publicly before construction

Enumeration of Major and Moderate Impacts

The ESMP identifies potential environmental and social impacts across planning, construction, operation, and decommissioning phases. The analysis considered magnitude, probability of occurrence, duration, and significance. The following impacts are enumerated from Chapter 5 of the ESMP.

Positive Impacts

- **Employment generation (planning phase):** Consultancies for feasibility studies, ESMP development, market analysis, and baseline studies created employment opportunities with engagement of consultants including at least 50 percent Malawian nationals.
- **Employment generation (construction phase):** Approximately 150 people employed, with 80 percent local labour target.
- **Employment generation (operation phase):** Approximately 200 people employed in irrigation management, agricultural production, maintenance, and administrative functions.
- **Employment generation (decommissioning phase):** Approximately 50 people employed.
- **Household income increase:** Expected that people participating in irrigation activities will increase their income through sale of agricultural produce; estimated 150-300 percent increase within 3-5 years based on experience from similar irrigation schemes (baseline MWK 420,000/year).
- **Crop production increase:** Irrigation enables cultivation more than twice per year (currently rain-fed, single season), leading to stable year-round production.
- **Reforestation (biodiversity offset):** Tree planting programme of approximately 1,300,000 trees (14 hectares allocated) to offset vegetation loss.
- **Poverty reduction:** Target 50 percent reduction from baseline 72 percent poverty rate by project end.
- **Government revenue:** Implementation of the project will generate revenue for Government through taxes including Pay-As-You-Earn, Withholding Taxes, Value Added Taxes, and corporate taxes.

Negative Impacts

- **Vegetation loss:** 6.8 percent of the area covered by open woodland requires heavy site clearing, involving clearing of grasses, shrubs, and climbers with very few trees. No protected tree species identified. The most significant vegetation-related impact is expected at the site of the proposed Night Storage Reservoir, where removal of trees and shrubs will be required. This impact represents a permanent change in land cover.
- **Disruption of animal habitats:** Clearance of vegetation will disturb natural habitat for some animals especially reptiles, amphibians and small mammals such as rodents. Habitat disturbance may lead to displacement of species and temporary loss of shelter and breeding grounds.
- **Soil erosion:** Clearing of vegetation will leave soils bare, resulting in soil erosion which can contribute to sedimentation of surrounding water bodies including the Shire River, loss of fertile topsoil, and reduced land productivity.
- **Dust emissions:** Excavation of soil and gravel material and speeding construction vehicles are likely to cause dust emission, affecting air quality, reducing visibility,

and posing health risks to workers and nearby communities, particularly those with respiratory conditions.

- **Water pollution:** Waste from construction materials, oil spills, fuel leaks, and human waste from workers may pollute surrounding water bodies including the Shire River and its tributaries, degrading water quality, affecting aquatic life, and reducing availability of safe water for downstream users.
- **Noise pollution:** Construction machinery and vehicles will increase noise levels (levels above 80 dB may affect hearing), potentially disturbing nearby communities and causing discomfort, stress, and potential health effects.
- **Solid waste generation:** Construction activities may generate waste such as unused cement mortar, broken bricks, stones, packaging materials, scrap metal, and food remains, leading to land degradation, visual pollution, and potential contamination of soil and water resources.
- **Borrow pits:** Excavation works and extraction of fill materials are likely to create borrow pits that may pose safety and health risks to surrounding communities. Unrehabilitated borrow pits may accumulate water, posing drowning risks (particularly to children) and serving as breeding grounds for disease vectors such as mosquitoes.
- **HIV/AIDS and STI transmission:** Labour influx and continued interaction between workers, traders, and communities may increase risk of transmission of HIV and other STIs. Baseline HIV prevalence in the project area is 11.8 percent, and in Chikwawa District is 12.4 percent (national average 8.9 percent).
- **GBV/SEA risk:** Construction activities may result in temporary labour influx, which has the potential to create social risks including increased risk of gender-based violence (GBV) and sexual exploitation and abuse (SEA).
- **Child labour:** During operation, some farmers may engage under-aged persons to provide cheap labour. This risk is associated with increased labour demand in irrigated farming systems and weak enforcement of labour standards.
- **Disruption of children's education:** Engagement of school-going children in farming activities may disrupt their education, leading to absenteeism and poor academic performance.
- **Water-related diseases:** Stagnant water in canals may create conditions for malaria and bilharzia (schistosomiasis). Poor sanitation may lead to diarrheal diseases (cholera, typhoid, dysentery). Irrigation systems can increase exposure to water-related diseases if not properly managed.
- **Water use conflict:** The Shire River is a shared resource and downstream users (including Katunga-Maseya Cane Growers Association and other cooperatives) may be affected by upstream abstraction. Competing demands may lead to conflicts, especially during dry periods when river flows are low. Up to 12 percent of the long-term Q80 Shire River flow for September at Kapichira will be abstracted, corresponding to an 8 percent net abstraction.

- **Agrochemical pollution:** Use of fertilizers, herbicides, and pesticides may lead to water and soil pollution. Agrochemical runoff may degrade water quality, affect aquatic ecosystems, and pose health risks to downstream users.
- **Agrochemical exposure:** Handling agrochemicals poses health risks to farmers and workers. Improper use may lead to acute poisoning (skin contact, inhalation, ingestion) and chronic health effects.
- **Hazardous waste generation:** Agrochemical use generates hazardous waste (empty containers, unused product, rinsate, contaminated PPE). Improper disposal may contaminate soil and water.
- **GHG emissions:** Irrigated agriculture may generate greenhouse gases such as methane, carbon dioxide, and nitrous oxide. Waterlogged conditions promote methane production. Fertilizer use (particularly nitrogen fertilizers) leads to nitrous oxide emissions.
- **Salinization:** Excessive use of chemical fertilizers and poor drainage can lead to increased soil salinity, acidity, and alkalinity over time. Salinization reduces soil productivity and may render land unsuitable for agriculture.
- **Human-wildlife conflict (hippopotamus and crocodile):** The Shire River supports populations of hippopotamus and Nile crocodile. Local communities and the SVTP baseline survey have reported that hippos occasionally emerge from the river to forage on crops in fields adjacent to the floodplain, particularly at night. Crocodiles pose risks to humans, livestock, and domestic animals when accessing water points or working near riverbanks. Risks include fatal or injurious attacks on farmers and workers, loss of livestock, destruction of crops, and psychological distress.
- **Loss of employment (decommissioning):** After construction activities, the contractor will lay off workers (approximately 150 workers). This impact will reduce incomes for persons who were working under the project, potentially contributing to food insecurity within families.
- **Reduction of small-scale businesses (decommissioning):** Cessation of construction activities will lead to termination of employment for workers, resulting in reduced incomes and likely leading to a decline in small-scale businesses within the project area.
- **Increased generation of solid wastes (decommissioning):** Demolition of temporary shelters and pit latrines as construction ends will result in increased generation of solid waste within the project area.
- **Chance finds (cultural heritage):** The potential exists for chance finds during excavation, earthworks, and land preparation, including archaeological remains (pottery, stone tools, ironworking remnants), human remains, burial sites, or culturally significant objects.
- **Theft and vandalism:** Availability of farm inputs, equipment, and infrastructure (solar panels, pumps, pipes) at the irrigation block may attract thieves and vandals, leading to economic losses and potential danger to community members involved in theft.

Consultation Process

Stakeholder consultations were conducted in the project area (GVH Mbenderana/Chikhambi, TA Kasisi, Chikwawa District) using a mixed-method approach including community meetings, focus group discussions, key informant interviews, and structured surveys. The consultations were conducted in an inclusive manner to ensure representation of different groups, including women and youth. The stakeholder participation process tried to ensure that due consideration will be given to stakeholder values, concerns and preferences when decisions regarding the project are made. The purpose of stakeholder involvement was to inform stakeholders about the proposal and its likely effects, canvass their inputs, views and concerns, and take account of the information and views of the public in the ESMP and decision making.

The consultations drew on the SVTP Baseline Survey (2020) and COWI (2016) studies. The comments stakeholders raised were collated and analysed to see which issues are of concern and should be addressed through the ESMP study.

Stakeholders Consulted

The following stakeholders participated in the consultation process:

Category	Specific Stakeholders	Number/Location
Community members	Farmers from 12 villages	Chikhambi 1, Chikhambi 3, Light, Mwingama, Mpotazingwe, Mbenderana, Ling'awa 1-6
Cooperative leadership	Mwana Alirenji Cooperative members; Business Centre Committees (5 BCCs)	791 members (51.7% male, 48.3% female)
Traditional authorities	Group Village Headmen, Traditional Authority Kasisi	GVH Mbenderana, GVH Chikhambi, TA Kasisi
Government institutions	Department of Irrigation, Chikwawa District Council, MEPA	District-level
Development partners	World Bank, AfDB	Supervision missions
Other stakeholders	Mantchombe Cooperative (neighbouring); Katunga-Maseya Cane Growers Association; Pesticide Control Board; NWRA; Ministry of Lands	Regional and national

Main Concerns Raised and Developer Responses/Commitments

The following table presents the key concerns raised by stakeholders during consultations and the corresponding responses and commitments documented in the ESMP. Specific individuals who raised issues included Joseph Jeke, Austin Kamanula, Thokozani Yasino, Mac Nell Shire, Cathreen Andrea, Lukia Ngomario, Leah Malimbasa, Godfrey Banda, Wilson Maduka, Peter Ngondo, Shammah Mlenga, Loyd Kachonde, Chikumbutso Kafe, Mc dolnard Kanyongolo, Chimwemwe Malupia, Thokozani Mwiliyah, Sydney Chikafa, Victoria Nkasale, Peter Jali, Chimwemwe Nyoni, Robert Mackion, Treazer Mwalija, Elizabeth Khumbenyiwa, Lovemore Tadikire, Annie Magombo, Maximoss Govesuar, Oswald Kanyunga, Steven Kamorere, and John Chimbwebwa.

Concern Raised	Stakeholder Group	Developer Response/Commitment
Employment local content	Community members, Cooperative	Commit to 80% local recruitment for unskilled labour; involve chiefs and WUA in recruitment; pay above minimum wage; ensure transparent recruitment processes
Child protection / girl child education	Community members, parents	Implement child protection and HIV/AIDS policy; by-laws to protect girls; prohibit children at construction sites; civic education and sensitization to girls and community
HIV/AIDS and STI spread	Community members, health officials	Awareness campaigns; condom distribution; VDC and chief-led sensitization; strict laws on relationships among co-workers
GBV/SEA risk	Women's groups, Cooperative	Code of Conduct with enforceable sanctions; confidential GRM; SEA/SH Action Plan; contractors to have child protection and HIV/AIDS policy
Vegetation/tree clearing	Community members, Department of Forestry	Replant 1.3M trees (2:1 offset ratio); choose tree species suitable for the area (Mfungo, Neen, Malambe); plant windbreaks around solar panels
Land disputes	Landowners, Traditional Authorities	Early land demarcation; copies of demarcation to landowners; GRM for land grievances; assurance that no one will lose land; train community leaders and WUA on dispute resolution

Concern Raised	Stakeholder Group	Developer Response/Commitment
Crocodile attacks	Farmers, WUA	Use pipes instead of open canals from Shire River; safety committees; design command areas away from river
Flooding	Communities in floodplain	Construct flood protection bunds; cut-off drainage; water outlets; conservation agriculture; afforestation and re-afforestation; planting of vertiver
Aquatic biodiversity protection	Fisheries department, communities	Provide nets/mesh on pumps to prevent fish and other aquatic animals from getting trapped in pipes
Noise pollution	Communities near construction	Restrict working hours to daytime (08:00-17:00); service vehicles regularly; minimize idling of machinery; temporary fencing; place noisy equipment away from villages
Dust emissions	Communities near construction	Use water browsers to sprinkle water; enforce speed limits for vehicles; cordoning off area with fencing
Theft and vandalism	Community members, Cooperative	People found should be persecuted as per laws; chiefs to sensitize their people; provide security personnel; construct perimeter fencing around solar panels and pumping areas
Decommissioning job loss	Workers, Cooperative	Ensure long project life; workers compensation; transition support; workers compensation unions
Waste generation	Community members	Proper disposal as recommended by District Council
Injuries and accidents	Workers, community	Use PPE; engineering safety controls; sensitize communities on machinery safety

Grievance Redress Mechanism (GRM)

A dedicated, multi-tiered Grievance Redress Mechanism (GRM) has been established operating at contractor, PMT, and MEPA levels. The GRM is free of charge, accessible in local languages (Chichewa and Chisena), and includes a target resolution timeframe of

thirty calendar days for standard grievances, with expedited procedures for complaints related to Gender-Based Violence and Sexual Exploitation and Abuse. The GRM will be operationalized prior to commencement of construction and maintained throughout all phases of the project.

Environmental and Social Management Plan (ESMP)

Enumeration of Risks/Impacts Management Measures

The ESMP translates identified impacts into specific, measurable, and enforceable actions across four phases, applying the mitigation hierarchy (avoid → minimize → restore → offset) to all negative impacts. The following tables present the specific measures addressing each significant/moderate impact.

(a) Specific Measures Addressing Each Significant/Moderate Impact

The following table summarizes the key mitigation and enhancement measures for each project phase as presented in Table 9.1 of the ESMP:

Phase	Key Mitigation/Enhancement Measures	Responsible Parties	Cost (USD)
Planning Phase	Local participation (≥50%); stakeholder sensitization; GRM establishment; information disclosure	PMT, District Council, Local Leaders, GRM Committees	2,500.00
Construction Phase (Positive Impacts)	Local labour (≥80%); local procurement; on-the-job training; tax compliance	Contractor, PMT, District Council	3,500(plus contractor obligations)
Construction Phase (Negative Impacts)	Reforestation (1.3M trees; 2:1 ratio); erosion control (silt fences, sediment basins, diversion drains); dust suppression (water spraying 2x/day); water pollution prevention (bundled fueling areas, spill kits); noise controls (restricted hours 08:00-17:00); waste segregation; borrow pit rehabilitation; OHS training (including heat stress, confined spaces, working at height); GBV/SEA Code of Conduct; child	Contractor, PMT, MEPA, Department of Forestry, Department of Health, NGOs/CSOs, Local Leaders, Department of Antiquities	17,000.00

Phase	Key Mitigation/Enhancement Measures	Responsible Parties	Cost (USD)
	labour enforcement; community policing; chance find procedure		
Operation Phase (Positive Impacts)	Efficient irrigation (pressurized systems); market linkages; crop diversification; nutrition awareness; farmer training (GAPs, IPM, financial literacy); environmental flows; WUA water allocation	Cooperative, Extension Services, PMT, NWRA, Department of Health	6,500.00
Operation Phase (Negative Impacts)	Drainage maintenance; IPM (to reduce chemical use); safe agrochemical use (approved pesticides only, restricted entry intervals 24-72 hrs); water allocation schedules (WUA-managed); environmental flow releases (NWRA permit compliance); vector control (larviciding, larvivorous fish); PPE provision (chemical-resistant gloves, coveralls, respirator); hazardous waste collection (triple-rinse, container collection); zoonotic disease prevention (vaccination, stocking limits of 20/HH); theft/vandalism prevention (security lighting, fencing, community policing); human-wildlife conflict mitigation (fencing, lighting, deterrents, compensation mechanism with DNPW); soil salinity monitoring	WUA, Cooperative, Extension Services, Department of Health, NWRA, DNPW, District Council	12,000.00
Demobilisation Phase	Site restoration (≥90% restored); terminal benefits (minimum 30 days notice, outstanding wages, severance as per Employment Act);	Contractor, PMT, MEPA, District Council	8,500.00

Phase	Key Mitigation/Enhancement Measures	Responsible Parties	Cost (USD)
	vendor transition support; waste cleanup		

(b) Specific EOHS Clauses to Insert in Works Contracts

The following specific clauses shall be inserted into all works contracts, as derived from the ESMP:

(i) General Rules of Hygiene, Health and Safety (HHS) on Construction Sites:

- The Contractor shall provide and maintain adequate sanitation facilities (minimum 1 toilet per 15 workers, separate for men and women) and potable drinking water at all work sites.
- The Contractor shall implement a site-specific Occupational Health and Safety Plan approved by the PMT before construction commences.
- The Contractor shall provide and enforce use of appropriate personal protective equipment including hard hats, steel-toed boots, high-visibility vests, dust masks (N95/P100), ear muffs (31 dB NRR), gloves, and chemical-resistant PPE where applicable.
- The Contractor shall conduct daily pre-start safety briefings and weekly toolbox talks, and maintain a first-aid kit and trained first-aider on site at all times.
- The Contractor shall implement heat stress management: rest breaks (15 minutes every 2 hours in hot conditions), shaded rest areas, acclimatization period for new workers (7 days), and work cessation when wet bulb globe temperature exceeds 30°C.
- The Contractor shall implement safety protocols for working at height (guardrails at 1.1m, fall arrest systems), confined spaces (permit system, atmospheric monitoring), excavation/trenching (shoring or sloping, competent person daily inspection), and heavy machinery operation (exclusion zones minimum 10m, spotter for reverse operations).

(ii) STD - HIV Awareness:

- The Contractor shall implement an HIV/AIDS Workplace Policy approved by the PMT, conduct HIV/AIDS awareness campaigns for all workers (minimum 4 per year), and provide condoms at all work sites (accessible, free of charge).
- The Contractor shall partner with local health services to provide on-site voluntary counseling and testing (VCT) services and establish referral pathways to Chikwawa District Hospital for HIV care and treatment.
- The Contractor shall prohibit discrimination against people living with HIV in employment.

(iii) Management of the Relationship Between Employees and Communities in the Project Area, with Emphasis on Protection of Minors and Other Vulnerable Groups:

- The Contractor shall implement a Code of Conduct (CoC) with specific provisions prohibiting sexual harassment, sexual exploitation and abuse (SEA), and discrimination, including enforceable sanctions including immediate termination for substantiated GBV/SEA violations.
- The Contractor shall establish a confidential worker-specific GRM for reporting violations, prohibit children (persons under 18 years) from entering construction sites, and implement a community liaison function to receive and address community concerns.
- The Contractor shall conduct sensitization sessions for workers on respectful interaction with local communities and ensure that recruitment does not disrupt children's education.

(iv) Consideration of Gender Equity and Gender-Based Violence (GBV) as well as Sexual Exploitation and Abuse (SEA):

- The Contractor shall target minimum 40 percent female participation in unskilled labour positions, ensure equal pay for equal work regardless of gender, and provide separate and secure sanitation facilities for women and men.
- The Contractor shall implement a SEA/SH Action Plan including risk assessment specific to GBV/SEA, prevention measures (awareness training, CoC), response measures (confidential reporting, survivor-centered referrals), and monitoring and evaluation.
- The Contractor shall establish referral pathways for GBV/SEA survivors to health, psychosocial, and legal support services, ensure confidentiality and protections against retaliation for complainants, and maintain anonymized records of GBV/SEA incidents for monitoring purposes.

(v) Management of "Chance Finds":

- The Contractor shall include a Chance Find Procedure in site-specific management plans approved by PMT prior to construction, train all construction personnel on the Chance Find Procedure, and designate a site officer responsible for receiving and acting on chance find reports.
- Upon discovery of any potential cultural heritage object or human remains, the Contractor shall cease work within a 50-meter radius, immediately notify the PMT, who shall notify the Department of Antiquities within 48 hours.
- No further disturbance shall occur until the Department of Antiquities has assessed the find and issued instructions for salvage, protection, or relocation. If human remains are discovered, the Department of Antiquities shall coordinate with local traditional authorities and the community on appropriate handling and reburial protocols.

(c) Environmental and Social Monitoring Plan (ESMoP) – Key Indicators

The following table presents key monitoring indicators from Table 9.2 of the ESMP:

Indicator	Baseline	Target	Verification Method	Frequency	Responsibility
Local employment (planning)	Not applicable	≥ 50% local staff	Employment records	Once	PMT
Local employment (construction)	Not applicable	≥ 80% local labour	Payroll	Monthly	Contractor, PMT
Grievance resolution	No GRM in place	100% within 30 days (standard); expedited for GBV/SEA	GRM logs	Monthly	PMT, GRM Committees
Vegetation restoration	6.8% open woodland (pre-clearance)	Area cleared vs restored documented; 1.3M trees planted (2:1 offset ratio)	Site reports; planting records	Monthly (clearance); Quarterly (planting)	Contractor, Department of Forestry
PPE compliance	Not applicable	≥ 90%	Site inspections	Daily/Monthly	Contractor
Water quality	Baseline testing to be established	No exceedance of Malawi national water quality standards	Laboratory testing (pH, turbidity, agrochemical residues, E. coli)	Monthly	Contractor, MEPA
GBV/SEA incidents	No system in place	100% reported and responded (confidential)	GRM reports (anonymized)	Monthly	Contractor, PMT, NGOs/CSOs
Child labour	No systematic monitoring	Zero incidents (verified age records)	Age verification records; site inspections	Monthly	Contractor, PMT, Ministry of Labour

Indicator	Baseline	Target	Verification Method	Frequency	Responsibility
HIV/AIDS awareness	Baseline awareness not assessed	Minimum 4 campaigns/year	Campaign reports	Quarterly	Contractor, Department of Health
Water conflict resolution	No formal mechanism	Zero unresolved conflicts >30 days	GRM logs; WUA meeting minutes	Monthly	WUA, NWRA, Local Leaders
Environmental flows	No formal monitoring	Compliance with NWRA permit conditions	Flow monitoring data	Continuous	PMT, NWRA
Human-wildlife conflict incidents	No systematic reporting	Zero fatalities; reduction in crop losses	Incident reports; DNPW records	Monthly	WUA, Cooperative, DNPW
Soil salinity	pH 6.03-6.88 (baseline)	No significant increase (maintain pH 6.0-7.5)	Soil laboratory analysis	Annually (pre- and post-wet season)	Extension Services, Cooperative
Site restoration (decommissioning)	Not applicable	≥90% restored	Independent inspection	Once (post-decommissioning)	Contractor, MEPA

ESMP Budget

The following table presents the overall cost of the ESMP from Table 9.3 of the ESMP:

Budget Category	Cost (MWK)	Cost (USD)	Percentage of Total ESMP Budget
Environmental and Social Management Plan (Mitigation and Enhancement Measures)	76,000,000	40,000.00	49.4%
Environmental and Social Monitoring Plan (Monitoring Activities)	50,000,000	26,315.79	32.5%

Budget Category	Cost (MWK)	Cost (USD)	Percentage of Total ESMP Budget
Capacity Building and Orientation Programmes	14,000,000	7,368.42	9.1%
Subtotal	140,000,000	73,684.21	91.0%
Contingency (10%)	14,000,000	7,368.42	9.1%
Total ESMP Budget	154,000,000	81,052.63	100%

The ESMP budget represents approximately 1 percent of total project cost (USD 8.4Million), which falls within an acceptable range for irrigation development and is broadly consistent with international benchmarks for similar schemes.

Site-Specific Management Plans (To Be Prepared by Contractor Before Construction)

To operationalize ESMP requirements, the Contractor shall prepare and submit to the PMT for approval the following site-specific management plans. No construction activities shall commence until these plans have been formally approved by the PMT:

1. Construction Environmental and Social Management Plan (CESMP)
2. Waste Management Plan
3. Occupational Health and Safety Plan (including heat stress, confined spaces, working at height, electrical safety, manual handling, and psychosocial risks)
4. HIV/AIDS Workplace Policy
5. Code of Conduct (CoC) with GBV/SEA provisions (including enforceable sanctions and referral pathways)
6. Grievance Redress Mechanism (GRM) procedures (worker-specific and community-level)
7. Chance Find Procedure (aligned with Monuments and Relics Act and Department of Antiquities requirements)
8. Cholera Response Plan
9. Drinking Water Management Plan
10. Integrated Pest Management (IPM) Plan
11. Hazardous Materials Management Plan
12. Labor Management Procedures (LMP) with worker-specific GRM
13. Stakeholder Engagement Plan (SEP)

Adaptive Management and Compliance Enforcement

Compliance thresholds are defined in the ESMP. Where monitoring indicators fall below acceptable limits (e.g., PPE compliance below 80 percent, grievance resolution beyond 30 days, or failure to meet environmental flow requirements), corrective actions will be triggered immediately. A structured corrective action process is applied including identification and documentation of non-compliance, issuance of corrective action instructions, implementation of corrective measures within defined timelines, and verification of compliance through follow-up inspections.

For significant or repeated non-compliance, the PMT will enforce corrective action plans, contractual penalties or sanctions may be applied, and the issue will be escalated to MEPA for regulatory intervention where required.

An adaptive management approach is embedded in the ESMP. Where monitoring indicates that mitigation measures are ineffective or insufficient, mitigation strategies will be revised, additional control measures introduced, and implementation approaches adjusted to site-specific conditions. This adaptive approach ensures that environmental and social management remains responsive, effective, and aligned with evolving project risks.

Conclusion and Recommendations

The ESMP concludes that the Chikhambi/Mbenderana Irrigation Scheme is environmentally and socially feasible and sustainable. The identified adverse impacts are localized, largely reversible, and can be effectively managed through proper implementation of the proposed mitigation measures. The anticipated socio-economic benefits, including increased agricultural productivity, improved household incomes, enhanced food and nutrition security, strengthened market integration, expanded livelihood opportunities, and reduced vulnerability to climate variability, significantly outweigh the potential negative impacts. The institutional framework, monitoring systems, Grievance Redress Mechanism, and budget allocations are adequate and robust to ensure compliance with national regulations and international safeguards requirements.

Based on the findings of this assessment, the following recommendations are made for AfDB consideration:

1. The ESMP shall be formally integrated into all project contracts and procurement documents, ensuring that compliance with environmental and social requirements is a binding contractual obligation for all implementing entities.
2. The Grievance Redress Mechanism shall be operationalized and made fully accessible to all affected communities and workers prior to the commencement of any construction activities and shall be maintained throughout all phases of the project.

3. All site-specific management plans, including the Construction Environmental and Social Management Plan, Labor Management Procedures, Stakeholder Engagement Plan, SEA/SH Action Plan, Waste Management Plan, and Occupational Health and Safety Plan, shall be submitted to the PMT for review and formal approval before any construction activities begin.
4. A Project Decommissioning Plan shall be prepared prior to project closure, outlining specific decommissioning activities, environmental and social management measures, roles and responsibilities, timelines, and monitoring requirements to ensure that decommissioning is carried out in a safe and environmentally sound manner.
5. Adequate financial, technical, and human resources shall be secured and maintained throughout the project lifecycle to support ESMP implementation, monitoring, reporting, and adaptive management.
6. Targeted capacity building and training programmes shall be implemented for the PMT, Contractor, Supervision Consultant, Cooperative members, and local stakeholders to strengthen environmental and social management capabilities.
7. Continuous and structured stakeholder engagement shall be maintained to promote transparency, inclusiveness, and community ownership of the project, with documented records of all consultations maintained for audit purposes.
8. Regular monitoring and compliance reports shall be submitted to MEPA, the World Bank, the African Development Bank, and other relevant authorities in accordance with the reporting protocols established in the ESMoP, ensuring accountability and facilitating effective oversight throughout the project lifecycle.
9. The Contractor shall prepare and submit for approval a Resettlement Policy Framework or Abbreviated Resettlement Action Plan consistent with AfDB OS2 prior to any land acquisition.
10. The Contractor shall prepare and submit for approval an Integrated Pest Management Plan and Hazardous Materials Management Plan consistent with AfDB OS4 prior to construction.
11. The Contractor shall prepare and submit for approval Labor Management Procedures with Code of Conduct and worker-specific GRM consistent with AfDB OS5 prior to construction.
12. A stand-alone Stakeholder Engagement Plan consistent with AfDB OS10 shall be prepared and disclosed publicly prior to construction.

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1 BACKGROUND

1.1 OVERVIEW OF SHIRE VALLEY TRANSFORMATION PROGRAMME II

The Shire Valley Transformation Programme (SVTP)-2 is a development program launched by the Government of Malawi (GoM) with the aim of transforming the Shire Valley within the administrative districts of Chikwawa and Nsanje into a productive and commercially viable agricultural hub. The Programme is being financed by the World Bank, the African Development Bank, the OPEC Fund for International Development (OFID), the Global Environment Facility, and the Government of Malawi. The Programme Development Objective (PDO) is to increase agricultural productivity and commercialization for targeted households in the Shire Valley and to improve the sustainable management and utilization of natural resources.

The Programme involves the development of key irrigation infrastructure, including water abstraction from the Shire River at Kapichira Dam, conveyance systems comprising primary and secondary canals, drainage infrastructure, and associated support facilities. These components are designed to ensure reliable year-round irrigation water supply, improve climate resilience, and support sustainable agricultural intensification within the Shire Valley.

In line with the SVTP ESMP, site specific ESMPs for irrigation blocks will be developed and aligned to national and development partners' safeguards policies as required. All development blocks are managed by cooperatives and one such block is Chikhambi Mbenderana managed by Mwana Alirenji Cooperative.

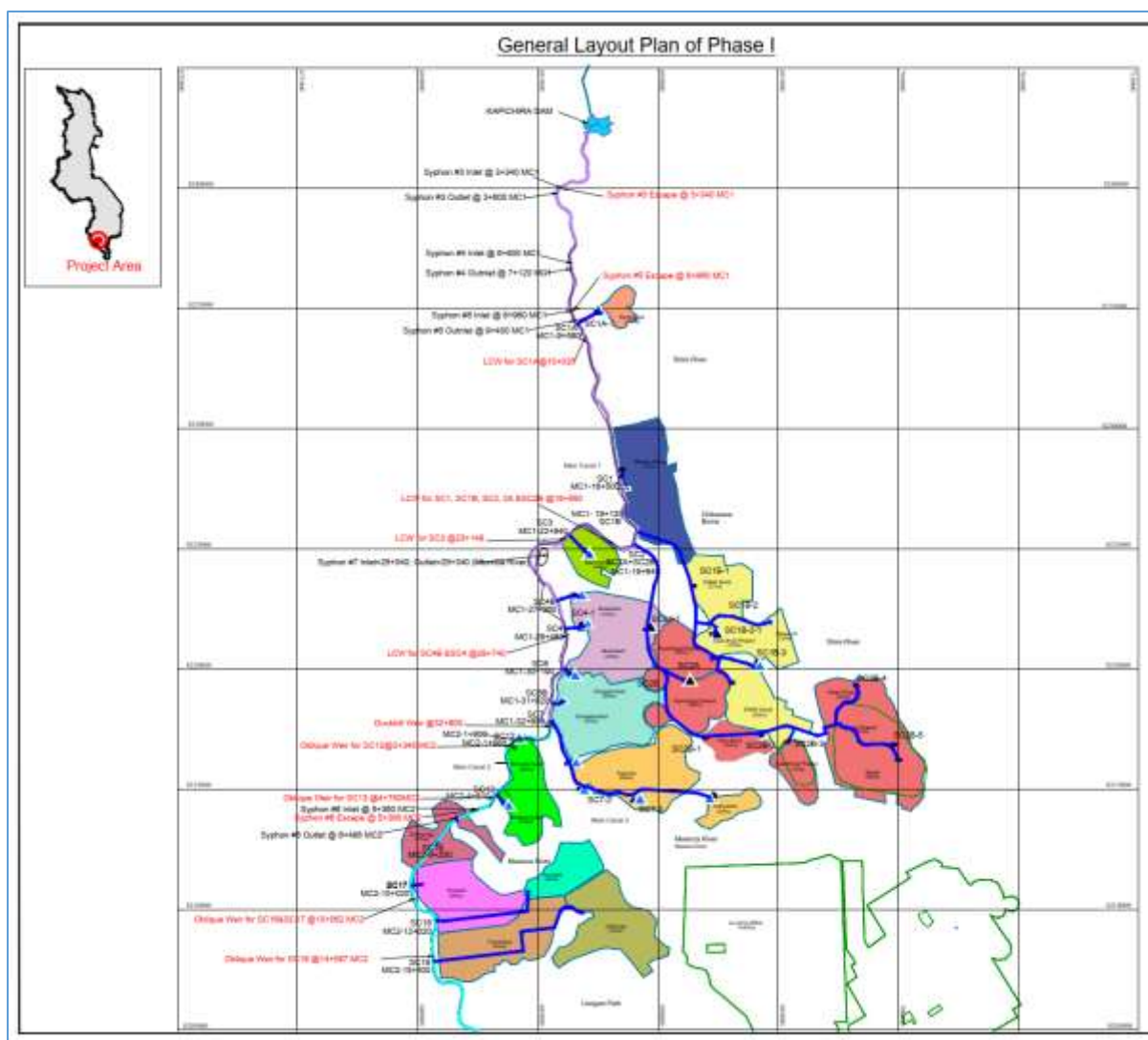


Figure 1: Layout Plan for Shire Valley Transformation Programme (SVTP-1) Showing Location of Mwana Alirenji

3.2 BACKGROUND OF MWANA-ALIRENJI COOPERATIVE

Chikhambi and Mbenderana block is located in Group Village Headmen (GVH) Mbenderana and Chikhambi, Tradition Authority (TA) Kasisi, east of Chikwawa District. The block is under Mwana-Alirenji Cooperative and is bordered by Kambadwa Cooperative in the north, Mantchombe Cooperative in the east, and Katunga-Maseya (KAMA) Cane Growers Association in the south. Figure 2 shows the location of Chikhambi and Mbenderana Irrigation Block (Mwana-Alirenji Cooperative).

The project is expected to generate significant employment opportunities during both construction and operation phases. Approximately 150 people are expected to be employed during the construction phase, while around 200 people will be employed during the operational phase. In line with national policies and international good practice, efforts will be made to ensure equitable employment opportunities, with a target of achieving gender balance. Priority will be given to local communities within Chikhambi/Mbenderana and the wider Chikwawa District, particularly for unskilled labour. All workers will undergo appropriate occupational health and safety training to ensure compliance with labour and safety standards.

The Cooperative plays a central role in the implementation and sustainability of the irrigation scheme, and its structure, membership, and operations are critical in shaping the environmental and social context of the project. As such, understanding the characteristics of the Cooperative provides an important basis for assessing potential impacts, designing appropriate mitigation measures, and ensuring inclusive and sustainable project outcomes.

Table 1: Summary of Membership of Mwana-Alirenji Cooperative

GVH	Villages	BCC	Membership		
			Male	Female	Total
Chikhambi	Chikhambi 1 and 3	Mthundu	114 (54.8%)	94 (45.2%)	208
Mbenderana	Mpotazingwe, Mbenderana	Nsekere	136 (53.1%)	120 (46.9%)	256
Mbenderana	Light, Mwingama	Mtondo	75 (49.1%)	78 (50.9%)	153
Mbenderana	Ling'awa1, 2, 3, 4, 5 and 6	Tiyanjane and Chidziwitso	84 (48.2%)	90 (51.8%)	174
Total			409 (51.7%)	382 (48.3%)	791

1.3 MAIN OBJECTIVE OF THE COOPERATIVE

The primary goal of Mwana Alirenji Cooperative is to establish a financially sustainable enterprise that generates consistent returns while securing the economic welfare of its members. The Cooperative seeks to enhance the socio-economic conditions of its members and surrounding communities by pooling productive resources and engaging in irrigation-based agriculture as a commercially viable venture, supported by modern irrigation systems and improved agricultural technologies.

The Cooperative aims to achieve long-term financial sustainability through the adoption of efficient farming practices, diversification of income streams, and integration into agricultural value chains. These efforts are expected to contribute to improved household incomes, enhanced food security, and overall economic development within the project area. In addition, the Cooperative is committed to promoting environmentally sustainable agricultural practices and responsible resource management, in line with the broader objectives of the Shire Valley Transformation Programme. This approach is intended to ensure that economic gains are achieved alongside the sustainable use of natural resources and long-term resilience of the farming system.

1.4 PROJECT DURATION

The development of the Chikhambi/Mbenderana Irrigation Block is expected to take approximately 24 months. The project will be implemented in distinct phases, including planning, construction, operation and maintenance, and decommissioning. These phases will require varying levels of labour and technical input over time.

The project is expected to generate significant employment opportunities, with more than 350 people anticipated to be engaged across different phases of implementation. During the planning phase, over 100 people are expected to be employed, while the construction phase is also expected to employ more than 100 people. Similarly, the operation and maintenance phase is projected to engage more than 100 people, while the decommissioning phase is expected to employ more than 50 people. In line with national policies and international good practice, the project will promote equitable employment opportunities, with a target of achieving gender balance in employment. Priority will be given to local communities within Chikhambi and Mbenderana villages, as well as the wider Chikwawa District, particularly for unskilled labour. All employees will undergo appropriate occupational health and safety training to ensure safe working conditions and compliance with labour and safety standards throughout the project lifecycle.

1.5 DETAILS OF THE PROJECT PROPONENT

Table 1.3 provides the details of the project proponent, which is the Government of Malawi through the Ministry of Agriculture.

Table 2: Details of Project Proponents

Item	Description
Proponent Name	Ministry of Agriculture – Shire Valley Transformation Programme (SVTP-2)
Postal Address	Private Bag 379, Chichiri, Blantyre 3, Malawi
Contact Person	Limbani Gomani (Project Coordinator)
Email	lgomani.doi@svtp.gov.mw

1.6 SCOPE OF ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

This section outlines the scope, objectives, and methodological approach adopted in the preparation of the Environmental and Social Management Plan (ESMP). The scope of the study involved undertaking environmental and social assessments in line with the Guidelines for Environmental Assessment in Malawi (2025) and the requirements of the Environment Management Act (EMA), 2017. The study covered the entire Chikhambi /Mbenderana irrigation block, the immediate environment surrounding the project site, and all associated project implementation activities. The report includes a description of the project setting, a comprehensive evaluation of the site and its surrounding environment, and an assessment of predicted environmental and social impacts, as well as applicable legal and regulatory frameworks. It also outlines mitigation and enhancement measures, together with strategies and recommendations for managing the environmental and social impacts of the project.

In addition, the scope of this ESMP has been defined to align with international good practice, including the safeguards requirements of the African Development Bank, Opec Fund for International Development and the World Bank, ensuring that environmental and social risks are systematically identified, assessed, and managed throughout the project lifecycle.

1.7 JUSTIFICATION FOR THE ESMP

In accordance with the Environment Management Act (2017), a screening exercise was conducted to determine whether an Environmental and Social Impact Assessment (ESIA) was required and, if so, the appropriate level of assessment. The total land area for the irrigation block is approximately 844.9 hectares, which classifies the project as a Category 1 project under the National Environmental Impact Assessment (EIA) Guidelines (2025) that stipulates a threshold of 30 ha and applicable safeguards requirements.

However, given that the project forms part of the Shire Valley Transformation Programme (SVTP-1), for which a comprehensive ESIA has already been undertaken for the broader project area, the Malawi Environment Protection Authority (MEPA) exempted this sub-project from conducting a full ESIA and instead required the preparation of an Environmental and Social Management Plan (ESMP).

The ESMP has therefore been developed based on Terms of Reference (ToRs) provided by MEPA (Annex 1), and is intended to address site-specific environmental and social risks and impacts associated with the proposed irrigation scheme.

The preparation of this ESMP ensures that site-specific environmental and social risks are effectively managed in a manner consistent with national legislation and international safeguards requirements.

1.8 MAIN OBJECTIVE OF THE ESMP

The main objective of the ESMP is to identify, assess, and predict potential positive and negative environmental and social impacts associated with the project, and to develop appropriate mitigation and enhancement measures to ensure sustainable project implementation. The ESMP will guide stakeholders in the implementation of environmental and social safeguards, including contractor compliance with safeguards requirements, establishment and functioning of grievance redress mechanisms, promotion of gender, youth, and community participation, and awareness and sensitisation on environmental and social management issues.

The ESMP also aims to ensure compliance with applicable national regulations and international safeguard standards, while promoting sustainable resource use and enhancing positive socio-economic outcomes. The ESMP further provides a framework for continuous monitoring, reporting, and adaptive management throughout the project lifecycle.

1.9 SPECIFIC OBJECTIVES OF THE ESMP

The specific objectives of the ESMP study are to:

- Identify necessary statutory and regulatory approvals and licences required for the project;
- Determine the compatibility of the proposed project with the local environmental and social conditions of the project area;
- Assess the physical, biological, and socio-economic environment of the project area;
- Identify and evaluate potential positive and negative environmental and social impacts associated with the project;
- Propose appropriate mitigation and enhancement measures for significant impacts;
- Prepare an Environmental and Social Management Plan (ESMP) for the project;
- Develop an Environmental and Social Monitoring Plan (ESMoP) to support effective implementation of the ESMP; and
- Ensure continuous stakeholder engagement and integration of feedback throughout the project lifecycle.

1.10 SCOPE OF THE ESMP

In accordance with the national environmental and social regulatory framework and relevant international standards, the scope of the ESMP includes:

- i. Assessment of the current status of the biophysical and socio-economic environment within the project area;
- ii. Identification of potential environmental and social risks and impacts throughout the project lifecycle, including pre-construction, construction, and operation phases;
- iii. Conduct of stakeholder consultations at various levels to capture concerns, expectations, and potential impacts;
- iv. Alignment of mitigation and enhancement measures with national and international environmental and social standards;
- v. Preparation of the ESMP, including monitoring plans and budget provisions; Assessment of institutional arrangements for managing environmental and social aspects of the project; and
- vi. Establishment of mechanisms for monitoring, reporting, and adaptive management of environmental and social performance.

1.11 PROJECT JUSTIFICATION / RATIONALE

The Shire Valley Transformation Programme (SVTP-1) is a 14-year programme (2017–2031) structured around three coordinated pillars: (i) provision of reliable, professionally managed and sustainably financed irrigation services through phased development of irrigation infrastructure; (ii) support for farmer organization, land tenure strengthening, and natural resource management; and (iii) establishment and investment in Smallholder-Owned Commercial Farm Enterprises (SOCFEs) to facilitate transition to commercial agriculture.

Under the Programme, smallholder farmers benefit from access to irrigated agriculture, secure land and water tenure, improved agricultural production systems, enhanced advisory services, and improved access to financial services and markets. The Programme also promotes formalization of farmer groups as irrigation service users and facilitates partnerships with service providers and off-takers in commercial agriculture to irrigate approximately 43,000 hectares of land.

In this context, the development of the Chikhambi/Mbenderana Irrigation Block under Mwana-Alirenji Cooperative will enable beneficiaries to access these Programme benefits, thereby improving agricultural productivity, household incomes, and overall socio-economic development within the project area.

1.12 METHODOLOGY

1.12.1 Technical Approach to the Study

The study adopted a mixed-method approach, integrating both qualitative and quantitative techniques to ensure comprehensive data collection and analysis. This approach enabled the capture of both scientific data and stakeholder perspectives relevant to the ESMP.

The general steps followed during the assessment included desk studies, field surveys, stakeholder consultations, and reporting. Data collection methods included literature review, site observations, and stakeholder engagement through community meetings, key informant interviews, and focus group discussions.

1.12.2 Desk Studies

Literature review involved review of SVTP project documents, environmental and social safeguards documents, district development plans, previous ESIAs/ESMPs, and relevant policy and legal frameworks.

1.12.3 Field Surveys

Field investigations included site inspections, biodiversity observations, topographic surveys, and soil assessments to establish baseline environmental conditions.

1.12.4 Stakeholder Consultations

Stakeholder consultations were conducted through community meetings, focus group discussions, and key informant interviews involving local communities, cooperative members, government institutions, and other stakeholders.

The consultations were conducted in an inclusive manner to ensure representation of different groups, including women and youth, and provided critical input into impact identification and mitigation planning.

1.13 SITE LOCATION

Mbenderana/Chikhambi Irrigation Block is located in Group Village Headmen (GVH) Mbenderana and Chikhambi, under Traditional Authority (TA) Kasisi in Chikwawa District. The project area is bordered by Kambadwe Cooperative to the north, Mantchombe Cooperative to the east, and Katunga-Maseya (KAMA) Cane Growers Association to the south.

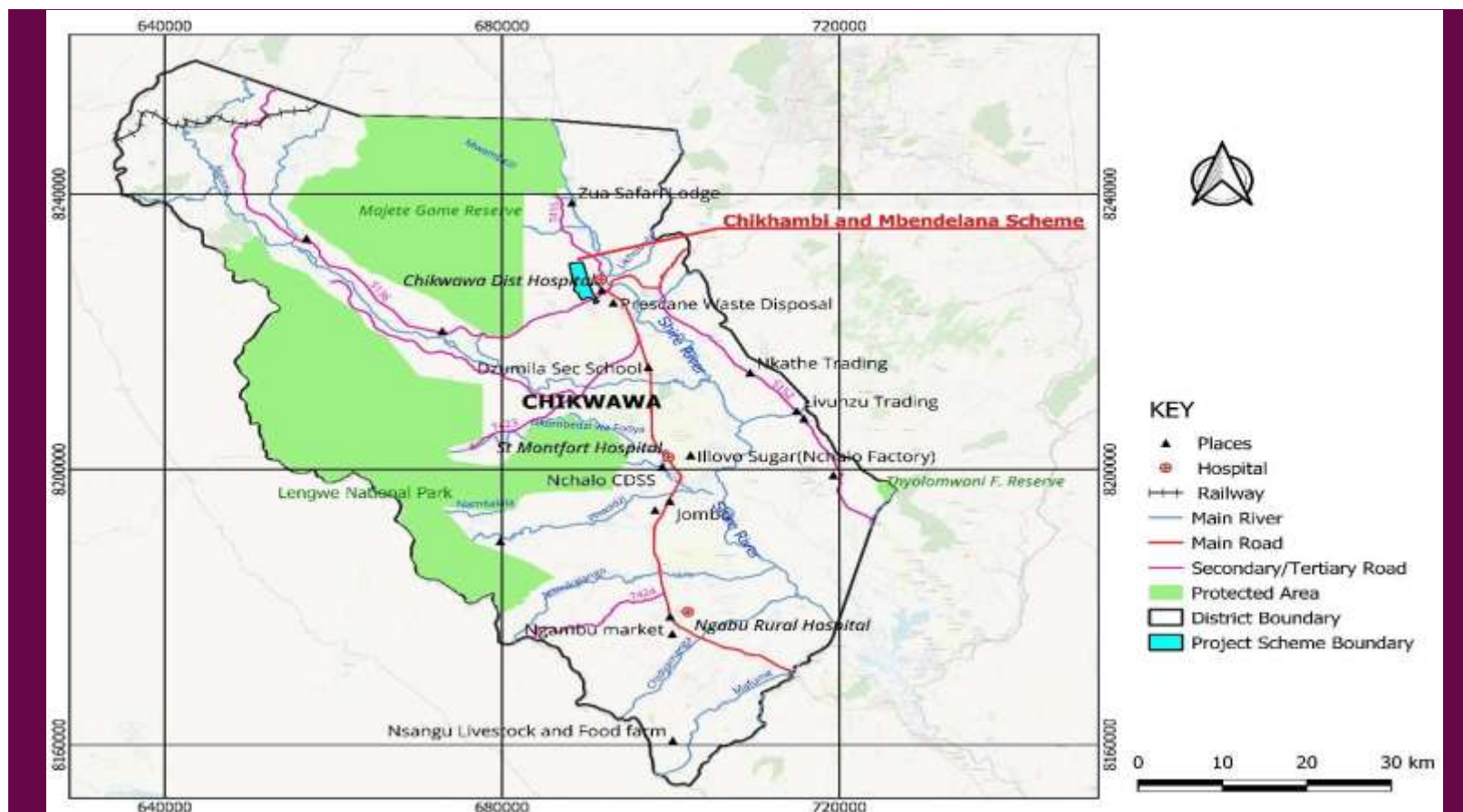


Figure 3: Location of Mbenderana/Chikhambi Irrigation Block (Mwana-Alirenji Cooperative)

The map illustrates the geographical location of the project area and its spatial relationship with surrounding settlements and infrastructure, which is important for understanding potential environmental and social interactions.

1.14 LAND OWNERSHIP AND LAND TENURE

The proposed project area is customary land and currently is used for cultivation. Once the project is in operation the WUA will be in charge. All farmed agricultural land under customary tenure within the project area will be demarcated and formally registered using a gender sensitive approach. Most agricultural land in Malawi farmed by smallholders is held under customary systems, either patrilineal, matrilineal or mixed, governed by Traditional Authorities (male or female). The chieftaincy hierarchy starts from the village chief, to the Group Village Headman (GVH) and traditional chief. The Traditional Land Management Authority (TLMA). Land administration institutions will only be established in GVHs and TLMAs gazetted by the Ministry of Local government.

1.15 POTENTIAL USERS

The Environmental and Social Management Plan (ESMP) is intended to guide sustainable development of the Mwana Alirenji Cooperative Irrigation Scheme at Chikhambi/Mbenderana in Chikwawa by identifying the principal issues to be considered in the Environmental and Social Management Plan (ESMP). The ESMP is intended for use by, among others, the following:

The Supervising Engineer: The supervising engineer will employ the ESMP to ensure that the contractor complies with the recommendations made in this document for the benefit of the beneficiaries and employees. This will be done through scheduled and unscheduled monitoring visits to the project sites. Full time Environmental and Social Experts will be responsible to monitor the activities of the contractor so that they meet Environmental, Social, gender and Health and safety requirements.

The construction company: In minimizing the negative impacts emanating from the construction works, the contractor will implement the strategies stipulated in this report especially the ESMP to mitigate against such impacts.

Malawi Environment Protection Authority (MEPA): As a custodial institution of the Environment Management Act (2017), MEPA will conduct routine monitoring visits through its inspectorate unit to ensure compliance with the recommendation made in this report.

Department of Irrigation (DoI): The Department of Irrigation is the technical arm of the project and, in addition to the consulting engineer, has responsibility to ensure that the construction company complies with the recommendations contained in the ESMP. The DoI will upon conducting the monitoring visits, make recommendations as to the furtherance of the ESIA recommendations.

Ministry of Labour: The Ministry of Labour is an important part of the project. It has responsibility to ensure that the construction company complies human resource with the recommendations contained in the ESMP.

Chikwawa District Council: The District Council has a legal duty to foster environmental management within the Decentralized Environmental Management (DEM) framework. The council host the District Environmental Sub-Committee (DESC) whose function is to further environmental management. The District Irrigation Officer is the responsible technical officer for the management of irrigation projects and sits on the DESC. He will be appraised on environmental and construction issues in addition to making supervision visits to the site.

Communities: The communities, being residents of the project sites, will assist in monitoring compliance to the ESIA by the contractor. Acting through the Water Users Associations (WUAs) in the two project sites, they will report to the consultant and district officials on any malpractice and defaults regarding implementation of the recommendation contained in the ESMP.

Development Partners (World Bank/ADB/GES): The development partners, in their supervision visits, will ensure compliance to the ESMP. Both partners will ensure that there is also compliance to the safeguards policies contained in the contract document.

Mantchombe cooperative: Understanding the relationship between the Mantchombe cooperative and the Mwana Alirenji cooperative is crucial for effective planning, stakeholder engagement, and sustainable development outcomes.

Pesticide Control Board: The Pesticide Control Board plays a critical role in the effective implementation of an Environmental and Social Management Plan (ESMP) by regulating and monitoring the use of pesticides in various sectors. Its responsibilities include assessing the environmental and social impacts of pesticide use, setting standards and guidelines for pesticide application, issuing permits, and enforcing compliance with regulations. Additionally, the board conducts inspections, educates stakeholders on safe pesticide practices, and facilitates research on alternative pest management strategies. By ensuring the responsible and sustainable use of pesticides, the Pesticide Control Board contributes to safeguarding environmental integrity, protecting public health, and promoting the overall success of ESMP initiatives

Ministry of water: The Ministry of Water plays a pivotal role in overseeing the management, conservation, and equitable distribution of water resources within a country. Its responsibilities encompass a wide range of activities, including developing water policies, regulating water use, implementing water infrastructure projects, and promoting water conservation and efficiency measures. The ministry collaborates with various stakeholders, including government agencies, local communities, and private entities, to address water-related challenges such as water scarcity, pollution, and inadequate access to clean water and sanitation services. By prioritizing sustainable water management practices, the Ministry of Water contributes to safeguarding the environment, supporting socio-economic development, and ensuring the well-being of present and future generations.

National Water Resources Authority: The National Water Resources Authority (NWRA) is a key governmental institution tasked with the comprehensive management and regulation of a country's water resources. Its primary role involves overseeing the sustainable use, conservation, and allocation of water for various sectors such as agriculture, industry, domestic use, and environmental preservation. The NWRA typically develops and implements policies, strategies, and regulations to ensure the equitable distribution of water, mitigate water-related risks such as droughts and floods, and promote efficient water resource utilization. Additionally, it may engage in monitoring water quality, conducting hydrological assessments, and coordinating water-related projects and initiatives across different regions and stakeholders. Through its activities, the National Water Resources Authority plays a crucial role in safeguarding water security, supporting socio-economic development, and preserving ecosystems dependent on water resources.

Ministry of Land: The Ministry of Land is a governmental body responsible for the administration, regulation, and management of land resources within a country. Its primary functions include land tenure systems, land use planning, land registration, and land policy formulation. The ministry ensures the effective utilization of land resources for various purposes such as agriculture, urban development, infrastructure projects, conservation, and natural resource management. It also addresses issues related to land ownership, land disputes, and land rights, working to establish transparent and equitable land governance systems. By promoting sustainable land management practices and facilitating land-related services, the Ministry of Land contributes to fostering economic growth, environmental sustainability, and social stability within the nation.

2 POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

2.1 POLICY FRAMEWORK

This section presents key national policies relevant to the proposed Chikhambi/Mbenderana Irrigation Block and analyses their implications for environmental and social management. The policies provide strategic direction for sustainable development in Malawi and establish the basis upon which sectoral interventions, including irrigation development, must be designed and implemented.

The relevance of each policy is assessed in relation to the project's environmental and social footprint, including land use, water resource utilization, agricultural intensification, labour management, and community welfare.

2.1.1 Malawi Vision 2063

Malawi Vision 2063 (MW2063) is the country's overarching long-term development strategy, which aims to transform Malawi into a wealthy, self-reliant, industrialized upper-middle-income economy by the year 2063. The Vision places strong emphasis on agricultural transformation, commercialization, and industrialization as key drivers of economic growth.

The agriculture sector is identified as a critical pillar of the economy, currently supporting approximately 80 percent of the population. However, the Vision acknowledges persistent challenges such as low productivity, dependence on rain-fed agriculture, environmental degradation, climate variability, fragmented land tenure systems, and limited irrigation infrastructure.

To address these challenges, MW2063 promotes climate-smart agriculture, expansion of irrigation systems, improved land management practices, and increased access to agricultural inputs, finance, and markets. The Vision further recognizes the importance of strengthening value chains and transitioning from subsistence farming to commercial agriculture.

The proposed irrigation scheme directly contributes to these objectives by enhancing agricultural productivity, promoting commercialization, and reducing vulnerability to climate variability. Through the development of irrigation infrastructure and support to cooperative-based farming, the project aligns with national priorities for economic transformation, food security, and climate resilience.

2.1.2 National Environmental Policy (2004)

The National Environmental Policy provides the overarching framework for environmental management in Malawi. It recognizes that natural resources constitute the foundation of the

country's socio-economic development and emphasizes the need for sustainable utilization and conservation of these resources.

The policy identifies key environmental challenges including land degradation, deforestation, water pollution, and loss of biodiversity, which are often exacerbated by development activities. It therefore promotes the integration of environmental considerations into development planning through tools such as Environmental and Social Impact Assessments (ESIAs), Environmental and Social Management Plans (ESMPs), environmental audits, and monitoring systems.

For the proposed irrigation project, the policy is particularly relevant given the potential impacts associated with land clearing, water abstraction, agrochemical use, and infrastructure development. In line with the policy, environmental and social considerations have been integrated into project planning and design through the preparation of this ESMP, which outlines measures to avoid, minimize, and mitigate adverse impacts while enhancing positive outcomes.

2.1.3 National Land Policy (2002)

The National Land Policy provides guidance on land administration, tenure security, and sustainable land management. It recognizes land as a fundamental resource for socio-economic development and emphasizes equitable access, efficient utilization, and protection of land rights.

The policy highlights the need to safeguard the rights of vulnerable groups, including women, children, and persons with disabilities, particularly in the context of land-based investments. It also promotes the use of environmental management tools to ensure that land development projects do not compromise ecological integrity.

The proposed project may involve land acquisition for infrastructure development, including borrow pits, access roads, and irrigation facilities. In line with the policy, any land acquisition will be undertaken in a transparent and equitable manner, with affected persons receiving fair compensation and livelihood restoration support where necessary. The project will also ensure that land use changes are environmentally sustainable and socially acceptable.

2.1.4 National Water Policy (2023)

The National Water Policy promotes integrated and sustainable management of water resources in Malawi. It emphasizes equitable allocation, efficient utilization, and protection of water resources to support socio-economic development and environmental sustainability.

The policy is highly relevant to the proposed irrigation scheme, which involves abstraction of water from the Shire River. Key principles of the policy include decentralized water

management, stakeholder participation, and the “polluter pays” principle, which holds users accountable for preventing water pollution.

The project will comply with the provisions of the policy by implementing water-efficient irrigation technologies, minimizing water losses, and ensuring that abstraction does not adversely affect downstream users or ecological systems. Measures to prevent water pollution from agricultural runoff, including the promotion of integrated pest management, will also be implemented.

2.1.5 National Irrigation Policy (2024)

The National Irrigation Policy provides strategic direction for the development and management of irrigated agriculture in Malawi. Its objectives include increasing land under irrigation, promoting crop diversification, enhancing productivity, and strengthening institutional capacity.

The policy recognizes irrigation as a key intervention for achieving food security, economic growth, and climate resilience. It also promotes the development of sustainable irrigation systems and the establishment of water user institutions to manage irrigation schemes effectively.

The proposed project is directly aligned with the policy, as it involves the development of irrigation infrastructure and the strengthening of cooperative-based management systems. The project also supports sustainable irrigation practices and contributes to the expansion of irrigated agriculture in the Shire Valley.

2.1.6 National Climate Change Management Policy (2016)

The National Climate Change Management Policy provides a framework for coordinated and integrated climate change management in Malawi. It emphasizes both mitigation of greenhouse gas emissions and adaptation to the impacts of climate change.

The policy identifies agriculture as one of the most climate-sensitive sectors and prioritizes interventions that enhance resilience to climate variability. These include the promotion of climate-smart agriculture, sustainable water management, and diversification of livelihoods.

The proposed irrigation scheme contributes to climate adaptation by reducing reliance on rain-fed agriculture and enhancing the resilience of farming systems. Climate considerations have been integrated into the design of the irrigation system and the ESMP, including measures to ensure efficient water use and sustainable land management.

2.1.7 National Gender Policy (2015)

The National Gender Policy aims to promote gender equality and empower women in all sectors of development. It emphasizes the need for gender mainstreaming in policies, programs, and projects to ensure equitable participation and benefit-sharing.

The project recognizes the importance of gender inclusion and will ensure that both men and women have equal access to employment opportunities, decision-making processes, and project benefits. Measures will also be implemented to prevent gender-based violence, sexual exploitation, and discrimination, in line with national policy and international safeguards requirements.

2.1.8 National Sanitation Policy (2008)

The National Sanitation Policy provides a framework for improving sanitation and hygiene in Malawi. It emphasizes the importance of proper waste management, pollution control, and public health protection.

The project will comply with the policy by providing adequate sanitation facilities during construction and operation phases, and by implementing measures to manage wastewater and prevent contamination of water resources. These measures are essential to protect both environmental quality and public health.

2.1.9 National Employment and Labour Policy (2021)

The National Employment and Labour Policy promotes decent work, fair labour practices, and social protection for workers. It emphasizes safe working conditions, non-discrimination, and inclusive employment.

The project will align with this policy by ensuring that employment opportunities are provided in a fair and transparent manner, with priority given to local communities. Labour management procedures will be implemented to safeguard workers' rights, promote occupational health and safety, and prevent exploitation.

2.2 LEGAL AND REGULATORY FRAMEWORK

This section outlines the key legal instruments governing environmental and social management in Malawi and analyses their relevance to the proposed irrigation project. The legal framework provides enforceable provisions for environmental protection, land administration, water resource management, labour relations, and public health, which are directly applicable to the project.

The implementation of the project will be guided by these legal requirements, ensuring compliance throughout the project lifecycle, including planning, construction, operation, and decommissioning phases.

2.2.1 Environment Management Act (2017)

The Environment Management Act (EMA), 2017 is the principal legislation governing environmental management in Malawi. The Act provides the legal basis for environmental protection, sustainable resource management, and regulation of development activities that may have adverse environmental and social impacts. The Act mandates that all projects with potential environmental and social impacts undergo environmental assessment and obtain approval from the Malawi Environment Protection Authority (MEPA) prior to implementation. It also provides for environmental monitoring, audits, and enforcement of compliance measures. For the proposed irrigation project, the EMA is highly relevant as it requires the identification, assessment, and mitigation of environmental and social impacts associated with land clearing, water abstraction, construction activities, and agricultural operations. The preparation of this ESMP is in compliance with the Act and provides a framework for ongoing environmental and social management.

2.2.2 Land Act (2016)

The Land Act (2016) provides the legal framework for land administration and management in Malawi. It classifies land into public land, private land, and customary land, and establishes procedures for land allocation, registration, and transfer. The project will be implemented primarily on customary land, which is governed by traditional authorities but subject to statutory regulation. The Act requires that any land acquisition or change in land use be conducted in a transparent and lawful manner. In the context of this project, the Land Act is particularly relevant for infrastructure development, including irrigation facilities, access roads, and borrow areas. Any land acquisition or loss of land use will be managed in accordance with the provisions of the Act, ensuring that affected persons are treated fairly and that their rights are protected.

2.2.3 Customary Land Act (2016)

The Customary Land Act complements the Land Act by providing specific provisions for the management and administration of customary land. It introduces mechanisms for formalizing customary land rights and establishes Customary Land Committees responsible for land governance at local levels. The Act is highly relevant to the project given that the irrigation scheme is located within customary land areas. It provides a framework for securing land tenure, reducing land disputes, and ensuring community participation in land-related decisions. The project will engage with local land governance structures, including Traditional Authorities and Customary Land Committees, to ensure that land-related issues are managed in a transparent and participatory manner.

2.2.4 Lands Acquisition and Compensation Act (2017)

The Lands Acquisition and Compensation Act (2017) provides legal provisions for compulsory acquisition of land for public purposes and establishes procedures for compensation of affected persons.

The Act requires that any person whose land or assets are affected by a development project be compensated fairly and promptly. Compensation must take into account the value of land, structures, crops, and other assets, as well as any associated livelihood impacts.

Although large-scale displacement is not anticipated, the project may involve localized land acquisition for infrastructure development. In such cases, the Act will guide the compensation process, ensuring that affected persons are adequately compensated and supported.

2.2.5 Water Resources Act (2013)

The Water Resources Act (2013) governs the management, development, and use of water resources in Malawi. It establishes the legal framework for water abstraction, allocation, and protection of water resources.

The Act requires that any entity intending to abstract water must obtain a water permit from the relevant authority. It also provides for the protection of water quality and the regulation of activities that may affect water resources.

Given that the project involves abstraction of water from the Shire River, compliance with the Act is critical. The project will obtain the necessary water abstraction permits and ensure that water use does not adversely affect downstream users or ecological systems. Measures to prevent pollution of water resources will also be implemented.

2.2.6 Occupational Safety, Health and Welfare Act (1997)

The Occupational Safety, Health and Welfare Act provides for the protection of workers from occupational hazards and ensures safe working conditions in all workplaces.

The Act requires employers to provide appropriate safety equipment, training, and supervision to prevent accidents and injuries. It also mandates the identification and management of workplace risks. This Act is particularly relevant during the construction phase, which involves the use of heavy machinery and potentially hazardous activities. The project will implement occupational health and safety measures in compliance with the Act, including training, provision of personal protective equipment (PPE), and regular safety inspections.

2.2.7 Employment Act (2000)

The Employment Act governs labour relations in Malawi and provides for fair employment practices, including wages, working conditions, and termination of employment.

The Act prohibits discrimination and promotes equal opportunity in employment. It also provides protections for workers, including provisions related to contracts, working hours, and dispute resolution. The project will comply with the Act by ensuring that all workers are employed under fair and transparent conditions, with clear contracts and adherence to labour standards. Particular attention will be given to protecting vulnerable groups and promoting inclusive employment.

2.2.8 Public Health Act (1948)

The Public Health Act provides for the protection and promotion of public health in Malawi. It includes provisions for sanitation, waste management, and control of communicable diseases.

The Act is relevant to the project in relation to sanitation facilities, waste management, and prevention of health risks associated with construction and operation activities. The project will implement measures to ensure that sanitation standards are maintained and that potential health risks are minimized.

2.2.9 Local Government Act (1998)

The Local Government Act establishes the framework for decentralized governance and assigns responsibilities for environmental and social management to local authorities. District Councils are responsible for overseeing development activities within their jurisdictions, including environmental management, land use planning, and service delivery. The project will work closely with Chikwawa District Council to ensure compliance with local regulations and coordination of project activities with district development plans.

2.2.10 National Construction Industry Act (2025)

The National Construction Industry Act regulates the construction sector in Malawi and provides for the registration and supervision of contractors. The Act ensures that construction works are carried out by qualified and registered contractors who adhere to industry standards and safety requirements. For this project, all construction activities will be undertaken by contractors registered with the Construction Industry Regulatory Authority (CIRA), ensuring compliance with national standards and minimizing risks associated with poor workmanship.

2.3 INSTITUTIONAL FRAMEWORK

This section outlines the institutional arrangements relevant to the implementation, regulation, and monitoring of environmental and social aspects of the proposed irrigation project. Effective coordination among institutions is essential to ensure compliance with national legal requirements and international safeguards standards. The implementation of the project involves multiple institutions at national, district, and community levels, each with specific roles and responsibilities in environmental and social management. These institutions collectively provide oversight, technical support, regulatory enforcement, and operational management throughout the project lifecycle.

2.3.1 Malawi Environment Protection Authority (MEPA)

The Malawi Environment Protection Authority (MEPA) is the principal regulatory body responsible for environmental management and oversight in Malawi. MEPA operates under the Environment Management Act (2017) and is mandated to review and approve environmental and social assessment reports, including ESMPs, and to monitor compliance with environmental regulations. For this project, MEPA will be responsible for reviewing and approving the ESMP, issuing environmental clearance, and conducting periodic monitoring and audits to ensure compliance. The Authority also has enforcement powers to require corrective actions in cases of non-compliance.

2.3.2 Ministry of Agriculture (Department of Irrigation)

The Ministry of Agriculture, through the Department of Irrigation, serves as the lead implementing agency for the Shire Valley Transformation Programme (SVTP). The Ministry is responsible for overall project coordination, technical oversight, and ensuring that the project aligns with national agricultural and irrigation policies. In the context of environmental and social management, the Ministry will ensure that ESMP requirements are integrated into project planning and implementation. It will also coordinate with other institutions to ensure compliance with regulatory and safeguards requirements.

2.3.3 Chikwawa District Council

The Chikwawa District Council is the local authority responsible for governance and development coordination within the project area. The Council plays a critical role in land use planning, environmental management, and service delivery at the district level. The Council will facilitate local-level coordination of project activities, support stakeholder engagement, and ensure that the project is aligned with district development priorities. It will also participate in monitoring environmental and social performance and addressing community concerns.

2.3.4 Ministry Responsible for Lands

The Ministry responsible for Lands is responsible for land administration, including land allocation, registration, and management. It also oversees land acquisition processes and ensures compliance with land-related legislation. For this project, the Ministry will play a key role in addressing land tenure issues, facilitating land acquisition where necessary, and ensuring that affected persons are compensated in accordance with applicable laws.

2.3.5 Ministry Responsible for Water Development

The Ministry responsible for Water Development is responsible for the management and regulation of water resources in Malawi. This includes issuance of water abstraction permits and monitoring of water use. Given the project's reliance on water from the Shire River, the Ministry will ensure that water abstraction is conducted in accordance with legal requirements and does not adversely affect other users or ecological systems.

2.3.6 Ministry of Labour

The Ministry of Labour is responsible for regulating labour practices and ensuring compliance with labour laws, including occupational health and safety standards. The Ministry will oversee compliance with labour regulations during project implementation, particularly during the construction phase, to ensure that workers' rights are protected and that safe working conditions are maintained.

2.3.7 Contractor

The Contractor will be responsible for the day-to-day implementation of construction activities and for ensuring compliance with environmental and social management requirements as specified in the ESMP and contract documents. This includes implementation of mitigation measures, management of waste, control of pollution, and adherence to occupational health and safety standards. The Contractor will also be required to prepare site-specific management plans and report regularly on environmental and social performance.

2.3.8 Supervising Engineer

The Supervising Engineer will be responsible for overseeing the Contractor's activities and ensuring that construction works are carried out in accordance with technical specifications and ESMP requirements. The Supervising Engineer will verify compliance with environmental and social measures, conduct site inspections, and provide guidance on corrective actions where necessary. The Engineer plays a critical role in bridging project implementation and safeguards compliance.

2.3.9 Mwana-Alirenji Cooperative

The Mwana-Alirenji Cooperative will be responsible for the management and operation of the irrigation scheme during the operational phase. This includes irrigation management, agricultural production, maintenance of infrastructure, and coordination of cooperative members. The Cooperative will also be responsible for implementing environmental and social management measures during operation, including sustainable water use, proper management of agrochemicals, and maintenance of sanitation facilities.

2.3.10 Local Communities and Traditional Authorities

Local communities and Traditional Authorities play a key role in project implementation, particularly in relation to land access, stakeholder engagement, and conflict resolution. Their involvement is essential in ensuring community acceptance of the project, facilitating communication between project implementers and local stakeholders, and addressing grievances. Traditional leadership structures will also support land governance and help manage local-level disputes.

2.3.11 Development Partners

Development partners, including the African Development Bank and the World Bank, provide financial and technical support to the project. These institutions also provide oversight to ensure that the project complies with international environmental and social safeguards standards. They may conduct supervision missions, review reports, and provide guidance on safeguards implementation.

2.3.12 Institutional Coordination

Effective implementation of the ESMP requires strong coordination among all institutions involved. This includes clear communication channels, defined roles and responsibilities, and regular monitoring and reporting mechanisms. Coordination will be facilitated through the project implementation structure, with the Ministry of Agriculture providing overall leadership and other institutions contributing according to their mandates. The institutional arrangements will ensure that environmental and social issues are addressed in a timely and effective manner throughout the project lifecycle.

2.4 PERMITS AND APPROVALS

This section outlines the statutory permits and approvals required for the implementation of the proposed irrigation project. Compliance with these requirements is essential to ensure that all project activities are undertaken in accordance with applicable national legislation and regulatory standards, as well as aligned with international safeguards requirements.

The project proponent, through the Ministry of Agriculture and its implementing partners, will be responsible for securing all relevant permits and approvals prior to commencement of specific project activities. Contractors engaged in the project will also be required to comply with permit conditions as part of their contractual obligations and will be monitored to ensure adherence to these requirements. The identification and timely acquisition of permits is critical to ensuring legal compliance, minimizing environmental and social risks, and facilitating smooth project implementation.

2.4.1 Environmental Approval

In accordance with the Environment Management Act (2017), all development projects with potential environmental and social impacts are required to obtain environmental clearance from the Malawi Environment Protection Authority (MEPA). For this project, an Environmental and Social Management Plan (ESMP) has been prepared in line with MEPA requirements. Approval of the ESMP by MEPA will constitute environmental clearance for the project. Compliance with any conditions attached to this approval will be mandatory throughout the project lifecycle, including construction and operation phases.

2.4.2 Water Abstraction Permit

The project involves abstraction of water from the Shire River for irrigation purposes. In accordance with the Water Resources Act (2013), a water abstraction permit must be obtained from the relevant authority prior to commencement of water use.

The permit will define allowable abstraction volumes, abstraction points, and conditions for water use, including requirements for monitoring and reporting. Compliance with these conditions is essential to ensure sustainable use of water resources and to avoid adverse impacts on downstream users and aquatic ecosystems.

2.4.3 Land Use and Land Acquisition Approvals

Where land is required for infrastructure development, including irrigation facilities, access roads, and borrow areas, approvals will be obtained in accordance with the Land Act (2016), the Customary Land Act (2016), and the Lands Acquisition and Compensation Act (2017).

These approvals will be facilitated through the Ministry responsible for Lands in collaboration with local authorities and Traditional Leaders. The process will ensure that land acquisition is conducted in a transparent and equitable manner, and that any affected persons are compensated in accordance with applicable legal provisions and safeguards requirements.

2.4.4 Construction Permits and Contractor Compliance

All construction activities will be undertaken in compliance with national construction regulations. Contractors engaged in the project will be required to be registered with the Construction Industry Regulatory Authority (CIRA) and to obtain any necessary construction-related permits prior to commencement of works. Construction activities will be subject to inspection and supervision to ensure compliance with technical specifications, environmental standards, and occupational health and safety requirements. Contractors will also be required to prepare and implement site-specific environmental and social management plans consistent with the ESMP.

2.4.5 Waste Management and Disposal Approvals

The project will generate various types of waste, including solid waste, liquid waste, and potentially hazardous materials. Disposal of such waste will be carried out in accordance with applicable environmental regulations and local authority requirements. Approvals for waste disposal will be obtained from relevant authorities, including the District Council, and waste will be disposed of at designated and approved sites. Hazardous materials, including fuels, oils, and lubricants, will be managed in accordance with established guidelines to prevent contamination of soil and water resources.

2.4.6 Occupational Health and Safety Compliance

Compliance with occupational health and safety regulations is mandatory under the Occupational Safety, Health and Welfare Act (1997). While a specific permit may not always be required, adherence to safety standards is a legal obligation. The Contractor will be required to prepare and implement site-specific health and safety plans, including risk assessments, emergency response procedures, and provision of personal protective equipment (PPE). Compliance will be monitored by the Ministry of Labour and other relevant authorities.

2.4.7 Local Authority Approvals

The Chikwawa District Council, as the local authority, will provide approvals related to land use, waste management, and local development compliance. The Council will also play a role in monitoring project activities and ensuring alignment with district development plans and local regulatory requirements.

2.4.8 Summary of Required Permits

Table 3.4 provides a summary of the key permits and approvals required for the project, the responsible authorities, and their legal basis.

Figure 4: Summary of Permits and Approvals

Permit / Approval	Responsible Authority	Legal Basis	Applicability to Project
Environmental Approval (ESMP)	MEPA	Environment Management Act (2017)	Required prior to project implementation
Water Abstraction Permit	Water Resources Authority	Water Resources Act (2013)	Required for irrigation water use
Land Acquisition Approval	Ministry of Lands	Land Act (2016), Lands Acquisition Act (2017)	Required for infrastructure development
Construction Permit	CIRA / Local Authorities	National Construction Industry Act	Required for construction works
Waste Disposal Approval	District Council	Public Health Act / Environmental Regulations	Required for waste management
Occupational Health & Safety Compliance	Ministry of Labour	Occupational Safety Act	Required during construction and operation

2.4.9 Compliance and Monitoring

Compliance with permit conditions will be monitored throughout the project lifecycle by relevant authorities, including MEPA, the Ministry of Agriculture, and the Chikwawa District Council. The Contractor and Project Implementing Agency will be required to maintain records and submit periodic reports demonstrating compliance with permit conditions.

All relevant permits and approvals will be obtained prior to commencement of the respective project activities, and compliance with permit conditions will be integrated into contractual obligations and ESMP implementation procedures.

The enforcement of regulatory requirements will be supported by periodic inspections, reporting obligations, and corrective action mechanisms to ensure continuous compliance throughout the project lifecycle. Failure to comply with permit conditions may result in enforcement actions, including suspension of activities, penalties, or revocation of permits.

2.5 INTERNATIONAL SAFEGUARDS FRAMEWORK

The proposed project is financed by development partners, including the World Bank. As such, it is required to comply with the World Bank's Environmental and Social Framework (ESF), implemented through a set of Environmental and Social Standards (ESSs). The ESMP has been prepared to reflect the requirements of the ESF, particularly ESS1 (Assessment and Management), ESS2 (Labour and Working Conditions), ESS3 (Resource Efficiency), ESS4 (Community Health and Safety), ESS5 (Land Acquisition), and ESS10 (Stakeholder Engagement)

2.5.1 African Development Bank Operational Safeguards: Relevance and Gap Analysis

In addition to compliance with national legislation and World Bank requirements, this project is required to meet the environmental and social safeguards of the African Development Bank (AfDB) as a financing partner. The AfDB's Integrated Safeguards System comprises five Operational Safeguards (OS) that address environmental and social risks. This section describes the relevance of each OS to the proposed irrigation scheme, compares applicable AfDB requirements with corresponding national legislation, identifies any gaps, and provides recommendations for alignment.

Hierarchy of Standards

In the implementation of this ESMP, where a requirement of the AfDB Operational Safeguards differs from or is more stringent than the corresponding requirement of Malawian national legislation or World Bank standards, the AfDB standard shall prevail. Conversely, where national legislation or World Bank standards impose a stricter requirement, the more stringent provision shall apply. This approach ensures the highest practicable level of environmental and social protection.

2.5.2 Operational Safeguard 1 (OS1): Environmental and Social Assessment

Relevance: OS1 requires that projects undergo environmental and social assessment proportionate to the level of risk. This ESMP fulfills that requirement. OS1 also requires consideration of cumulative impacts, transboundary effects, and climate change.

Comparison with National Legislation: Malawi's Environment Management Act (2017) and EIA Guidelines (1997) require ESIA or ESMP based on project category. The national system does not explicitly require cumulative impact assessment or climate risk assessment as standard components, though these are recognized in the National Climate Change Management Policy.

Gap Identified: The national ESMP format does not mandate separate analysis of cumulative impacts or climate vulnerability. These are, however, included in this ESMP (see Chapter 5).

Recommendation: The ESMP already addresses cumulative impacts (Section 5.1.1) and climate resilience (Section 2.6 and 4.2). This shall be explicitly referenced in ESMP implementation records as evidence of OS1 compliance.

2.5.3 Operational Safeguard 2 (OS2): Involuntary Resettlement

Relevance: OS2 applies to any project causing physical or economic displacement, including restrictions on land use. The project involves customary land with potential localized land acquisition for infrastructure.

Comparison with National Legislation: Malawi's Lands Acquisition and Compensation Act (2017) provides for compulsory acquisition and compensation. However, the national Act does not fully align with OS2 requirements for: (i) restoration of livelihoods to pre-project levels (not just compensation for assets), (ii) vulnerable group-specific measures, or (iii) community participation in resettlement planning.

Gap Identified: The national compensation framework focuses on asset valuation rather than livelihood restoration. OS2 requires that displaced persons be at least as well off after displacement.

Recommendation: The project shall prepare a Resettlement Policy Framework or Abbreviated Resettlement Action Plan consistent with OS2, even where displacement is localized. This shall include livelihood restoration measures, vulnerability screening, and a grievance mechanism specific to land and compensation issues. The GRM described in Chapter 6 shall be explicitly accessible for land-related grievances.

2.5.4 Operational Safeguard 3 (OS3): Biodiversity and Ecosystem Services

Relevance: OS3 applies to projects affecting natural habitats. The project involves vegetation clearance and alteration of water bodies.

Comparison with National Legislation: Malawi's National Environmental Policy and Forestry Act protect certain species and require environmental assessments. The National Biodiversity Strategy and Action Plan provides guidance. However, national legislation does not explicitly require the application of the mitigation hierarchy (avoid → minimize → restore → offset) in the sequential manner required under OS3.

Gap Identified: The mitigation hierarchy is applied in this ESMP but is not a statutory requirement under national law. Additionally, OS3 prohibits projects that would result in significant conversion or degradation of critical natural habitats.

Recommendation: The ESMP shall explicitly document application of the mitigation hierarchy for all biodiversity impacts. The reforestation programme (1,300,000 trees) shall be designed as a biodiversity offset only after avoidance and minimization have been demonstrated. The 200-meter river buffer zone shall be maintained and enforced as a no-go area for cultivation.

2.5.5 Operational Safeguard 4 (OS4): Pollution Prevention and Control, Hazardous Materials, and Resource Efficiency

Relevance: OS4 applies to all project-related pollution risks, including agrochemical use, waste management, and emissions.

Comparison with National Legislation: Malawi has environmental regulations on waste management, chemicals, and hazardous substances. The Pesticides Act regulates agrochemical use. However, national regulations do not explicitly require the preparation of Integrated Pest Management (IPM) plans, hazardous waste management plans, or the application of best available techniques for pollution prevention.

Gap Identified: While mitigation measures are proposed in Table 6.1, OS4 requires documented site-specific pollution prevention plans.

Recommendation: The Contractor shall prepare and submit for approval a Hazardous Materials Management Plan and an IPM Plan prior to construction, consistent with OS4 requirements. These shall address storage, handling, application, disposal, and emergency response for all agrochemicals and hazardous substances.

2.5.6 Operational Safeguard 5 (OS5): Labour and Working Conditions

Relevance: OS5 applies to all project workers, including direct employees, contracted labour, and supply chain workers.

Comparison with National Legislation: Malawi's Employment Act (2000) and Occupational Safety, Health and Welfare Act (1997) cover basic labour standards. However, OS5 includes specific requirements that go beyond national law, including: (i) a formal Code of Conduct addressing GBV/SEA, (ii) grievance mechanisms for workers, (iii) occupational health services, (iv) non-discrimination provisions explicitly covering vulnerable workers, and (v) prohibition of forced labour with specific monitoring requirements.

Gap Identified: National labour law does not mandate a stand-alone Code of Conduct with GBV/SEA provisions, nor does it require worker-specific grievance mechanisms separate from the general GRM.

Recommendation: The project shall prepare and implement a Labor Management Procedures (LMP) document consistent with OS5. This shall include a worker-specific GRM, a Code of Conduct with enforceable sanctions for GBV/SEA, provisions for occupational

health services, and measures to prevent child and forced labour. The LMP shall be submitted to the PMT and made available to all workers in local languages.

2.5.7 Additional Safeguards – Stakeholder Engagement (OS4 and OS10 cross-cutting)

Relevance: AfDB requires ongoing, documented, and inclusive stakeholder engagement throughout the project lifecycle.

Comparison with National Legislation: Malawi's Environment Management Act requires public consultation during ESIA/ESMP preparation but does not mandate continuous engagement or a stand-alone Stakeholder Engagement Plan (SEP).

Gap Identified: No documented commitment to a SEP covering the full project lifecycle.

Recommendation: A stand-alone Stakeholder Engagement Plan shall be prepared, describing consultation methods, frequency, documentation procedures, and feedback mechanisms. The GRM shall be integrated into the SEP. Both documents shall be disclosed publicly prior to construction.

Table 3: Summary of Gaps and Alignment Measures

AfDB OS	National Law	Gap Identified	Alignment Measure
OS1 (Assessment)	EMA 2017	Cumulative impacts not mandated	Addressed in Chapter 5; reference in ESMP implementation records
OS2 (Resettlement)	Lands Acquisition Act 2017	Livelihood restoration, vulnerable groups	Prepare Resettlement Policy Framework or ARAP with livelihood restoration
OS3 (Biodiversity)	Environmental Policy, Forestry Act	Mitigation hierarchy not sequential	Explicitly document hierarchy in ESMP implementation
OS4 (Pollution)	Pesticides Act, Waste Regulations	Site-specific plans (IPM, hazardous waste)	Prepare IPM Plan and Hazardous Materials Plan
OS5 (Labour)	Employment Act, OSH Act	Code of Conduct, worker GRM, GBV/SEA provisions	Prepare Labor Management Procedures with CoC and worker GRM
Stakeholder Engagement	EMA 2017 (consultation only)	Continuous engagement, stand-alone SEP	Prepare Stakeholder Engagement Plan and disclose

2.6 APPLICATION OF MORE STRINGENT STANDARD

Where this analysis identifies a requirement under AfDB OS that is not explicitly provided for under national legislation, the project shall apply the AfDB standard. This applies specifically to livelihood restoration under OS2, the sequential mitigation hierarchy under OS3, site-specific pollution prevention plans under OS4, and the Labor Management Procedures with GBV/SEA provisions under OS5. Compliance with both national law and AfDB OS shall be verified through the monitoring framework established in Table 6.2 of this ESMP.

3 ANALYSIS OF ALTERNATIVES CONSIDERED

The analysis of alternatives is a critical component of the ESIA as it evaluates different options for the development of Mwanaalirenji Irrigation Block. The analysis entailed identifying alternative forms of development and considering the environmental and social implications of these alternatives to demonstrate that the proposed scheme is environmentally preferable. The process involved consultation with community and various stakeholders where different suggestions and solutions were proposed for construction of safety and water control structures. This section examines three key alternatives: a) The No Action Alternative; b) Pressurised Irrigation Method System; c) Surface Furrow Irrigation Method; Each option is assessed in terms of environmental and social implications, technical feasibility, financial considerations, and long-term sustainability.

3.1 NO ACTION ALTERNATIVE

The project aims to enhance the economy of the project area and Malawi at large. Specifically, the project will create jobs, improve the livelihoods of small-holder farmers, increasing agricultural productivity, and enhancing the competitiveness of local produce. In contrast, the no-project alternative implies that the project will not proceed, maintaining the status quo of agricultural production in the targeted communities.

Under the no-project scenario, the site would remain unchanged, with no activities related to the development of the irrigation scheme implemented. Consequently, there would be limited economic growth for both commercial and small-holder farmers in the project area. This option could significantly setback efforts to increase agricultural production and productivity, and economic growth in the country.

3.2 SURFACE IRRIGATION ALTERNATIVE

Surface Irrigation Option Under surface irrigation option, the irrigation network for Mwanaalirenji has been grouped into four zones based on offtake points on the secondary pipeline to be provided by SVTP. Main pipelines from the secondary pipeline will feed a network of secondary pipelines which will deliver the water to the tertiary pipelines planned in various irrigation blocks or zones. The tertiary pipelines serve the blocks which are a subdivision of the zones. The water is supplied to the fields through hydrants spaced at 50m on the secondary and/or tertiary pipelines. The hydrants will feed infield canals supplying water to furrows through syphon tubes.

Surface systems have low upfront costs but waste water through evaporation and runoff.

3.3 PRESSUREIZED SYSTEM ALTERNATIVE.

Pressurized Irrigation Option Two system configurations were considered for pressurized irrigation. Generally, center pivot was considered as a suitable option. However, this system leaves outfall area based on the geometry of center pivots which forms circles and leaves some area unirrigated. The consultant considered having either semi-solid sprinkler irrigation or drip irrigation in the outfall area. The designed pressurised option covers a net area of 793ha which is about 93.8% of the total area targeted for Mwanaalirenji block

Pressurized irrigation methods offer the following key advantages:

- **High Water Efficiency:** Delivering water directly to the root zone (drip) or via fine sprays (sprinklers) minimizes losses from evaporation and deep percolation. This can lead to 28% to 56% water savings compared to traditional flood irrigation.
- **Uniform Water Application:** Unlike gravity-fed systems, piped water maintains consistent pressure. This ensures every plant receives the exact same amount of water, avoiding under-watered dry spots and waterlogged roots.
- **Enhanced Crop Yields:** Targeted moisture and nutrient management significantly reduce plant stress. Studies show that using these systems can boost crop production by 12% to 31%.
- **Labor and Energy Savings:** While initial setup requires labour and equipment, automated pressurized systems reduce the daily manual effort needed to move pipes or dig ditches.
- **Precision Fertilizer Application (Fertigation):** Water-soluble fertilizers can be injected directly into the irrigation lines. This delivers nutrients straight to the root zone, maximizing absorption and minimizing chemical waste.
- **Terrain Adaptability:** Unlike gravity-fed surface irrigation, which requires perfectly levelled land, pressurized systems can easily irrigate hilly, undulating, or rocky terrains without causing soil erosion.

Table 4: Technological Alternative & Rationale

Technological Alternative	Description	Reasons for Rejection / Selection
Option 1: Construct open canals and surface irrigation methods	Construction of main, secondary, tertiary and if necessary, infield channels for water distribution into ditches/furrows/basins	Rejected because of high labour costs, low water application efficiency as well as low water distribution uniformity. Applied water likely to be lost through evaporation, runoff and deep percolation (in case of sandy soils).
Option 2: Install centre pivots pressurized systems	Install a network of main, distribution lines, as well as centre pivots complete with all electromechanical components and associated works.	Selected because of high water efficiency, High water distribution uniformity, enhanced crop yields, manual labour and energy savings, precision fertilizer application (fertigation), and terrain adaptability.

4 DESIGN MEASURES

The center pivot design option, which involves the construction and installation of center pivots, sprinklers and associated infrastructure in Mwanaalirenji block was selected. This design was selected as the preferred option because it has the following advantages over other systems: water use efficient, enhanced crop yields, mitigates the effects of soil erosion, and it is fast and easy to install. The design is firmly grounded in the application of the mitigation hierarchy.

Firstly, the design seeks to minimize the water losses through evaporation and ensures increases water use efficiency by utilizing controlled application rates that mimic rainfall. Water delivered to the block and applied to the field is used by the crops efficiently. This design reduces water loss through deep percolation as the system utilizes a closed conveyance system.

The center pivot system design adapts well to varying, uneven topographies, farmers do not have to unnaturally flatten or deforest their land to accommodate water flow. This design will reduce the construction period which will enable the members to start utilizing the scheme faster than other designs reducing the access disturbance period.

Where impacts for example of soil degradation and waterlogging cannot be fully mitigated, the design allows supplies of adequate water depending on crop needs. It does not allow overwatering that washes fertilizers, pesticides, and topsoil into local streams and groundwater aquifers. The controlled application used in the design keep water locked in the soil profile, minimizing toxic agricultural runoff. The design also allows the farmer to prevent water logging and high salinity levels that can destroy the arable land. The project provides for the restoration of affected areas once construction is completed. Road access disturbances and food crop production will be address through site rehabilitation, reinstatement of access routes and provision of food land parcels within the block.

In summary, the design option represents the most sustainable design measure, as it avoids unnecessary impacts, minimizes unavoidable disturbances, and restores affected areas thereby aligning with international best practices.

5 PROJECT DESCRIPTION

This chapter provides a comprehensive description of the proposed land use, project components, infrastructure, and implementation processes. It presents the technical characteristics of the irrigation scheme and outlines the key activities to be undertaken during the planning, construction, operation, and decommissioning phases. The description highlights elements of the project that may have environmental and social implications, thereby forming the basis for impact identification and the development of mitigation and management measures in subsequent chapters of this Environmental and Social Management Plan (ESMP).

The project forms part of the broader Shire Valley Transformation Programme (SVTP), and its design has taken into account cumulative impacts associated with multiple irrigation schemes within the Shire Valley.

5.1 LAND USE PLANS

Land use planning for the Mbenderana/Chikhambi Irrigation Block was undertaken under the SVTP framework to ensure optimal utilization of available land while supporting the economic objectives of the Cooperative. The land use plan reflects a balance between commercial agricultural production, environmental considerations, and infrastructure development. The irrigation block has a Gross Land Area (GLA) of approximately 844.9 hectares, of which about 793 hectares (93.9%) will be developed for commercial irrigation. The remaining land is allocated to essential infrastructure, environmental buffers, and support facilities such as drainage systems, access roads, and service areas.

Figures 5 to 7 present the spatial layout of the project area, including its geographical location and the proposed land use configuration.

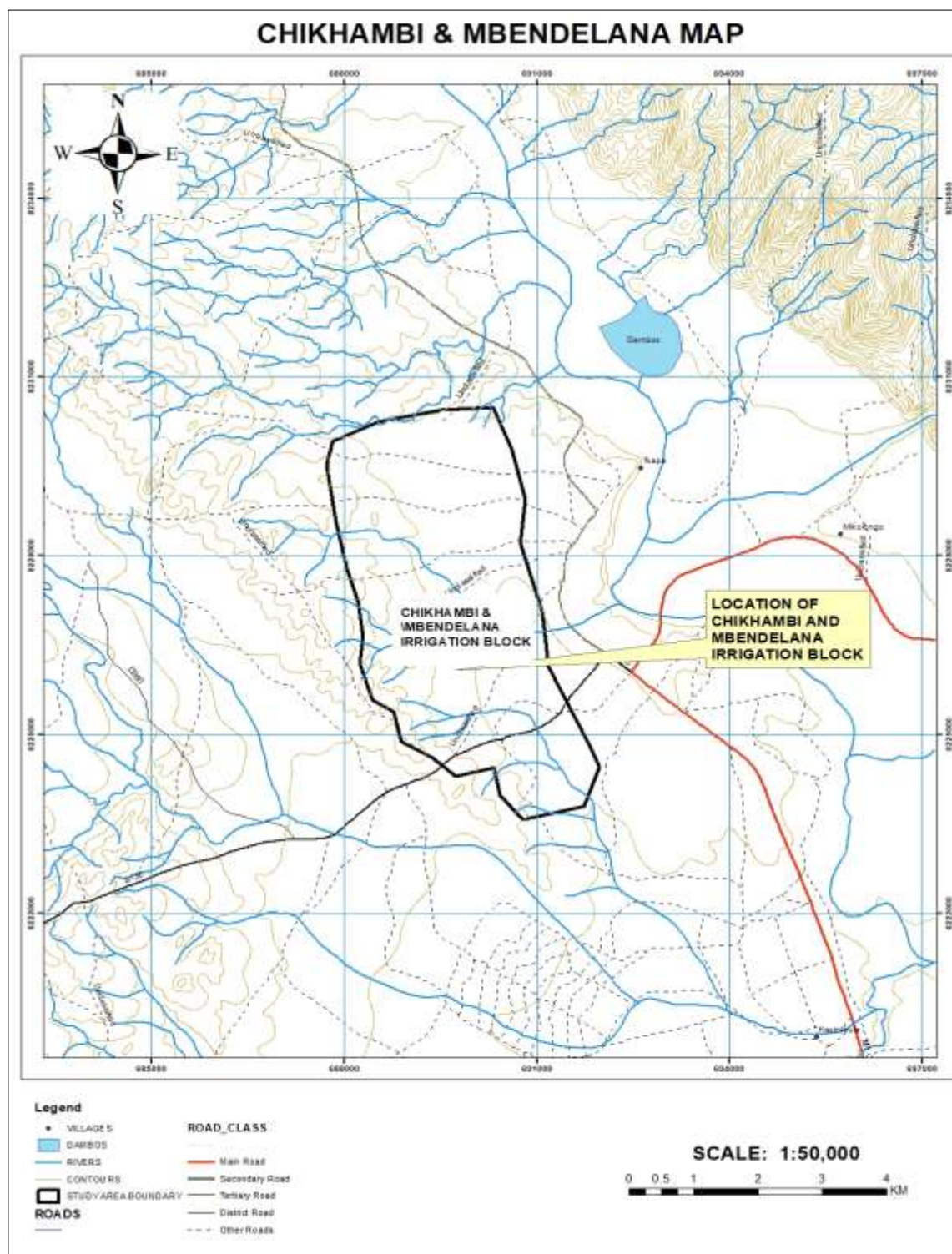


Figure 5: Location of Mbenderana/Chikhambi Irrigation Block

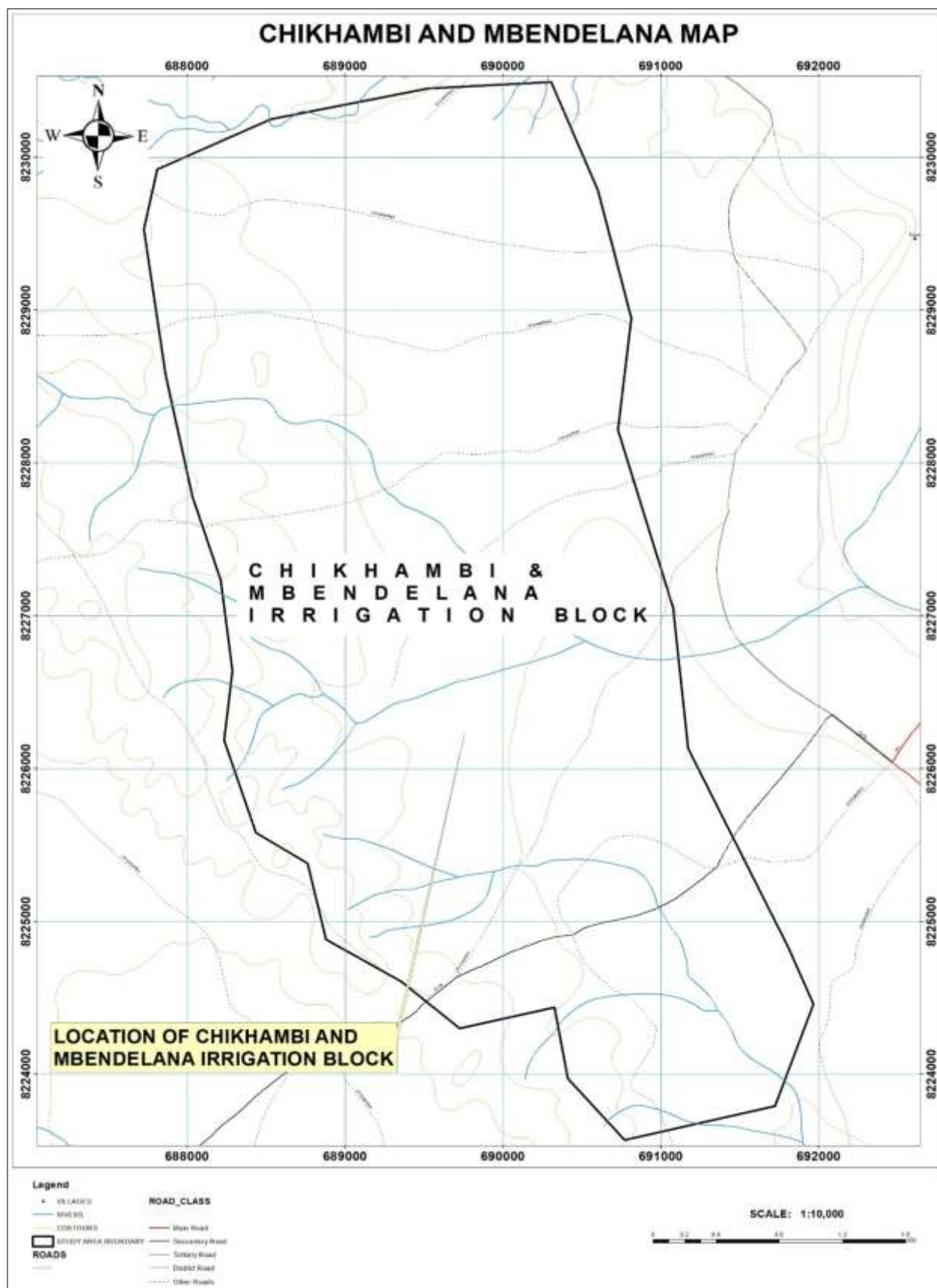


Figure 6: Location of Mbenderana/Chikhambi Irrigation Block

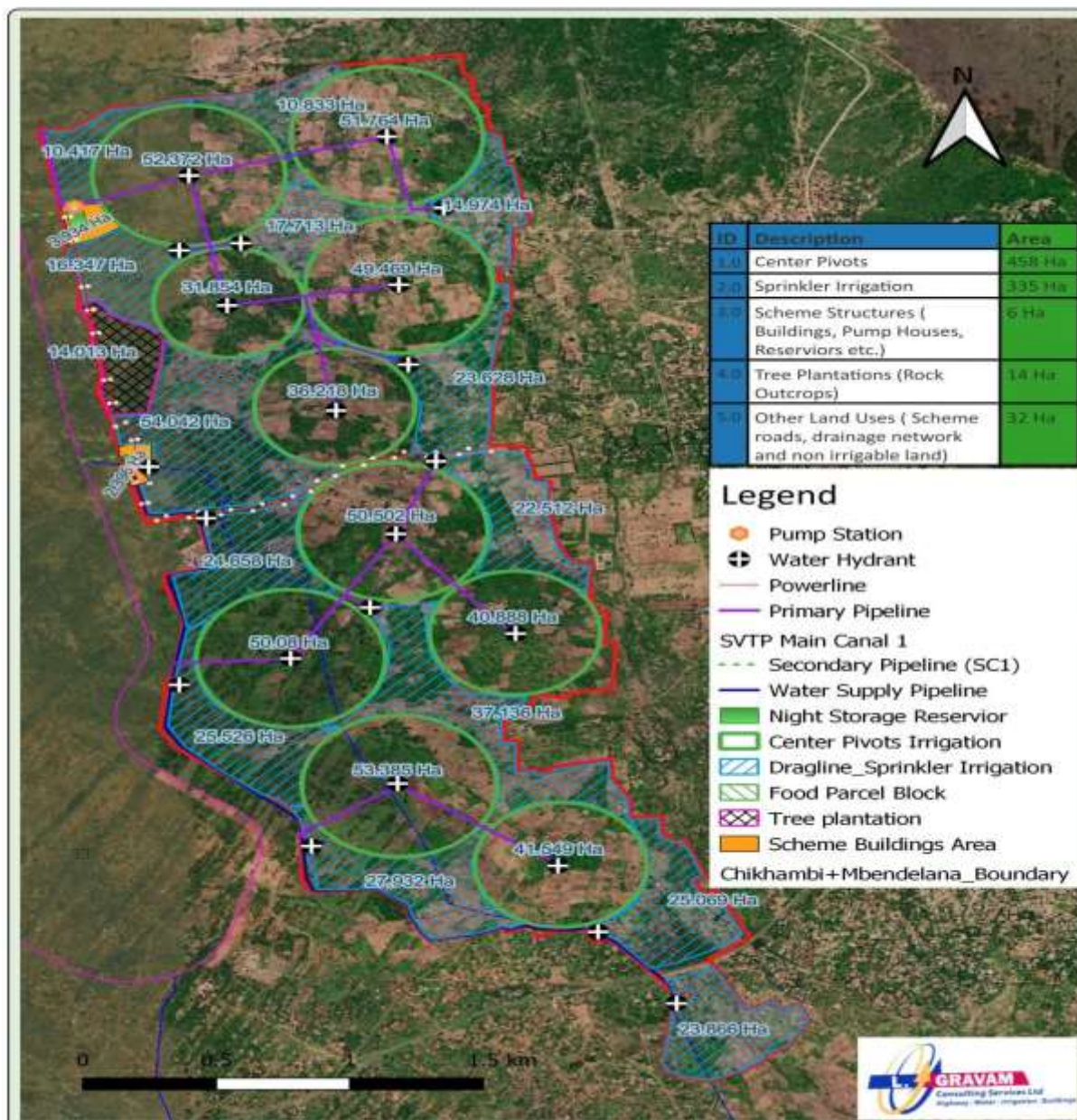


Figure 7: Land Use Map Under Pressurized Irrigation Systems

From Figure 8, land has been allocated to the enterprises as follows:

- Commercial production under different methods of irrigation;
- Food crop production;
- Farmstead for offices and warehouses;
- Trees – allocation around the entire block and open spaces in between blocks; and
- Drainage system – the scheme has natural water ways, some of which would be

made into drains for the blocks.

The irrigation block has the Gross Land Area (GLA) of 844.9 hectares of which 793 ha will be under commercial irrigation representing 93.9 per cent of GLA. Center Pivot Irrigation method has been allocated 458 ha. Sprinkler Irrigation method has been allocated 335 ha. Scheme Buildings has been allocated 6 ha. Tree planting has been allocated 14 ha. Livestock has been allocated 22 ha. Aquaculture has been allocated 5 ha and scheme roads has been allocated 5 ha.

Land clearing, levelling, and preparation operations will be required to prepare the site for irrigated crop production and to achieve this the consultant conducted land cover analysis for Mbenderana/Chikhambi block in order to discover the extent of area required for site or bush clearing as shown in Figure 8 below. The land use configuration has important environmental and social implications, particularly in relation to vegetation clearance, water resource utilization, biodiversity conservation, and potential land-use conflicts. The project area largely comprises modified agricultural landscapes; however, vegetation clearance and land transformation may still result in localized impacts on biodiversity, which are addressed in this ESMP.

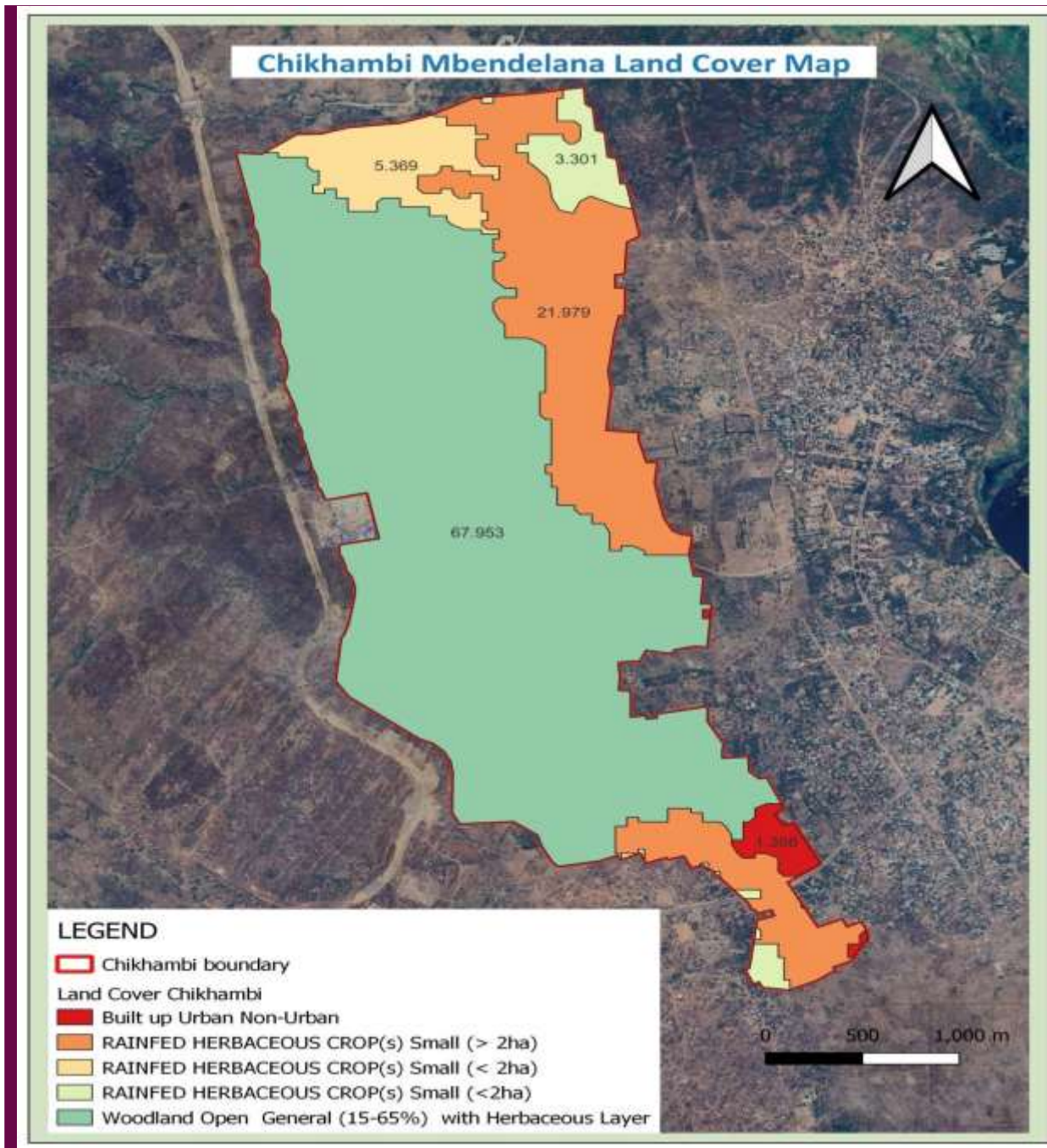


Figure 8: Land Cover Analysis

Based on land cover analysis 6.8 percent of the area covered by open woodland require heavy site clearing.

5.2 MAIN ACTIVITIES OF THE PROJECT

The proposed project will be implemented through four main phases, namely planning and design, construction, operation and maintenance, and decommissioning. Each phase is associated with distinct activities and corresponding environmental and social risks that require appropriate management. The phased approach ensures that environmental and social considerations are integrated throughout the entire project lifecycle.

5.3 PLANNING AND DESIGN PHASE

The planning and design phase involves detailed technical and environmental preparation of the project. Key activities include soil investigations, topographic surveys, and refinement of engineering designs to ensure suitability of the irrigation system to local conditions.

During this phase, baseline environmental and social data are collected through field surveys and stakeholder consultations. This information is critical in identifying potential impacts and informing the design of mitigation measures. The preparation of the ESMP itself is a key output of this phase.

5.4 CONSTRUCTION PHASE

The construction phase involves the physical development of the irrigation scheme and associated infrastructure. This phase is expected to generate the most significant environmental and social impacts due to the scale of activities and the use of heavy machinery.

Activities during this phase include land clearing, excavation, earthworks, installation of irrigation infrastructure, and development of access roads. These activities may result in vegetation removal, soil disturbance, increased levels of noise and dust, waste generation, and occupational health and safety risks.

The construction phase may also result in temporary labour influx, which has the potential to create social risks, including pressure on local resources and increased risk of gender-based violence (GBV). These risks are addressed through mitigation measures outlined in this ESMP.

Land preparation will involve clearing and grubbing of vegetation, followed by levelling and shaping of land to suit irrigation requirements. These activities will be undertaken using heavy machinery such as excavators and graders by contractors registered with the Construction Industry Regulatory Authority (CIRA) of Malawi.

Vegetation clearing will be undertaken in a controlled manner to minimize environmental impacts, and measures will be implemented to preserve valuable vegetation where feasible.

Earthworks will include ripping and levelling of land to facilitate efficient water distribution. Topsoil will be conserved and reused where possible to support land rehabilitation and maintain soil fertility. Measures will also be implemented to prevent soil erosion.

Approximately 15 km of internal access roads will be rehabilitated or constructed to support project implementation and operation.

5.5 SYSTEM SELECTION

The selection of the irrigation system was based on a comprehensive evaluation of technical, economic, and environmental factors, including topography, soil characteristics, water availability, crop requirements, energy use, and cost efficiency.

Pressurized irrigation systems were selected due to their higher water use efficiency, suitability for commercial agriculture, and long-term sustainability. This approach minimizes water losses and supports efficient resource utilization.

5.6 IRRIGATION SYSTEM DESIGN

The irrigation system design has been developed based on internationally recognized standards and best practices. It includes conveyance and distribution systems, hydraulic structures, and storage facilities necessary for reliable irrigation water supply.

The design incorporates climate resilience considerations by ensuring efficient water use, minimizing losses, and accommodating variability in water availability associated with climate change.

Detailed engineering designs and calculations are provided in the design documentation and are summarized here for purposes of environmental and social assessment.

5.7 IRRIGATION METHOD OPTIONS AND SELECTION

Different irrigation methods were evaluated, including surface irrigation, sprinkler systems, drip irrigation, and hybrid systems. While surface irrigation systems were technically feasible, they were found to be less efficient in terms of water use and more prone to losses through seepage and evaporation.

Pressurized irrigation systems, particularly center pivot and sprinkler systems, were selected due to their efficiency, suitability for the terrain, and ability to support commercial agricultural production. These systems also provide better control over water application, thereby reducing risks of waterlogging and soil degradation.

The selection of pressurized irrigation systems also reflects considerations related to operational capacity and management under a cooperative model. Compared to drip

systems, which require higher levels of maintenance and technical expertise, sprinkler-based systems provide a balance between efficiency and ease of operation. This is particularly important in ensuring long-term sustainability and minimizing system failure risks.

5.8 DRAINAGE SYSTEM DESIGN

The drainage system has been designed to manage excess irrigation water and runoff effectively while preserving natural drainage patterns.

Consideration has been given to integrating natural drainage channels with engineered systems to ensure efficient removal of excess water while minimizing environmental disturbance.

Poorly managed drainage systems can result in waterlogging, soil salinization, and downstream sedimentation. The design of the drainage system therefore incorporates measures to ensure adequate flow capacity and minimize adverse environmental impacts, particularly during periods of heavy rainfall.

The drainage system also contributes to climate resilience by reducing the risk of flooding and maintaining soil productivity.

5.9 COST ESTIMATES

Cost estimates have been developed to provide an indication of the financial requirements for project implementation. These estimates include costs associated with irrigation infrastructure, machinery, and operational requirements.

These cost estimates provide a basis for understanding the scale of investment and are complemented by environmental and social management costs presented in Chapter 6.

5.10 MACHINERY AND EQUIPMENT

The project will utilize various machinery and equipment during construction and operation, including excavators, graders, loaders, and tractors. These machines will be operated by trained personnel in accordance with safety and environmental standards.

The operation of heavy machinery presents potential environmental and social risks, including noise, dust emissions, fuel spills, and safety hazards. These risks will be managed through adherence to occupational health and safety standards and implementation of appropriate environmental controls.

5.11 RAW MATERIALS

The project will utilize raw materials including water, aggregates, steel, pipes, concrete, and fuels. Efficient use of these materials will be promoted to minimize waste and environmental impacts.

The sourcing and use of construction materials will be managed to avoid depletion of local resources and minimize environmental degradation. Where possible, materials will be sourced from approved suppliers in compliance with national regulations.

The use of fuels, oils, and lubricants presents potential environmental risks, including soil and water contamination, which will be managed through appropriate handling, storage, and disposal measures.

5.12 DEMOBILIZATION

Following construction, temporary facilities will be removed, and disturbed areas rehabilitated. This process will include site clean-up, removal of waste materials, and restoration of land to stable conditions.

Proper demobilization is critical to prevent long-term environmental degradation and ensure that temporary impacts do not become permanent. Rehabilitation measures will include re-vegetation and stabilization of disturbed areas.

5.13 OPERATION AND MAINTENANCE PHASE

During operation, the irrigation scheme will be managed by the Cooperative. Activities will include irrigation management, crop production, maintenance of infrastructure, and application of agricultural inputs.

The operation phase presents ongoing environmental and social risks, including water use efficiency, agrochemical management, and infrastructure maintenance. These require continuous monitoring and management to ensure sustainability.

The operation of the scheme will be undertaken under the oversight of the Cooperative, with support from relevant government institutions, ensuring compliance with environmental and social management requirements.

5.14 DECOMMISSIONING PHASE

Although decommissioning of the irrigation scheme is not anticipated in the foreseeable future, provisions are made for the eventual closure or rehabilitation of project infrastructure in accordance with applicable regulatory requirements and good international practice.

Planning for decommissioning is important to ensure that long-term environmental and social risks are minimized and that the site can be safely restored or repurposed.

Decommissioning activities may include the dismantling and removal of irrigation infrastructure such as pipelines, pumping systems, storage facilities, and associated structures. It may also involve rehabilitation of disturbed land, restoration of natural drainage patterns, and stabilization of soils to prevent erosion and land degradation.

Environmental considerations during decommissioning will include the management of waste materials, including scrap metal, concrete debris, and any hazardous substances such as oils and lubricants. These materials will be handled, transported, and disposed of in accordance with national environmental regulations to prevent contamination of soil and water resources.

Social considerations will include potential impacts on employment and livelihoods associated with the cessation of project activities. Where applicable, appropriate measures will be implemented to support affected workers and communities, including transition planning and livelihood restoration options.

A detailed Project Decommissioning Plan (PDP) will be prepared prior to closure of the project and submitted to relevant authorities for approval. This plan will outline specific decommissioning activities, environmental and social management measures, roles and responsibilities, timelines, and monitoring requirements to ensure that decommissioning is carried out in a safe and environmentally sound manner.

5.15 WASTE GENERATION AND MANAGEMENT

The project will generate various types of waste during both the construction and operation phases, including solid waste, liquid waste, and hazardous materials. These waste streams will arise from construction activities, operation of machinery, agricultural production processes, and associated support services.

During the construction phase, waste is expected to include excavated soil, vegetation debris from land clearing, packaging materials, scrap metal, concrete residues, and domestic waste generated by workers. Liquid waste may include wastewater from construction camps and equipment cleaning activities. Hazardous waste may include used oils, lubricants, fuel residues, and contaminated materials.

During the operation phase, waste generation will primarily be associated with agricultural activities and facility maintenance. This may include organic agricultural waste, used agrochemical containers, irrigation system residues, maintenance-related waste, and domestic waste from workers and farm operations. Improper handling of agrochemical containers and residues, in particular, poses a risk of environmental contamination.

Improper management of these waste streams may result in soil and water contamination, air pollution, and risks to human health and safety. There is also potential for indirect impacts on surrounding communities if waste is not properly controlled.

To address these risks, the project will implement a comprehensive waste management approach based on the principles of waste minimization, reuse, recycling, and safe disposal. Waste will be segregated at source into different categories, including biodegradable, recyclable, and hazardous waste. Appropriate storage facilities will be provided to prevent leakage, contamination, and exposure.

Waste collection, transportation, and disposal will be undertaken in accordance with national environmental regulations and local authority requirements. Hazardous waste, including used oils and agrochemical containers, will be handled with particular care and disposed of through approved channels to prevent environmental and health risks.

The detailed procedures for waste management, including roles, responsibilities, and monitoring requirements, are outlined in the ESMP to ensure effective implementation and compliance throughout the project lifecycle.

5.16 LAND TENURE SYSTEM

The project will be implemented on customary land under the authority of traditional leadership structures, in accordance with Malawi's land administration system. Customary land in the project area is managed by Traditional Authorities and Group Village Headmen, and is primarily used for smallholder agricultural production and settlement.

Land tenure considerations are critical to ensuring equitable access to land resources, minimizing potential conflicts, and safeguarding the rights and livelihoods of affected communities. Under the Shire Valley Transformation Programme (SVTP), land within the irrigation scheme is consolidated under cooperative arrangements, whereby individual landholdings are pooled for collective agricultural production while maintaining recognized user rights.

Although the project is largely being implemented within an already designated irrigation block, there may be localized land requirements for infrastructure such as canals, access roads, and Night Storage Reservoirs. Any land acquisition, restriction of access, or loss of assets arising from such developments will be managed in accordance with applicable national legislation and international safeguards requirements.

This includes the provision of fair and adequate compensation, livelihood restoration where necessary, and transparent consultation processes with affected persons. Special attention will be given to vulnerable groups, including women, youth, and the elderly, to ensure that they are not disproportionately affected.

The project will also implement a grievance redress mechanism (GRM) to address any land-related concerns or disputes that may arise during project implementation. This will ensure that issues are resolved in a timely, transparent, and culturally appropriate manner.

Overall, land tenure arrangements under the project are designed to support secure land use, promote inclusive participation, and minimize social risks associated with land access and use.

5.17 WATER AND ENERGY REQUIREMENTS

Water for the irrigation scheme will be abstracted from the Shire River at designated abstraction points under the SVTP framework. Abstraction will be undertaken in accordance with approved water rights and permits, taking into account environmental flow requirements and downstream water users.

Efficient water and energy use is critical to the sustainability of the irrigation scheme. Measures will be implemented to minimize water losses and optimize energy consumption, thereby reducing operational costs and environmental impacts.

Energy requirements will be met through grid electricity, supplemented by backup systems where necessary.

5.18 SANITATION

Sanitation facilities will be provided to ensure proper waste management and protection of public health during both construction and operation phases of the project. During the construction phase, temporary sanitation facilities such as mobile toilets and pit latrines will be installed at work sites to serve construction workers. These facilities will be maintained in a hygienic condition to prevent environmental contamination and the spread of communicable diseases.

During the operation phase, appropriate sanitation infrastructure will be established within the irrigation scheme, including facilities at farmsteads, offices, and other operational areas. Wastewater generated from these facilities will be managed through suitable systems such as septic tanks or other approved technologies to prevent pollution of soil and water resources.

Poor sanitation can lead to contamination of surface and groundwater as well as pose health risks to workers and surrounding communities. As such, sanitation management will be implemented in accordance with national public health regulations and good international practice, with monitoring measures outlined in the ESMP.

5.19 EMPLOYMENT OPPORTUNITIES

The project is expected to generate both direct and indirect employment opportunities for local communities during construction and operation phases. These opportunities will contribute to improved household incomes and overall socio-economic development within the project area.

During the construction phase, labour demand will increase for both skilled and unskilled workers, with priority given to local communities in line with project commitments. Employment during the operation phase will focus on irrigation management, agricultural production, maintenance of infrastructure, and administrative functions within the Cooperative.

Employment opportunities will be implemented in a manner that promotes inclusivity, with particular attention to women, youth, and vulnerable groups, in line with national policies and international safeguards requirements. The project will also promote fair labour practices, including safe working conditions, non-discrimination, and equal opportunity.

While employment creation presents positive socio-economic benefits, it may also introduce potential social risks, including labour influx and pressure on local services. These aspects will be managed through the implementation of labour management procedures and other mitigation measures outlined in the ESMP.

5.20 AGRICULTURAL ENTERPRISES

The Cooperative will undertake crop production based on market demand, agro-climatic suitability, and economic viability, with a focus on transitioning from subsistence farming to commercial agriculture. Planned agricultural enterprises are expected to include a mix of staple crops, cash crops, and high-value horticultural crops to ensure both food security and income generation.

The adoption of irrigation-based agriculture will enable multiple cropping seasons and improved productivity, thereby enhancing resilience to climate variability. Agricultural practices will be supported by modern irrigation technologies, improved seed varieties, and access to extension services.

However, intensified agricultural production may also introduce environmental and social risks, including increased use of agrochemicals, water demand, and potential soil degradation. These risks will be managed through the promotion of sustainable agricultural practices, including integrated pest management, efficient water use, and soil conservation measures.

The development of agricultural enterprises under the Cooperative model is expected to strengthen value chains, improve market access, and enhance livelihoods, while ensuring

that environmental and social considerations are adequately addressed through the ESMP. Figure 9 below depicts proposed road network in the Chikhambi / Mbenderana block.

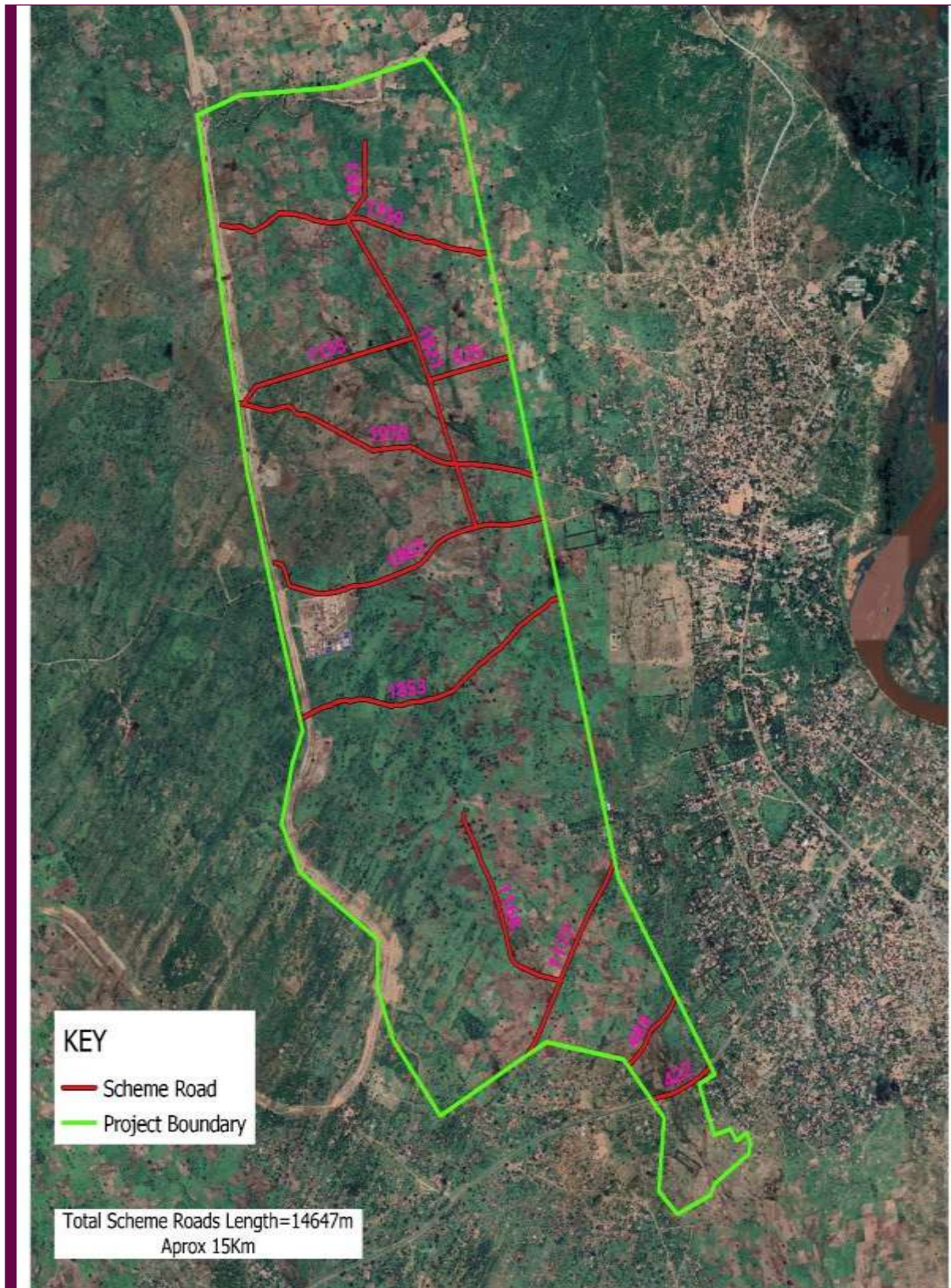


Figure 9: Block Road Network

6 ENVIRONMENTAL SETTING OF THE PROJECT AREA

6.1 VEGETATION

Vegetation within the project area is characterized by a mosaic of modified woodland, grassland, and shrubland systems, reflecting long-term human use of the landscape for agriculture and settlement. Field observations indicate that the area is predominantly dominated by Mfula, alongside a range of indigenous tree species including Mfungo (*Albizia harveyi*), Neen (*Dalbergia melanoxylon*), Njalu (*Diplorhynchus* spp.), Nsalu (*Pterocarpus lucens*), and Malambe (*Adansonia digitata*), as grasses, herbs, and scattered shrubs. The presence of these species indicates a degraded but ecologically functional vegetation system, where natural vegetation has been progressively reduced and fragmented due to agricultural expansion and resource use. Although none of the identified species are listed among protected tree species in Malawi, they continue to provide important ecological functions, including stabilization, microclimate regulation, and habitat for local fauna.

The current project design has intentionally avoided areas with significant tree cover, thereby minimizing the need for large-scale tree removal. As a result, direct impacts on mature trees are expected to be limited. However, construction activities will involve the clearing of grasses, herbs, and shrubs within the project footprint, which may result in localized habitat disturbance and temporary loss of vegetation cover.

The most significant vegetation-related impact is expected at the site of the proposed Night Storage Reservoir (NSR), where removal of trees and shrubs will be required. While this impact is spatially limited, it represents a permanent change in land cover and may contribute to localized habitat loss.

In addition, certain areas within the project's zone of influence have been identified as unsuitable for crop production due to factors such as poor equality and location within river buffer zones. These areas present an opportunity for ecological restoration. The proposed reforestation programme, involving the planting of approximately 1,300,000 trees, is therefore a critical mitigation and enhancement measure. This intervention has the potential to offset vegetation loss, improve ecological connectivity, enhance carbon sequestration, and strengthen resilience to climate variability.

From an analytical perspective, the vegetation baseline indicates that while the project is not located within a highly sensitive or protected ecological area, there are still important ecosystem services and localized habitats that require careful management. The balance between vegetation clearance for infrastructure development and restoration through reforestation will be a key determinant of the project's overall environment performance.



Figure 5: A picture depicting a baobab (*Adansonia digitata*) in the Mbenderana/Chikhambi (Mwana Alirenji) block



Figure 6: A picture depicting the Mbenderana/Chikhambi vegetative cover



Figure 7: A picture depicting the Mbenderana/Chikhambi vegetative cover

6.2 FAUNA

The project area supports a range of fauna typical of modified rural landscapes, although the abundance and diversity of large wildlife species are relatively limited. Field observations indicate the occasional presence of species such as Gwape (antelope), Nkhanga (guineafowl), and Njiwa (wild doves). These species are not permanently resident in large numbers but utilize the area intermittently, reflecting the fragmented and human-influenced nature of the habitat.

In addition to these larger species, the project area supports a variety of bird, insect, and reptile species, which, although not systematically studied, play important ecological roles, including pollination, pest control, and nutrient cycling. The presence of these species indicates that, despite land use pressures, the area retains a level of ecological functionality.

The area is also known to host a variety of snake species, which has implications for human safety, particularly during construction and operation phases when disturbance of habitats may increase human–wildlife encounters.

From an impact perspective, construction activities will primarily affect fauna through vegetation clearing and habitat disturbance, particularly for smaller species dependent on grasses, shrubs, and ground cover. While impacts on large wildlife are expected to be minimal due to their low presence, localized impacts on smaller fauna may occur.

Overall, the fauna baseline suggests a modified but functioning ecosystem, where biodiversity value is moderate but still relevant. Project impacts are expected to be localized and manageable, but specific attention will be required to address habitat disturbance and human–wildlife interaction risks.

6.3 WATER RESOURCES

Chikwawa District is characterized by a complex hydrological system with both dendritic and parallel drainage patterns, reflecting variations in topography and soil conditions. The Shire River is the dominant watercourse and serves as the primary outlet for numerous tributaries within the district, including rivers such as Mwanza, Phwadzi, Mkombedzi, Nyamikalango, Chidyamanga, Nyakamba, and Lalanje.

Within the Mbenderana/Chikhambi Irrigation Block, the Manyumwa River forms part of the boundary and ultimately feeds into the Shire River. The Nsenjere River runs through the Mbenderana block and connects to the Mwana Alirenji River, which traverses the Chikhambi block. These interconnected river systems form an important part of the local hydrological network and influence both water availability and flood dynamics within the project area. Water availability in these systems is highly seasonal, with increased flows during the rainy season and significantly reduced flows during the dry season. This seasonal variability has direct implications for irrigation reliability, water abstraction, and ecosystem functioning.

The project design includes a 200-meter buffer zone between irrigation activities and river systems, which is an important mitigation measure aimed at protecting riverbanks, maintaining ecological integrity, and reducing risks of sedimentation and pollution.

From an analytical perspective, the dependence of the irrigation scheme on surface water systems introduces both opportunities and risks. While the proximity to multiple river systems enhances water availability, it also increases exposure to flooding and places importance on careful water management. In addition, irrigation activities may influence water quality through runoff containing sediments and agrochemicals, with potential downstream implications. These conditions highlight the need for integrated water resource management, ensuring that water abstraction, infrastructure design, and land use practices are aligned with maintaining hydrological balance and protecting downstream users.

6.4 TOPOGRAPHY

Chikwawa District is located within the Lower Shire Valley and forms part of the Great East African Rift Valley, with an average elevation of approximately 112 meters above sea level. The terrain is generally flat to gently undulating, although variations exist across the district, including marshlands along the Shire River, moderate highlands to the west, and the Thyolo Escarpment to the east.

The Mbenderana/Chikhambi Irrigation Block is situated to the west of Chikwawa Boma and is bordered by the Shire River to the north and west (Figure 13). The predominantly flat terrain of the project area is favourable for irrigation development, as it facilitates efficient water distribution and reduces the need for complex engineering interventions.

However, this same topography places the area within a floodplain environment, increasing susceptibility to flooding, particularly during periods of high river flow. The presence of marshy areas further indicates poor drainage conditions in certain locations, which may contribute to waterlogging under irrigation. From a project perspective, the topographic characteristics present both advantages and constraints. While the flat terrain supports irrigation infrastructure development, it also requires careful design of drainage systems to manage excess water and prevent negative impacts on crops and soils. These conditions highlight the importance of integrating flood risk management and drainage planning into project design to ensure long-term sustainability and resilience.

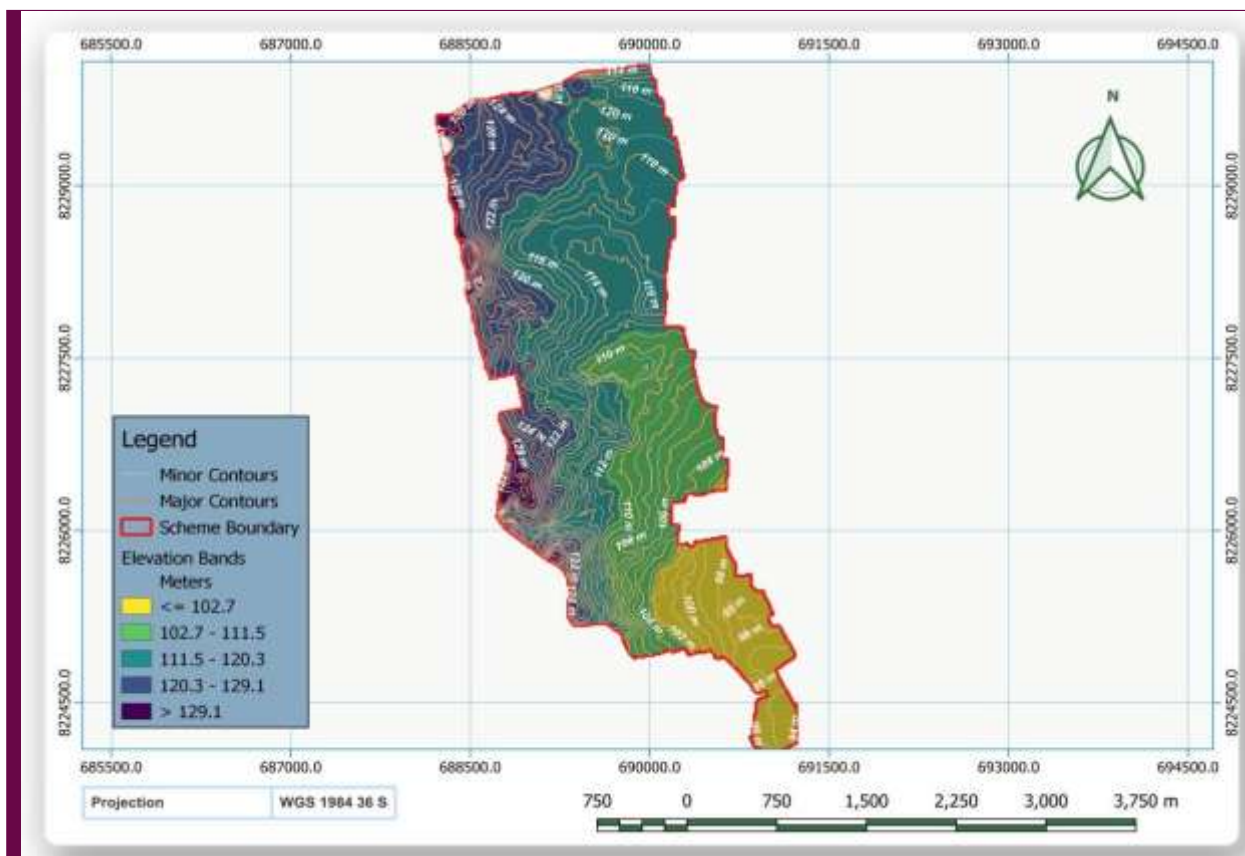


Figure 8: Topographic Map for Mbenderana/Chikhambi Irrigation Block

6.5 SOILS

A wide variety of soils exist in Chikwawa District that vary from area to area according to different types of sediments and rocks. Sandy loam soils dominate among the groups with 48 percent, with clay loam soils as the least at 2.2 percent. Major soil types are shown in Figure 14 below.

This diversity of soil types reflects the complex geological and depositional history of the Lower Shire Valley and has important implications for land use and irrigation management within the project area.

The soils range from deep, medium to fine textured, brown to very dark-grey in colour. Drainage varies from good to very poor. In the uplands and hills, the soils are predominantly moderately deep, medium textured, well-drained and yellowish brown. Alkaline and slightly saline soils occur at the edge of swamps; otherwise soils have a slightly acidic to neutral reaction. Chikwawa has more than ten groups of soils out of a total of thirteen soil groups

in Malawi, indicating a great variety of soils in the district. Agriculturally, this means several types of crops can be grown in Chikwawa.

From an irrigation perspective, this variability in soil texture and drainage capacity is a critical determinant of water distribution efficiency, crop suitability, and long-term soil performance. Areas with good drainage are likely to respond well to irrigation, while poorly drained and swamp-edge soils are more susceptible to waterlogging and salinity build-up under sustained irrigation.

The soil survey that was conducted indicated that the Mbenderana/Chikhambi Irrigation Block has a high percentage of sand, silt, and clay solids respectively. Figure 7.5 below indicates a summary of the soil texture within the irrigation block.

The presence of a balanced composition of sand, silt, and clay suggests generally favourable conditions for crop production, as such soils typically support adequate water retention while allowing sufficient drainage. However, local variations in composition may result in differential responses to irrigation across the scheme.

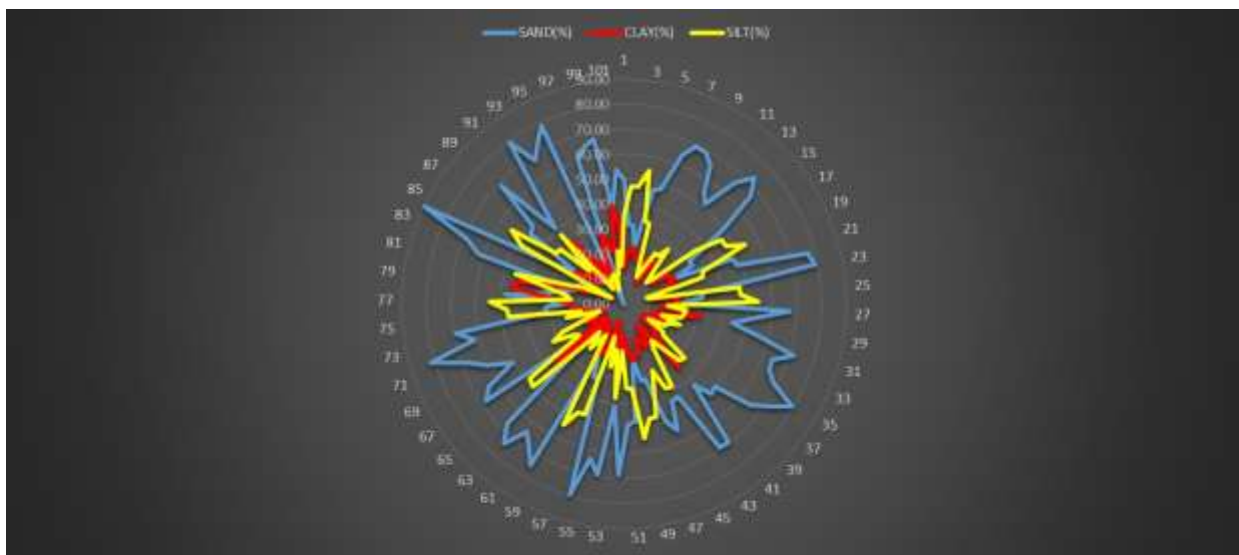


Figure 9: Summary of soil texture analysis for Mbenderana/Chikhambi Irrigation Block

Figure 15 shows chemical analysis results of soils from soil pits. Overall, the results indicate that soil pH for the Mbenderana/Chikhambi Irrigation Block is good, ranging from 6.03 to 6.88. This implies that the soil is neither too acidic nor alkaline and is, therefore, favourable for all the selected crop enterprises and will require minimal treatment. Further, the results also show that the soil contains all of the major elements of soil nutrients required for crops. These chemical characteristics indicate that the soils are inherently suitable for irrigated agriculture and are unlikely to require significant initial soil amendments. However, under continuous irrigation, there is a risk of gradual changes in soil chemistry, including nutrient depletion or salinity accumulation, particularly in areas with poor drainage.

In addition, the flat topography and proximity to river systems, as described in Sections 6.4 and 6.5 may increase the likelihood of waterlogging in certain areas, especially during periods of high rainfall or excessive irrigation. This highlights the importance of incorporating effective drainage systems and soil management practices into the project design.

Overall, the soil conditions within the Mbenderana/Chikhambi Irrigation Block present a strong opportunity for improved agricultural productivity under irrigation. However, the long-term sustainability of these benefits will depend on appropriate management of soil-water interactions, including irrigation scheduling, drainage, and monitoring of soil quality.

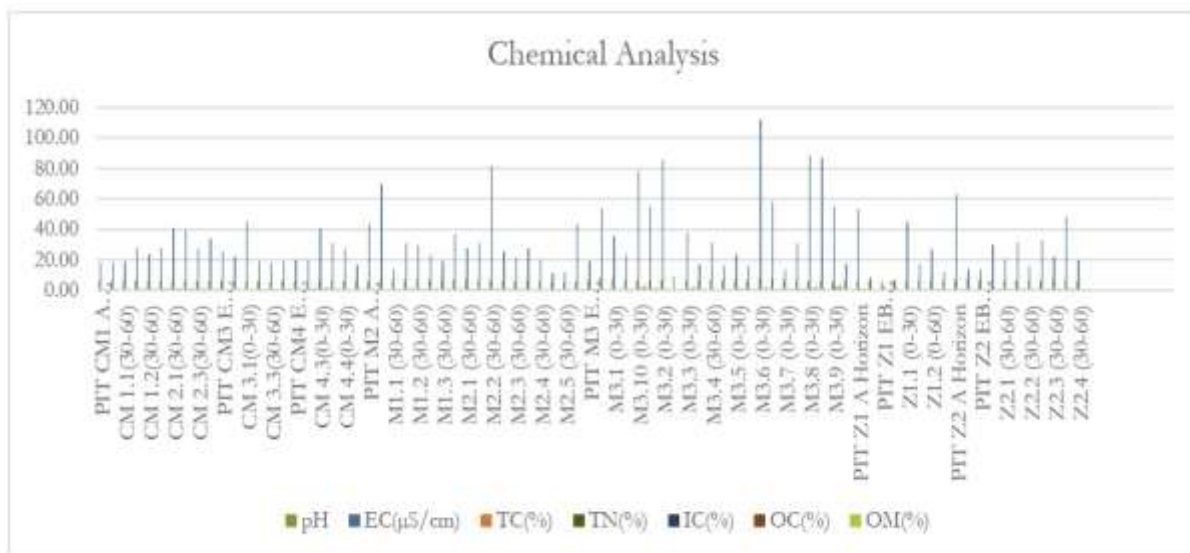


Figure 10: Chemical Analysis Results for Selected Elements

6.6 CLIMATE AND PRESENT RAINFALL

The SDSP used climatic data from Ngabu Meteorological Station in Chikwawa for the other climatic parameters for estimating crop water requirements, upon consultations with the Department of Climate Change and Meteorological Services including engineers from the project. Ngabu Meteorological Station was recommended as representative of climatic conditions for Mbenderana/Chikhambi area. The selection of Ngabu Meteorological Station provides a reliable and locally representative dataset for assessing climatic conditions within the project area, ensuring that irrigation design and water requirement estimations are based on site-relevant parameters.

6.6.1 Climate

Being in the Lower Shire and having an altitude ranging between 70 and 100 m, the climate is characterised by high temperature during most months of the year. Rainfall is limited to the months of December to April and the long-term mean (LTM) average is about 800 mm per annum. Rainfall is unreliable and often erratic. This pattern of concentrated and erratic rainfall creates significant uncertainty for rain-fed agriculture, making crop production highly vulnerable to intra-seasonal dry spells and delayed onset of rains. Due to the high temperature, evaporation and evapotranspiration are also high (approximately 2000 mm and 1780 mm per annum respectively). The high evapotranspiration rates indicate substantial water loss from both soil and crops, resulting in a persistent moisture deficit throughout much of the year. The climatic parameters which were obtained included minimum and maximum temperatures, sunshine hours, relative humidity, wind speed and rainfall as shown in Table 5. This data informed further analysis of the current designs. These parameters are critical in determining crop water requirements and irrigation scheduling, and directly influence the sizing and operational requirements of the irrigation system.

Table 5: Mean Climatic Data for Ngabu Meteorological Station

Month	Tmin (°C) [1996- 2015]	Tmax (°C) [1996- 2015]	Sunshine (hrs.) [1996- 2015]	Wind Speed (km/day) [1949-2015]	Relative Humidity (%) [1996- 2015]	Rainfall (mm) [1949- 2015]
Jan	23.25	32.98	7.7	143.3	75	6.74
Feb	22.61	32.28	7.6	125.9	77	5.05
Mar	23.02	32.75	7.6	134.7	77	3.49
Apr	20.71	31.72	8	155.7	76	1.33
May	17.65	30.22	8.2	151.9	72	0.43
Jun	16.10	28.42	7.8	164.3	72	0.46
Jul	15.52	28.18	7.6	178.9	67	0.49
Aug	17.12	30.60	9	204.3	59	0.23
Sep	19.79	34.04	9.2	230.7	54	0.11
Oct	22.36	35.77	9	255.0	52	0.52
Nov	24.08	36.12	8.9	240.0	56	2.01
Dec	23.99	34.66	7.3	176.2	71	5.15

Source: Department of Climate Change and Meteorological Services

Overall, the climatic conditions of the project area can be characterized as semi-arid, with high temperatures and limited, unreliable rainfall. This combination of factors results in a structural dependence on irrigation for sustainable agricultural production.

6.6.2 Rainfall and Evapotranspiration

In the field of agriculture, the notion of effective rainfall is important as it subtracts from the amount of rainfall, the amount of water that is unusable for crop (for plant intake) due to rapid evaporation, deep percolation or rapid runoff to surface water. In the study area, effective rainfall is, on a yearly average, 48% lower than total rainfall, which means that only 52% of rainfall is effective rain. This indicates that more than half of the rainfall does not contribute to crop water uptake, significantly reducing the reliability of rain-fed agriculture. Evapotranspiration is the process by which water is transferred from the land to the atmosphere by evaporation from soil and transpiration by plants, and therefore represents water losses. In the study area, the balance between rainfall (intake) and evapotranspiration (offtake) only shows a surplus of water between February and April. In the dry season, soil moisture drops to zero. Surplus of water only occurs when the soil is saturated after the first heavy rains. This water balance clearly demonstrates that the project area experiences a prolonged moisture deficit for most of the year, with only a short period of surplus conditions. As a result, crops cannot rely on rainfall alone to meet their water requirements. Overall, the region is semi-arid, meaning that the study area generally suffers from a soil moisture deficit. This persistent deficit is the primary justification for the development of irrigation infrastructure within the Mbenderana/Chikhambi Irrigation Block, as it enables the stabilization of crop production and reduces vulnerability to climatic variability.

Figure 16 and Figure 17 below show the main figures related to rainfall and evapotranspiration. Data was obtained from the Shire Valley ADD in 2021.

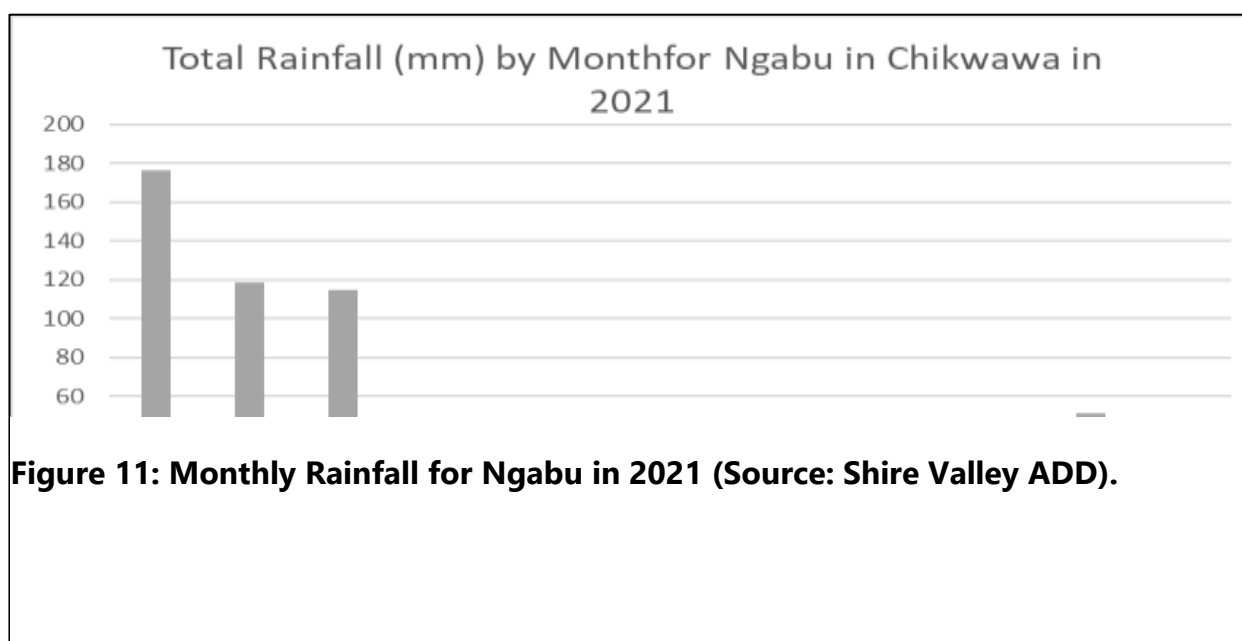


Figure 11: Monthly Rainfall for Ngabu in 2021 (Source: Shire Valley ADD).

On the other hand, temperature recorded at the station is as depicted in the figure below:

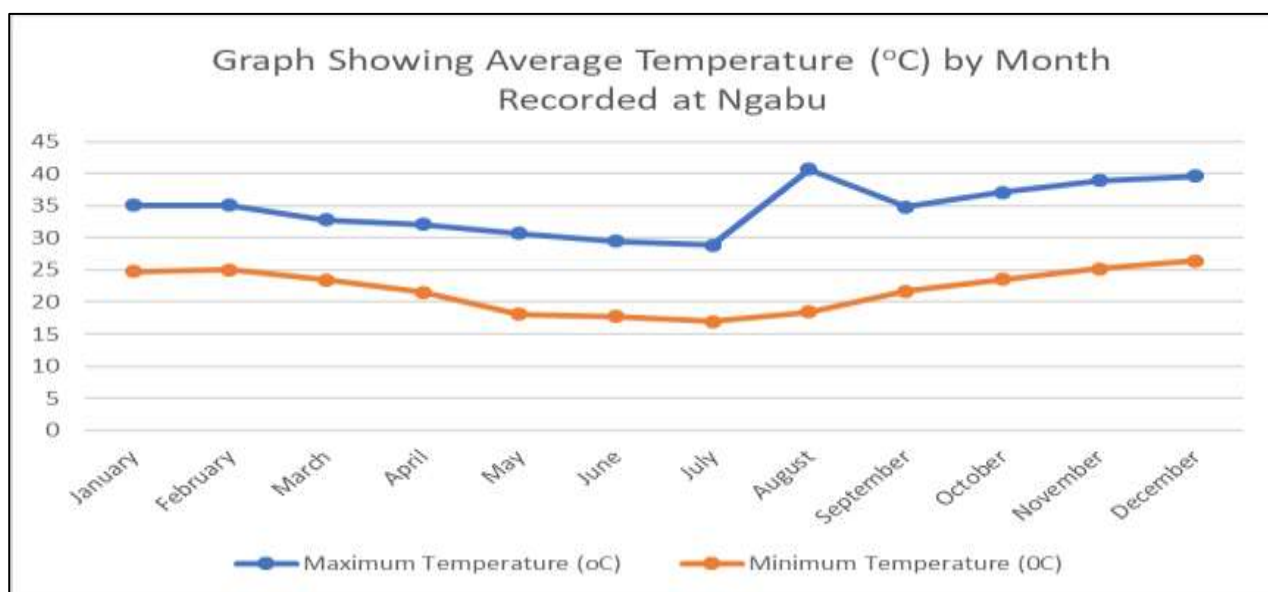


Figure 12: Monthly Rainfall for Ngabu in 2021 (Source: Shire Valley ADD).

From an analytical perspective, the combination of low effective rainfall, high evapotranspiration, and seasonal variability confirms that irrigation is not merely a productivity enhancement measure, but a fundamental requirement for viable agricultural production in the project area. However, this dependence also increases pressure on water resources, reinforcing the need for efficient water management and climate-resilient design.

6.7 SOCIO-ECONOMIC ENVIRONMENT

6.7.1 Social Infrastructure around the Scheme

a) Health Facilities

In Mwana Alirenji Cooperative, the main health care service provider is Chikwawa District Hospital (CDH), which is a Government-run hospital. The other nearest healthcare facilities include Mphate and Abwenzi Private Clinics, both located within a reachable distance of approximately 3 km from the scheme. While these facilities provide essential health services, their distance and capacity may limit timely access to care, particularly for vulnerable households and during peak demand periods. HIV and AIDS pandemic in Chikwawa and the proposed project area poses a big threat to the district population and development activities. The disease mostly affects the reproductive middle-aged groups of 15–49 years. The pandemic depletes household capital and labour force, increases orphans and vulnerability, changes behaviours in decision making, and diverts man hours from developmental issues to attending to both the sick and funerals. From a project perspective, the high prevalence of HIV/AIDS represents a critical socio-economic vulnerability, as it

directly affects labour availability and household productivity. In addition, project-related labour influx may increase the risk of disease transmission if not properly managed.

b) Education Facilities

Mwana Alirenji Cooperative has Mthomba Primary School, Matchomba Primary School and Mthomba Secondary School located in West bank in its locality.

While the presence of these institutions supports access to basic education, challenges such as long walking distances for some households, limited resources, and competing labour demands during peak agricultural seasons may affect school attendance and performance. In particular, children from vulnerable households may be required to support farming activities, which can influence educational outcomes and long-term livelihood opportunities.

c) Domestic Water Supply and Sanitation

There are 6 boreholes in Mwana Alirenji Cooperative. Across the scheme, households go to great efforts making water safe. Through the baseline study, it was learned in the survey that households employ a number of sanitary methods, both traditional and modern in keeping the water free from germs. The methods include: boiling, chlorination/waterguard, filtering and covering the water containers. However, the most common methods employed in both phase areas was covering the container. In phase 1, 42% of the people cover their container while 24% chlorinate their water with water guard and 26% employ other methods. The proportions were virtually similar in Phase 2 (COWI, 2016). Covering water only allows to protect water from dust and insects. While these practices reduce contamination risks, reliance on basic methods such as covering alone is insufficient to ensure water safety, exposing households to waterborne diseases. The SVTP Baseline Study revealed that 74 percent and 70 percent of male and female headed households had toilet facilities in the project impact area. About 76 percent and 71 percent of male and female headed households had toilet facilities in the comparison area. This agrees with the findings from focus group discussions where members expressed that ownership of toilets at household level had improved as compared to the previous years. They explained that the work was facilitated by non-governmental organisations like Goal Malawi and World Vision. As expected, the most common toilet type is the traditional type (a latrine). Although sanitation coverage has improved, the predominance of basic facilities indicates continued exposure to sanitation-related health risks, particularly in densely populated or flood-prone areas.

There is an existing borehole at the scheme offices which has a manual pump. In the past there was a motorized pump which pumped water up to storage tanks which supplied a piped water system to all management houses and offices. This system is no longer functional and requires rehabilitation. Water tests of the borehole showed that the water is suitable for human consumption. The non-functionality of improved water infrastructure

highlights gaps in service reliability and maintenance capacity, which may be further stressed by increased demand associated with project activities.

d) Electricity Supply and Energy Use

Mbenderana area benefits from reliable electricity availability due to the presence of a construction camp for Sino-Hydro working on the SVTP-1 main canal. The road network in the area is generally well-developed, providing good accessibility to the blocks. As regards telecommunication, there are no land lines in the area but the area accesses mobile networks provided by Airtel and Telecom Networks Malawi (TNM). Households in most rural areas use solar lanterns, candles and kerosene lamps for lighting in their households. The connection to the national electricity grid is still low in the project area and the households indicated that electricity is still not affordable. The most common source of energy for cooking is firewood. This reliance on biomass energy contributes to environmental degradation and may have health implications, particularly for women and children exposed to indoor air pollution.

e) Waste Management

6.7.2 Demography of the Project Area of Influence

The project area of influence encompasses the twelve villages whose members constitute the Mwana Alirenji Cooperative: Chikhambi 1, Chikhambi 3, Light, Mwingama, Mpotazingwe, Mbenderana, Ling'awa 1, Ling'awa 2, Ling'awa 3, Ling'awa 4, Ling'awa 5, and Ling'awa 6. These villages fall under Group Village Headman (GVH) Mbenderana and Chikhambi, within Traditional Authority (TA) Kasisi, Chikwawa District. Based on the SVTP Baseline Survey (2020) and Chikwawa District Social Economic Profile (2017-2022), the total population of the project area of influence is estimated at approximately 8,700 people, distributed across approximately 1,600 households. The average household size in the area is 5.4 persons, consistent with the district average of 5.2 to 5.6 persons per household.

The age distribution of the population is characterized by a broad-based pyramid, with children under 15 years constituting approximately 42 percent of the population, the working-age population (15 to 64 years) comprising approximately 54 percent, and persons aged 65 years and above accounting for approximately 4 percent. The dependency ratio (the ratio of dependents aged 0-14 and 65+ to the working-age population) is estimated at 0.85, indicating a relatively high dependency burden on the working-age population.

The gender composition of the adult population is approximately 52 percent female and 48 percent male, reflecting the out-migration of working-age males to urban centers and tea estates in Thyolo and Mulanje districts for seasonal employment. Female-headed households constitute approximately 28 percent of all households in the project area, a proportion higher than the national average of 24 percent, reflecting patterns of male labor migration, widowhood, and marital separation.

The population is predominantly rural, with no significant settlements or urban centers within the irrigation block. Population density in the project area is approximately 110 persons per square kilometer, which is slightly above the Chikwawa district average of 95 persons per square kilometer due to the concentration of settlements along the Shire River floodplain.

This demographic baseline is important for understanding the scale of potential project impacts, targeting of livelihood enhancement measures, and design of inclusive engagement and grievance mechanisms that reach all segments of the population, including female-headed households, youth, and the elderly.

In Chikwawa, about 20% of households dispose their refuse in refuse pits, while the majority use crude dumping and open burning. Incineration is practiced mainly in hospitals. These waste disposal practices have implications for environmental quality and public health, particularly in areas where waste accumulates near settlements or water sources. Open burning contributes to air pollution, while uncontrolled dumping increases the risk of contamination of surface and groundwater. With increased economic activity under the irrigation scheme, waste generation may rise, placing additional pressure on existing systems. HIV and AIDS prevalence in Chikwawa District is among the highest in Malawi, with significant implications for household labour availability, productivity, and vulnerability. Detailed baseline data on HIV/AIDS prevalence, impacts, and project-related risks are provided in Section 4.7.1.

6.7.3 Access to Safe Drinking Water

Access to safe drinking water in the project area is primarily through boreholes equipped with hand pumps, supplemented by untreated surface water from the Shire River and its tributaries during the dry season when other sources are depleted.

According to the SVTP Baseline Survey (2020), approximately 68 percent of households in the project area have access to an improved drinking water source within a walking distance of 500 meters or less. Improved sources include boreholes (62 percent of households), protected dug wells (4 percent), and piped water systems (2 percent). The remaining 32 percent of households rely on unimproved sources, including unprotected wells (18 percent), the Shire River or other surface water bodies (10 percent), and purchased water from vendors (4 percent).

As noted in Section 4.3.1(c), there are six operational boreholes within the Mwana Alirenji Cooperative area. Water quality testing conducted on the borehole at the scheme offices confirmed that the water is suitable for human consumption. However, no systematic water quality testing has been conducted for the remaining five boreholes. The motorized piped water system that previously supplied management houses and offices is non-functional and requires rehabilitation.

Water treatment practices at the household level are inconsistent. The SVTP Baseline Survey (2020) found that only 24 percent of households treat their drinking water through chlorination (Waterguard). A further 42 percent rely on covering water containers, which protects against dust and insects but does not eliminate microbial contamination. The remainder employ boiling (6 percent), filtering (2 percent), or no treatment (26 percent). This indicates that a substantial proportion of the population remains exposed to waterborne diseases including cholera, typhoid, and diarrhea.

The project may place additional demand on existing water sources during construction through worker consumption and domestic use at construction camps. This will be managed through the provision of adequate potable water supplies for workers, as specified in the Drinking Water Management Plan required under the ESMP (Table 6.1), and through agreements with the Cooperative and local authorities regarding shared use of boreholes

6.7.4 HIV/AIDS Prevalence and Context

Chikwawa District has one of the highest HIV prevalence rates in Malawi. According to the Malawi Population-based HIV Impact Assessment (MPHIA, 2020-2021), the adult HIV prevalence (ages 15-49) in Chikwawa District is estimated at 12.4 percent, compared to the national average of 8.9 percent. Among women aged 15-49 in the district, prevalence is 14.2 percent, while among men of the same age group, prevalence is 10.3 percent.

Within the project area of influence, the SVTP Baseline Survey (2020) estimated HIV prevalence among adults at approximately 11.8 percent, slightly below the district average but still substantially above the national average. The survey also found that approximately 68 percent of adults in the project area had ever been tested for HIV and knew their status, compared to the district average of 72 percent.

The high prevalence of HIV/AIDS has significant implications for the project. The disease disproportionately affects the reproductive and economically active age group (15-49 years), which constitutes the primary labour pool for both construction and agricultural activities. HIV/AIDS-related morbidity and mortality reduce household labour availability, increase household expenditure on health care and funerals, deplete household savings and assets, and increase the number of orphans and vulnerable children. In affected households, agricultural productivity is often reduced by 30 to 50 percent, undermining food security and household income.

The project may increase HIV transmission risks through labour influx, temporary worker settlements, and increased disposable income that may be spent on alcohol and commercial sex. Conversely, the project provides an opportunity to strengthen HIV prevention, testing, and treatment referral through workplace programs and community awareness campaigns.

Mitigation measures, as outlined in Table 6.1, include locally recruited labour to reduce influx, awareness campaigns, condom distribution, and partnership with local health services.

The project will also coordinate with the Chikwawa District Health Office and the National AIDS Commission to align workplace interventions with district HIV strategic plans.

6.7.5 Economic Activities and Livelihoods

The economy of the project area is predominantly agricultural, with approximately 92 percent of households deriving their primary livelihood from crop production and livestock rearing. Rain-fed agriculture dominates, with only an estimated 8 percent of households having access to any form of irrigation (primarily small-scale, informal schemes using treadle pumps or river diversion).

Crop Production: The primary food crops grown include maize (grown by 96 percent of households), cassava (68 percent), sorghum (42 percent), and beans (38 percent). Cash crops include cotton (grown by 34 percent of households), sesame (22 percent), tomatoes (18 percent), and groundnuts (15 percent). The average cultivated landholding is 1.2 hectares per household, though landholdings are fragmented, with many households cultivating multiple small plots.

Livestock: Livestock ownership is common but at low levels. The SVTP Baseline Survey (2020) found that 54 percent of households own goats (average 3.2 goats per owning household), 28 percent own chickens (average 8.5 birds), 12 percent own pigs (average 2.1 pigs), and 8 percent own cattle (average 2.8 cattle). Livestock provides both food (meat, milk, eggs) and cash income, as well as manure for soil fertility management.

Off-farm Income: Approximately 38 percent of households engage in off-farm income-generating activities. These include small-scale trading (selling vegetables, fish, charcoal, or firewood), casual labor on neighboring estates or other farms, piecework (ganyu) in the construction or transport sectors, and artisanal fishing. Remittances from household members employed in urban centers or in South Africa are an important income source for an estimated 22 percent of households.

Formal Employment: Formal sector employment is limited. An estimated 12 percent of households have at least one member employed in formal wage employment, primarily as teachers, health workers, agricultural extension staff, or in the district council. The SVTP itself has generated some employment during the construction of the main canal, but this has been temporary.

Market Access: The main market centers serving the project area are Chikwawa Boma (approximately 12 kilometers east), Ngabu (approximately 25 kilometers south), and smaller periodic markets (weekly or bi-weekly) at Mthomba and Matchomba. Market access is constrained by poor road conditions during the rainy season, limited market information, and the absence of formal storage facilities, forcing farmers to sell immediately after harvest at low prices.

The introduction of year-round irrigation under the proposed scheme is expected to fundamentally transform the local economy by enabling multiple cropping cycles, diversifying crop production, increasing yields, stabilizing incomes, and creating employment along agricultural value chains. The SOCFE model is specifically designed to facilitate this transition from subsistence to commercial agriculture.

6.7.6 Poverty Rate, Household Income and Expenditure

Poverty Rate: Chikwawa District ranks among the poorest districts in Malawi. According to the Malawi National Statistical Office's Fifth Integrated Household Survey (IHS5, 2019-2020), the district poverty rate (proportion of population living below the national poverty line) is 68 percent, compared to the national average of 51 percent. The ultra-poverty rate (proportion living below the food poverty line) in Chikwawa is 32 percent, compared to the national average of 21 percent.

Within the project area of influence, the SVTP Baseline Survey (2020) estimated a poverty rate of approximately 72 percent and an ultra-poverty rate of 36 percent, both slightly higher than the district average, reflecting the area's dependence on rain-fed agriculture, limited irrigation access, and poor market integration.

Household Income: The average annual household income in the project area (Table 6) is estimated at MWK 420,000 (approximately USD 245 at 2020 exchange rates). Income distribution is highly unequal, with the wealthiest quintile of households earning an estimated 48 percent of total income, while the poorest quintile earns only 8 percent.

Table 6: Sources of household income are as follows, based on the SVTP Baseline Survey (2020)

Income Source	Percentage of Total Household Income
Crop sales (rain-fed)	52%
Livestock sales	12%
Off-farm casual labor	14%
Remittances	10%
Small-scale trading	6%
Formal employment	4%
Other (fishing, charcoal, etc.)	2%

The seasonality of rain-fed agriculture results in highly variable monthly incomes. Household income peaks between April and June (post-harvest) and reaches its lowest point between November and January (the lean season), when food stocks are depleted and agricultural labor demand is low. This seasonality contributes to cyclical food insecurity and household vulnerability.

Household Expenditure: The average monthly household expenditure (Table 7) in the project area is estimated at MWK 38,000. The expenditure breakdown is as follows:

Table 7: Average Monthly Household Expenditure

Expenditure Category	Percentage of Total Monthly Expenditure
Food	62%
Education	12%
Health	8%
Housing and utilities (including energy)	7%
Transport	5%
Clothing and footwear	4%
Other (social obligations, alcohol, tobacco, etc.)	2%

The high proportion of expenditure allocated to food (62 percent) indicates that households have limited disposable income for savings, investment in agricultural inputs, or other productive activities. This constrains households' ability to escape poverty through their own resources and highlights the importance of interventions, such as the proposed irrigation scheme, that increase agricultural productivity and household income.

Projected Economic Impacts: Based on experience from similar irrigation schemes in the Shire Valley, the proposed project is expected to increase participating household incomes by an estimated 150 to 300 percent within three to five years of full operation, through increased yields, multiple cropping cycles, crop diversification, and improved market access. This projected income increase is a key assumption underlying the positive impact assessment in Chapter 5 and will be monitored through the indicators established in Table 6.2 of the ESMP.

6.7.7 Transport

Roads are regularly maintained and connect small trading centres to major urban centres in the project area. Common modes of transport include motorcycles, bicycles (shapa/kabaza), vehicles and ox-carts. Most households own push bicycles, while a smaller proportion own

motorcycles and ox-carts. However, despite the presence of road infrastructure, the condition of both main and feeder roads remains a constraint, particularly during the rainy season when accessibility may be reduced. This has direct implications for transport costs, timely access to markets, and delivery of agricultural inputs, thereby affecting farm profitability.

6.7.8 Telecommunications

The study area is covered by mobile networks from Airtel and TNM, although communities reported weak signal strength away from the M1 road. The SVTP Baseline Survey (2020) indicated that 55% of male-headed households own cellular phones compared to 23% of female-headed households. Weak network coverage limits access to market information, financial services, and communication with buyers and suppliers. The disparity in phone ownership reflects gender-based inequalities in access to information and opportunities, which may influence participation in economic activities and decision-making.

6.7.9 Problems Faced by Scheme Members

The long-serving farmer members identified several key challenges including insufficient water supply, incomplete irrigation coverage, water losses due to poor infrastructure and management, flood damage, poor road conditions, limited market access, high input costs, weak access to credit, reduced extension services, and declining soil productivity due to past practices.

These challenges highlight structural constraints within the agricultural system and indicate that irrigation development must be complemented by improvements in infrastructure, market access, institutional coordination, and capacity building to achieve sustainable outcomes.

6.7.10 Security, Culture and Social Structure

Chikwawa District Police Station, located 12 km east of Chikwawa Boma, is the nearest police station to the proposed project site. The Malawi Police Service introduced a system of community policing in which communities were sensitised to take part in assisting the police in policing their areas. Chikwawa Police Station is involved in this type of policing, whereby community policing structures were developed in all eleven Traditional Authorities in the district through Community Policing Forums, at 79 Group Village Headman levels through Crime Prevention Panels, and at 593 Village Headman levels through Crime Prevention Committees. Elected members at forum level were trained on the concepts of community policing and were required to establish and support similar structures at GVH and VH levels. This programme is aimed at curbing crime and improving security in the district. The existence of these layered community policing structures is important for the project because it provides an established local mechanism for community-level security coordination, early identification of disputes, and communication between communities and formal law enforcement institutions. This is particularly relevant in the context of

construction activities, labour influx, and protection of project assets, all of which may place additional pressure on local security systems if not properly managed.

There are two main ethnic groups in the Mbenderana/Chikhambi area, namely Mang'anja and Sena. Minority ethnic groups include Yao, Lomwe, Ngoni, and Nyungwe, who are mostly found in Chapananga North areas where Chikhambi Village is located. The major languages spoken in the district are Chichewa, Chisena, and Mang'anja. These language patterns are important for project communication, stakeholder engagement, and grievance redress, as effective consultation will require communication methods that are accessible to all groups within the project area.

Christianity is the dominant religion in Chikwawa. Approximately 92.2% of the population are Christians, 1.2% are Muslims, 1.3% belong to other religious groups, and 5.3% do not belong to any religious grouping (National Statistical Office, 2018). These religious and cultural characteristics are relevant to community mobilization, meeting schedules, and the design of culturally appropriate engagement processes during project implementation.

The majority of the population follows a patrilineal system of marriage. Under this system, women live at their husband's home and dowry is paid to the parents of the woman. In most patrilineal systems, men dominate decision-making over household matters, with women and children having less control over important household decisions. Chieftainship is handed down from one generation to another within the same royal clan through the male lineage.

These social structures have direct implications for project implementation because they shape access to land, participation in decision-making, and control over productive resources and income. In practice, this may affect how benefits from irrigation development are distributed within households and communities, and may also influence whose voices are heard in consultations and cooperative governance processes. The predominance of male-led traditional and household structures therefore raises important inclusion considerations, particularly for women, youth, and other potentially marginalized groups. From a safeguards perspective, these dynamics are critical in assessing social risk, designing inclusive participation mechanisms, and ensuring that project benefits are not captured disproportionately by already dominant groups

6.7.11 Land Use and Agriculture

Land in Mbenderana/Chikhambi is held under customary ownership and is primarily used for agriculture and settlement. The Customary Land Act provides an opportunity for formalizing land rights through customary estate titles. While customary tenure provides flexibility, it may also create uncertainties regarding land rights and benefit distribution within collective irrigation schemes, particularly where land contributions vary among cooperative members. Most households engage in rain-fed agriculture, cultivating crops

such as maize, beans, cassava, tomatoes, sesame and sorghum. Livestock includes goats, pigs and cattle. The dependence on rain-fed agriculture exposes households to climate variability and contributes to unstable incomes. The introduction of irrigation has the potential to stabilize production and improve livelihoods; however, its success will depend on access to inputs, markets, extension services, and effective cooperative management. Mwana Alirenji Cooperative has 791 members organized into five Business Centre Committees (BCCs), with slightly more male members (51.7%) than female members (48.3%). Shareholding is based on land contribution. This structure may influence benefit distribution and decision-making power within the cooperative, with potential implications for equity and inclusion.



Figure 13: Mbenderana/Chikhambi post-harvest situation

The photograph above (Figure 18) illustrates typical post-harvest conditions within the project area, reflecting the scale and nature of agricultural production under current practices. It highlights the dependence on seasonal production cycles and the limited value

addition and storage capacity, which contribute to post-harvest losses and reduced income stability for farmers.

7 ENVIRONMENTAL AND SOCIAL RISKS AND IMPACTS

APPROACH AND METHODOLOGY

This Environmental and Social Management Plan (ESMP) outlines environmental and social impacts, mitigation and institutional measures to be undertaken during project design, construction and operation phases to avoid, reduce, minimise or eliminate adverse environmental and social impacts. The ESMP further designates responsibilities and schedules of tasks.

Approach and Methodology

The analysis of potential environmental and social impacts followed a structured, risk-based approach. This process involved a detailed examination of each identified impact based on its probability, magnitude, duration, and resulting significance.

Probability of Occurrence

This refers to the likelihood of an impact occurring, assessed before any mitigation is applied. The following criteria are used:

- **Possible:** The impact may occur but is not probable.
- **Probable:** The impact is very likely to occur.
- **Definite:** The impact is unavoidable.

Magnitude

Magnitude is a measure of the general degree, extensiveness, or scale of an impact. It is scored at three levels:

- Local Level
- Regional Level
- National Level

Duration

This refers to the period over which an impact may occur.

- **Short term:** Less than 5 years.
- **Medium term:** Between 5 and 10 years.
- **Long term:** Over 10 years.

Significance

Significance is a measure of the overall importance of an impact, determined by combining the above factors. The primary tool for determining significance is a risk matrix, where the **likelihood** of an impact occurring is matched with the **consequence (severity)** of the impact. The presence and vulnerability of sensitive receptors are considered when assessing potential severity, adopting a precautionary approach.

All risks classified as **medium or higher** are considered significant. These require detailed assessment (including quantification where appropriate) and the identification of specific mitigation measures to reduce the impact to an acceptable level. The contractor when developing their Construction Environmental Management Plan (CEMP) will also adopt this matrix approach (Figures 19 and 20).

RISK RATING		LOW 0 TO 3 ACCEPTABLE OKAY TO PROCEED	MEDIUM 3 TO 6 UNDISIRABLE TAKE MITIGATION EFFORTS (good site practice	HIGH 7 TO 10 UNACCEPTABLE Clearly identified mitigation will be required in ESMP	EXTREME 10 TO 12 INTORELABE Place event on Hold	
		CONSEQUENCE / SEVERITY OF IMPACT				
		IN SIGNIFICANT / MINOR Easily handled with the normal course of operations with no additional costs	MODERATE Immediate time / resource reallocation will be necessary with a moderate estimated cost	MAJOR Environmental conditions disrupted but can be reversed Potential for serious injury / fatality Significant disruption to community Require significant resources to rectify	CRITICAL Catastrophic environmental damage. Fines likely Potential for multiple fatalities Significant irreversible disruption to community Significant resources needed to rectify	
		>>>>>>>>>>Environmental / / Safety / Social Impact increasing in severity >>>>>>>>>>				
RISK / LIKELIHOOD OF IMPACT	IMPROBABLE Environmental / Safety / Social impact is unlikely to occur (<20%)	<<<<<likelihood of impact increasing <<<<<	LOW 1	MEDIUM 4	MEDIUM 6	HIGH 10
	POSSIBLE Environmental / Safety / Social impact is likely to		LOW 2	MEDIUM 5	HIGH 8	EXTREME 11

RISK RATING		LOW 0 TO 3 ACCEPTABLE OKAY TO PROCEED		MEDIUM 3 TO 6 UNDISIRABLE TAKE MITIGATION EFFORTS (good site practice	HIGH 7 TO 10 UNACCEPTABLE Clearly identified mitigation will be required in ESMP	EXTREME 10 TO 12 INTORELABE Place event on Hold
	occur (20% to 90%)					
	PROBALE Environmental / Safety / Social impact almost certain to occur (>90%)		MEDIUM 3	HIGH 7	HIGH 9	EXTREME 13

Figure 14: Risk Matrix - Likelihood and Consequence

The intensity of the colour will represent the severity of the impacts as presented in the Figure 21 below.

Negative	Significance	Positive
	Negligible	
	Low	
	Moderate	
	High	

Figure 15: Severity of Impacts

**SUMMARY OF IMPACTS AND THEIR SCORING BASED ON PROBABILITY, DURATION,
MAGNITUDE AND SIGNIFICANCE**

Table 8: Impact Scoring Matrix with Significance Levels

<u>Environmental and Social Impacts</u>	<u>Probability of Occurrence</u>	<u>Duration of Impact</u>	<u>Magnitude of Impact</u>	<u>Scoring</u>	<u>Significance of Impact</u>
<u>Component A- Planning and Design Phase</u>					
<u>Planning and Design Phase</u>					
<u>Positive Impacts</u>					
<u>Creation of employment</u>	<u>Definite</u>	<u>Short / term</u>	<u>Mostly local level</u>	<u>Medium (5x2=10)</u>	<u>Significant</u>
<u>Negative Impacts</u>					
<u>Loss of Land</u>	<u>Possible</u>	<u>Short to Long term</u>	<u>Local level</u>	<u>High (5x3=15)</u>	<u>Significant</u>
<u>Retention of water at the stilling basin creating a breeding ground for mosquitoes</u>	<u>Definite</u>	<u>Long term</u>	<u>Local level</u>	<u>High (5x3=15)</u>	<u>Significant</u>
<u>Component B: Construction Phase</u>					
<u>Positive Impacts</u>					
<u>Creation of employment</u>	<u>Definite</u>	<u>Short term</u>	<u>Mostly local level</u>	<u>Medium (5x2=10)</u>	<u>Significant</u>
<u>Improved knowledge and skill transfer</u>	<u>Definite</u>	<u>Long term</u>	<u>Local level</u>	<u>High (5x3=15)</u>	<u>Significant</u>
<u>Increased economic</u>	<u>Definite</u>	<u>Short term</u>	<u>Local level</u>	<u>High (5x3=15)</u>	<u>Significant</u>

<u>Environmental and Social Impacts</u>	<u>Probability of Occurrence</u>	<u>Duration of Impact</u>	<u>Magnitude of Impact</u>	<u>Scoring</u>	<u>Significance of Impact</u>
activities in the project area					
Source of revenue for government through taxes	Definite	Short term	National level	High (5x3=15)	Significant
<u>Negative impacts</u>					
Loss of Land	Possible	Long term	Local level	Medium (3x3=9)	Significant
Loss of Vegetation	Probable	Long term	Local level	High (4x3=12)	Significant
Unexpected discovery of cultural, archaeological, or paleontological resources.	Probable	Short term	Local and National level	Extreme (4x5=20)	Significant
Disruption of animal habitat (Terrestrial)	Probable	Long term	Local level	High (4x3=12)	Significant
Increased dust emissions	Possible	Short term	Local level	Medium (3x3=9)	Significant
Increased risk of noise and vibration	Possible	Short term	Local level	Medium (3x3=9)	Significant
Increased risk of soil erosion	Possible	Short term	Local level	Medium (3x3=9)	Significant
Development of spoil areas	Possible	Long term	Local level	Medium (3x3=9)	Significant
Pollution due to generation of liquid waste including	Possible	Short term	Local level	Medium (3x3=9)	Significant

<u>Environmental and Social Impacts</u>	<u>Probability of Occurrence</u>	<u>Duration of Impact</u>	<u>Magnitude of Impact</u>	<u>Scoring</u>	<u>Significance of Impact</u>
construction waste					
Pollution due to generation of solid waste including construction waste	<u>Probable</u>	<u>Short term</u>	<u>Local level</u>	<u>High (4x3=12)</u>	<u>Significant</u>
Increased Occupational safety and health hazard risks	<u>Possible</u>	<u>Short term</u>	<u>Local level</u>	<u>Medium (3x3=9)</u>	<u>Significant</u>
Increased risks to community health and safety	<u>Possible</u>	<u>Short term</u>	<u>Local level</u>	<u>Medium (3x3=9)</u>	<u>Significant</u>
Risk of increased incidences of STIs including HIV and AIDS	<u>Possible</u>	<u>Long term</u>	<u>Local and National level</u>	<u>Extreme (3x5=15)</u>	<u>Significant</u>
Increased risk of theft and crime	<u>Possible</u>	<u>Long-term</u>	<u>Local level</u>	<u>Medium (3x3=9)</u>	<u>Significant</u>
Increased risk of Gender Based Violence and Sexual Exploitation and Abuse (GBV/SEA)	<u>Possible</u>	<u>Short term</u>	<u>Local level</u>	<u>Medium (3x3=9)</u>	<u>Significant</u>
Risk of working in	<u>Possible</u>	<u>Short term</u>	<u>Local level</u>	<u>Medium (3x3=9)</u>	<u>Significant</u>

<u>Environmental and Social Impacts</u>	<u>Probability of Occurrence</u>	<u>Duration of Impact</u>	<u>Magnitude of Impact</u>	<u>Scoring</u>	<u>Significance of Impact</u>
<u>confined space with limited working area</u>					
<u>Increased risk of animals falling into open channels leading to conflicts with the community</u>	<u>Possible</u>	<u>Short term</u>	<u>Local level</u>	<u>Medium (3x3=9)</u>	<u>Significant</u>
<u>OPERATION PHASE</u>					
<u>Positive Impacts</u>					
<u>Increased food production and Food Security</u>	<u>Definite</u>	<u>Long term</u>	<u>Local level</u>	<u>Extreme (5x4=20)</u>	<u>Significant</u>
<u>Increased income at household level</u>				<u>Extreme (5x4=20)</u>	<u>Significant</u>
<u>Improved nutritional status</u>	<u>Definite</u>	<u>Long term</u>	<u>National level</u>	<u>Extreme (5x4=20)</u>	<u>Significant</u>
<u>Creation of Long-Term, Skilled and unskilled Employment</u>	<u>Definite</u>	<u>Long term</u>	<u>Local level</u>	<u>High (5x4=20)</u>	<u>Significant</u>
<u>Improved Linkage of Farmers to Markets</u>	<u>Probable</u>	<u>Long term</u>	<u>Regional</u>	<u>High (5x4=20)</u>	<u>Significant</u>
<u>Negative Impacts</u>					

<u>Environmental and Social Impacts</u>	<u>Probability of Occurrence</u>	<u>Duration of Impact</u>	<u>Magnitude of Impact</u>	<u>Scoring</u>	<u>Significance of Impact</u>
Increased Risk of Water Logging Conditions	<u>Possible</u>	<u>Long term</u>	<u>Local level</u>	<u>Medium (3x3=9)</u>	<u>Significant</u>
<u>Increased risk of child labour</u>	<u>Possible</u>	<u>Long term</u>	<u>Local level</u>	<u>Medium (3x3=9)</u>	<u>Significant</u>
Increased Risk of Pollution of Water from Agrochemicals	<u>Possible</u>	<u>Long term</u>	<u>Local level</u>	<u>Medium (5x3=15)</u>	<u>Significant</u>
<u>Increased risk of animals and humans falling into open channels leading to conflicts with communities</u>	<u>Possible</u>	<u>Long term</u>	<u>Local level</u>	<u>Medium (3x3=9)</u>	<u>Significant</u>
<u>Increase risk of water related diseases</u>	<u>Possible</u>	<u>Long term</u>	<u>National level</u>	<u>Medium (4x3=12)</u>	<u>Significant</u>
Increased Risk of Contracting Communicable and Emerging Infectious Diseases (including COVID-19, Mpox, and Cholera)	<u>Possible</u>	<u>Long term</u>	<u>Regional</u>	<u>Medium (3x3=9)</u>	<u>Significant</u>
Increased Risk of Generation	<u>Probable</u>	<u>Long term</u>	<u>National</u>	<u>Medium (3x3=9)</u>	<u>Significant</u>

<u>Environmental and Social Impacts</u>	<u>Probability of Occurrence</u>	<u>Duration of Impact</u>	<u>Magnitude of Impact</u>	<u>Scoring</u>	<u>Significance of Impact</u>
of Greenhouse Gases (GHGs)					
Risk of Water Use Conflict	<u>Possible</u>	<u>Long term</u>	<u>National</u>	<u>Medium (3x3=9)</u>	<u>Significant</u>
<u>Blockage of drainage pipes installed at the end sill invert of the stilling basin</u>	<u>Definite</u>	<u>Long term</u>	<u>National level</u>	<u>Medium (3x3=9)</u>	<u>Significant</u>
Increased Risk of Injuries to Maintenance Workers and Farmers	<u>Possible</u>	<u>Long term</u>	<u>Local</u>	<u>Medium (3x3=9)</u>	<u>Significant</u>
Reduced Availability of Water Downstream	<u>Possible</u>	<u>Long term</u>	<u>Regional</u>	<u>Medium (2x2=4)</u>	<u>Insignificant</u>
Increase in Generation of Wastewater	<u>Probable</u>	<u>Long term</u>	<u>local</u>	<u>Medium (2x2=4)</u>	<u>Insignificant</u>
Increase in theft of and vandalism of irrigation infrastructure	<u>Possible</u>	<u>Long term</u>	<u>Local</u>	<u>Medium (3x3=9)</u>	<u>Significant</u>
Increased Risk of Human-Wildlife Conflict	<u>Probable</u>	<u>Long term</u>	<u>Local</u>	<u>Medium (3x4=12)</u>	<u>Significant</u>
Increased Risk of Salinization	<u>Possible</u>	<u>Long term</u>	<u>Local</u>	<u>Medium (3x3=9)</u>	<u>Significant</u>

From Table 8 above, the probability of occurrence for most of the positive impacts is definite and duration is long-term with significance ranging from high to moderate. All the Negative impacts that are anticipated from the implementation are mitigatable and their duration is generally short term with some having long term duration.

8 IDENTIFICATION AND ANALYSIS OF IMPACTS

8.1 IMPACT IDENTIFICATION

The construction of Chikhambi/Mbenderana Irrigation Scheme is expected to generate a wide range of impacts in the project impact area. Some of the impacts are expected to be positive while others will be negative. The impacts will have a bearing on the biophysical and socio-economic environment. The main purpose of this Chapter, therefore, is to identify the potential environmental and social impacts that will be associated with the implementation of Chikhambi/Mbenderana Irrigation Scheme project, assess the extent and significance of the impacts and propose measures to manage them.

This Chapter builds on the baseline conditions described in Chapter 6 and assesses how project activities during the pre-construction, construction, operation and post-construction phases will interact with environmental and social receptors. The analysis considers direct, indirect and cumulative impacts, and distinguishes between impacts occurring at different stages of project implementation.

8.1.1 Methodology of Impact Identification

The methodology adopted for impact prediction mainly considered the impacts at various phases of the project and the activities to be undertaken at each phase.

This approach ensures that impacts are systematically identified based on the relationship between project activities and the environmental and social receptors that may be affected. The impacts were identified by considering project inputs, activities and outputs in all the project phases and how these would impact on the environment and the people. A step-by-step approach was taken to identify the potential impacts as follows:

Step 1: Assessment of baseline conditions

The purpose of assessing baseline conditions was to understand the existing situation as this is the basis for determining changes that may occur as a result of the proposed project.

Baseline conditions provide the reference against which impacts are measured and also indicate the sensitivity of environmental and social receptors to potential project-induced changes.

Step 2: Examination of project inputs associated with the proposed project

Project inputs such as project machinery were examined to determine the potential changes and impacts on the biophysical, social and cultural environment that would be created through the application and use of project inputs. This includes consideration of resource use (e.g. water abstraction, construction materials, fuel) and how these may introduce pressures on existing environmental and social systems.

Step 3: Examination of project activities that will be undertaken

Project activities were examined to identify the impacts that the activities would bring on the biophysical and socio-economic environment. This step establishes the cause–effect relationship between specific project activities (such as land clearing, excavation, canal construction, and irrigation operations) and the resulting environmental and social impacts.

Step 4: Examination of project outputs associated with the proposed project

Project outputs were examined to determine the potential changes and impacts that would happen through the delivery of project outputs. Project outputs such as irrigation infrastructure, improved water availability, and increased agricultural production may generate both beneficial impacts (e.g. improved livelihoods) and adverse impacts (e.g. increased pressure on natural resources).

Step 5: Determination of environmental impacts

A combination of techniques was used to isolate the impacts as well as the causes and sources of the impacts. A Leopold matrix was used to identify direct potential environmental impacts that can arise from the project. A combination of professional judgment and expert consultation was used to identify both the direct and indirect impacts on the biophysical, social and cultural environment. In addition, the assessment considered cumulative impacts arising from the interaction of project activities with existing and planned developments in the area. Valued Environmental and Social Components (VECs) were identified to focus the assessment on key receptors that are critical for ecological integrity, human well-being, and socio-economic sustainability.

8.1.2 Analysis of Predicted Impacts

After identifying the positive and negative environmental impacts Chikhambi/Mbenderana Irrigation Scheme will have on the environment and social lives of people, further analysis was conducted to determine the extent and significance of the impacts. The aspects that were considered were magnitude, significance, probability of occurrence and duration of impacts which are explained below:

The assessment of impact significance was based on a combination of these criteria, allowing for a structured evaluation of how serious each impact is in terms of its scale, likelihood, and persistence. This provides a basis for prioritizing mitigation measures.

8.1.2.1 Magnitude

Magnitude is a measure of the general degree, extensiveness, or scale of impacts. It refers to the intensity or severity of an impact on a given receptor, taking into account the degree of change from baseline conditions. This may range from negligible to high depending on the nature of the impact. The magnitude was scored at three levels i.e. local level, regional level and national level. In this context, the classification into local, regional and national levels is more appropriately associated with the spatial extent of impacts. Therefore, both

magnitude (intensity of impact) and extent (area over which the impact occurs) are considered in determining overall significance.

8.1.2.2 Probability of Occurrence

Provides an estimate of the probability of an impact occurring before mitigation is applied. The impacts were considered as:

- a) Possible (impact may occur but it is not probable);
- b) Probable (the impact is very likely to occur); and
- c) Definite (impact is unavoidable).

This classification helps in assessing the likelihood of impacts and supports risk-based prioritization of mitigation measures. Additional criteria considered in the assessment include duration (short-term, medium-term, long-term) and reversibility (whether the impact can be reversed or is permanent). These factors are critical in determining the overall significance of impacts and the appropriate mitigation response.

The scoping methodology involved an evaluation of the potential environmental effects, including cumulative environmental effects, regarding VECs. The VECs for this project were identified through a process whereby the features and activities (both planned and unplanned) associated with planning and designing, construction and operation phases of the project have been considered with respect to their potential impact with resources or receptors.

VECs represent key environmental and social components that are considered important for ecological sustainability and human well-being, and therefore require focused assessment. These include, for example, water resources, soils, biodiversity, public health, and livelihoods. This method identifies VECs and activities that could reasonably act as a source of impact and the vertical axis of a Potential Interaction Matrix as listed in Table 9 above and Table 10 below.

Table 10: Potential Interaction Matrix

Receptor Component		Anticipated Environmental and Social Impacts																						
		SES 2						SES 3						SES 4					SES 5		SES 6		SES 10	
		Occupational Safety and Health	Risk of Forced labour	Risk of Child Labour	Impact on Economy & Livelihood	HIV and AIDS	Risk of GBV & Sexual Harassment	Resource Consumption	Soil contamination	Air Pollution	Noise and Vibration	Water Contamination	Land Degradation	Increased Waste Generation	Provision of Education Services	Conflict on use of Amenities	Traffic & Road Safety Risks	Increase in theft and vandalism	Community Health and Safety	Forced Eviction	Involuntary Resettlement	Impact on Flora	Impact on Fauna	Anxiety over Loss of Land
SN	Project activity/Hazard																							
1	Pre-Construction Phase																							
2	Construction and Operation Phases																							
3	Post-Construction Phase																							

Key for Potential Interactive Matrix

	Scoped In
	Scoped Out
	Scoped Out with Justification
	Positive Impacts

Each impact was allocated a score from 1 to 5 based on criteria presented in Table 8.2. The scores for each impact were added to give a composite score. The composite score was then compared against numerical range bands, as shown in Table 11, which corresponds to a level of significance/change as described subsequently. A high negative score represents the greatest impact and a low score the least. The positive and negative scores signify positive and negative impacts respectively. The scoring system provides a simplified approach to evaluating impacts by combining key attributes of each impact into a single composite score. These attributes include the extent of the impact, its significance, and its duration. While these parameters are presented within a unified scoring scale, they are interpreted collectively to reflect both the intensity and spatial influence of impacts on environmental and social receptors.

Table 11: Scoring for Environmental and Social Impacts

Score	Coverage or Extent	Significance	Duration
1	Impacts will occur only on-site.	Low: A small change that is hardly detectable.	Short term, during the exploration phase only.
2		Moderate. An impact that is measurable but does not alter processes.	Medium-term, during early operations.
3	Impacts will occur within a 3-5 km radius of the site.	High. Many environmental and social components are lost or affected. A major disruption of ecosystem / socioeconomic status.	
4		Very high. A process or area or socioeconomic status is completely disrupted or destroyed.	Long-term, for the entire operational phase.
5	Impacts will occur beyond 5km.	Unknown. Insufficient information is available to determine impacts – apply the cautionary principle.	Very long term, for the entire operational phase and after closure.

In applying this scoring system, it is important to interpret the scores holistically. The “coverage or extent” column reflects the spatial influence of impacts, while the “significance” column reflects the degree of change to environmental or social conditions, and the “duration” column reflects the temporal persistence of impacts. These dimensions are considered together when assigning scores, rather than as independent parameters.

Table 12: Evaluation Numerical Range Bands

Impact Score	Range Band	Description of Range Band
0	N	No Change
1 to 3	A	Negligible negative/positive change/impact
4 to 6	B	Slight Negative/positive change/impact
7 to 9	C	Moderate negative/positive change/impact
10 to 12	D	Significant negative/positive change/impact
13 to 15	E	Major negative/positive change/impact

The range bands provide a classification of impacts from negligible to major based on the composite score (Table 12). This allows for a consistent interpretation of impact significance across different environmental and social components.

8.2 IMPACT SIGNIFICANCE RATING FOR THE IDENTIFIED IMPACTS

The potential environmental and social impacts were assessed and the significance ratings before the mitigation measures are applied as presented in Tables 12 and 13.

The assessment reflects a pre-mitigation scenario, which provides a baseline understanding of the potential severity of impacts prior to the implementation of management measures. This approach allows for the identification of priority impacts that require mitigation.

Table 13: Summary of Assessment of Impacts and their Ratings

SN	Category	Impact	Coverage or Extent	Significance	Duration	Impact Score	Range Band
1	Planning Phase						
1.1	Economy and Livelihoods	Creation of Employment opportunities	+3	+3	+2	+8	+C
2	Operation and Maintenance Phase						
2.1	Economy and Livelihoods	Foreign income	+5	+2	+2	+9	C
		Employment generation	+3	+2	+1	+6	B
		Increased incidences of child labour	-3	-2	-1	-6	B
		Increased cases of sexual harassment and Gender Based Violence	-3	-2	-1	-6	B
2.2	Air Quality & Emissions	Increased generation of particulate matter (especially dust)	-3	-1	-1	-5	B
		Increase in combustion emissions	-3	-2	-1	-5	B
2.3	Landscape and Visual Amenity	Visual scaring of the landscape	0	0	0	0	N
		Aesthetic change to the nature topography	0	0	0	0	N
2.4	Water Quality and Resource	Pollution of surface water and contamination of groundwater	-1	-2	-4	-7	C
		Reduced water availability	-3	-2	-4	-9	C
2.5	Soil Degradation	Contamination of soil with chemicals	-1	-2	-1	-4	B
		Increased susceptibility of soil to erosion	-1	-2	-1	-4	B
2.6	Noise and Vibration	Increase in ambient sound levels	-1	-2	-1	-4	B
		Risk of earth movement	-3	-2	-1	-5	B
2.7	Waste	Increased generation of non-hazardous and general waste	-1	-2	-1	-4	B

SN	Category	Impact	Coverage or Extent	Significance	Duration	Impact Score	Range Band
2.8	Flora and Fauna	Increased generation of hazardous waste	-1	-1	-1	-3	B
		Increased sewage generation	-1	-1	-1	-3	B
		Loss of natural habitat for flora and fauna	-1	-1	-3	-5	B
		Introduction of invasive and alien species	0	0	0	0	N
2.9	Community Health and Safety	Social conflicts resulting from access to jobs	-1	-1	-3	-5	B
		Decrease in human health due to air emissions	-1	-1	-3	-5	B
		Increased risk of fire and explosions	-1	-1	-1	-3	B
		Increased risk of traffic accidents	-1	-1	-4	-6	B
2.10	Occupational Health and Safety	Increased risk of accidents and exposure to hazardous material	-1	-3	-2	-6	B
		Increased transmission of communicable diseases such as STIs & HIV and AIDS	-3	-2	-4	-9	C
		Increased risk of spread of Cholera	-1	-1	-1	-3	B

The table presents the composite scores derived from the scoring system and classifies each impact according to the range bands defined in Table 5.3. The scoring reflects the combined effect of impact extent, duration, and significance, and provides a relative indication of impact severity.

5.2.1 Duration

Refers to the period of time over which an impact may occur, from once-off to continuous for the life of the project. Duration of impacts was considered in terms of the following criteria: Short term (less than 5 years); Medium term (between 5 and 10 years) and Long term (over 10 years). Duration is a critical factor in determining impact significance, as impacts that persist over longer periods are generally considered more significant, particularly where they affect sensitive environmental or social receptors.

5.2.2 Significance

Significance is a measure of the importance of a particular action on the environmental factor in the specific instance under consideration. This will be scored using colours for both positive and negative impacts. Red colour represents negative impacts while the green colour represents the positive impacts. The intensity of the colour will represent the severity of the impacts as presented below in Figure 21. In addition to the colour-based representation, significance is interpreted based on the composite scores and corresponding range bands. This ensures that the assessment is not only visual but also quantitatively supported.

Negative	Significance	Positive
	Negligible	
	Low	
	Moderate	
	High	

Figure 16: Severity of impacts

From the impact scoring matrix, the probability of occurrence for most of the positive impacts is definite and duration is long-term with significance ranging from high to moderate. All the negative impacts that are anticipated from the implementation of Chikhambi/Mbenderana Irrigation Block project are mitigatable. Most of the negative impacts have short term duration with very few with long term duration. Additionally, most of the negative impacts have low significance with some having negligible significance. While many of the identified impacts are assessed as having low to moderate significance, it is important to note that certain impacts, particularly those related to water resources, public health, and social risks (such as Gender-Based Violence and communicable diseases), may have higher significance due to their potential cumulative effects and sensitivity of affected communities. Therefore, these impacts require careful management despite their initial scoring. This entails that the irrigation project is not only environmentally friendly but also socio-economically sound. Overall, the assessment indicates that the project has the potential to generate significant positive socio-economic benefits while negative impacts can be effectively managed through the implementation of appropriate mitigation measures. However, this conclusion is contingent upon the effective application of the proposed environmental and social management measures. However, in order to maximize

the project benefits, the developer will be required to implement the proposed mitigate measures for the negative impacts and enhancement measures for the positive ones. The section which follows provides the proposed management measures for anticipated impacts during the Planning, Construction, Operation and Demobilisation Phases of the Chikhambi/Mbenderana Irrigation Block project. The subsequent sections therefore translate the identified impacts into actionable mitigation and enhancement measures, ensuring that environmental and social risks are minimized while project benefits are optimized.

9 EVALUATION OF MAIN IMPACTS AND THEIR MANAGEMENT MEASURES

9.1.1 Planning Phase

9.1.1.1 5.3.1.1 Positive Impacts

i. Creation of Employment

Cause and Comment:

During the planning phase of the Chikhambi/Mbenderana Irrigation Block project, consultants were engaged to undertake Feasibility Studies, ESMP Development, Market Analysis Studies, Baseline Studies and other related studies. These consultancies created employment opportunities. The engagement of consultants during this phase provides short-term employment opportunities and contributes to knowledge generation required for informed project design. Involvement of national professionals enhances local capacity in environmental and social assessment, irrigation planning, and project development.

Enhancement Measures (applying enhancement hierarchy: enable → strengthen → sustain):

Hierarchy Level	Measure
Enable	Ensure that consultants engaged to undertake different studies include at least 50 percent Malawian nationals as part of their personnel.
Strengthen	Promote participation of local professionals and institutions in study teams to strengthen national expertise and ensure knowledge transfer. Encourage mentorship arrangements between international and local experts.
Sustain	Document methodologies and findings in formats accessible to local institutions for use in future projects. Provide training materials to local universities and colleges.

Responsibility: PMT

Cost Estimate (USD): 1000

9.1.1.2 Negative Impacts

i. Anxiety on Loss of Land

Cause and Comment:

The presence of people conducting different studies in the project area during the planning phase may create anxiety among community members regarding potential loss of land. This anxiety arises from uncertainty about land acquisition, compensation processes, and potential displacement. If not properly managed, such concerns may lead to mistrust, resistance to project activities, and the spread of misinformation among affected communities.

Mitigation Measures (applying mitigation hierarchy: avoid → minimize → restore → offset):

Hierarchy Level	Measure
Avoid	Clearly define the project footprint early in the planning phase to avoid unnecessary speculation about land take. Limit studies to the minimum area required.
Minimize	Conduct sensitization meetings with affected and surrounding communities before any field studies commence. Provide clear, written information (in Chichewa and Chisena) on project scope, land requirements, and compensation processes. Use multiple communication channels (meetings, posters, radio announcements) to reach all segments of the community.
Restore	Where community members express specific concerns, address them individually through the Grievance Redress Mechanism (GRM) and document resolutions.
Offset	Not applicable to this impact.

Additional Measures:

- Engage communities through structured stakeholder consultation processes, including separate meetings with women, youth, and vulnerable groups to ensure all voices are heard.
- Establish and communicate a functional GRM prior to commencement of planning phase activities, with clear procedures for receiving, registering, and responding to land-related concerns.

Responsibility: PMT, District Council, Traditional Authorities

Cost Estimate (USD): 1,500,

9.1.2 Construction Phase

9.1.2.1 Positive Impacts

i. Creation of Employment

Cause and Comment:

Construction activities of the Chikhambi/Mbenderana Irrigation Block will employ approximately 100 people, primarily from the project area. This will create employment for surrounding communities and people from other parts of the country. Employment opportunities generated during the construction phase are primarily short-term but provide an important source of income for local households, contributing to improved household welfare, increased purchasing power, and temporary reduction in poverty levels.

Enhancement Measures (applying enhancement hierarchy: enable → strengthen → sustain):

Hierarchy Level	Measure
Enable	Engage at least 80 percent of the labour force from surrounding communities. Pay wages above government-stipulated minimum rates. Ensure equal opportunities for both male and female workers (target: minimum 40 percent female participation in unskilled labour).
Strengthen	Implement training programs, vocational courses, and on-the-job skill development to enhance capacity and employability of local residents. Pair skilled and unskilled workers during construction assignments to facilitate skills transfer. Formalize on-the-job training with learning targets and performance monitoring.
Sustain	Document and certify acquired skills where possible to enhance long-term employability. Provide letters of recommendation and skill records to workers upon completion of employment.

Additional Measures:

- Ensure transparent and fair recruitment processes using publicly advertised criteria and local recruitment committees that include women and youth representatives.
- Prohibit any form of discrimination in recruitment based on ethnicity, religion, disability, or social status.

Responsibility: Contractor, PMT

Cost Estimate (USD): 1,500

ii. Increased Economic Activities within the Project Area

Cause and Comment:

Construction activities are expected to increase the level of economic activity in the project area. Workers will create demand for various goods such as food, creating opportunities for local small-scale businesses (selling food items, provisions, and other commodities). This increased demand can stimulate local markets, support small-scale enterprises, and promote local economic growth. However, these benefits are often temporary and depend on the duration of construction activities.

Enhancement Measures:

Hierarchy Level	Measure
Enable	Designate an appropriate site within the project area for local vendors to sell food and other goods. Provide basic infrastructure (shade, water access, waste bins) at no cost to local vendors.
Strengthen	Engage with local communities, businesses, and relevant stakeholders through regular consultations to align project economic activities with local needs. Support local vendors through fair access to project-related markets and avoid monopolization by external suppliers. Facilitate access to finance and technical assistance for local entrepreneurs.
Sustain	Encourage formation of vendor associations to continue economic activity beyond the construction phase. Link local producers to agricultural value chains that will persist under the irrigation scheme.

Responsibility: Contractor, PMT, District Council

Cost Estimate (USD): 1000

iii. Skills Transfer to Local Communities

Cause and Comment:

Engagement of local people in construction activities will facilitate transfer of skills in the construction sector. This provides an opportunity for local workers to acquire practical skills in areas such as masonry, equipment handling, basic engineering works, and health

and safety practices, which may improve their future employability beyond the project lifecycle.

Enhancement Measures:

Hierarchy Level	Measure
Enable	Maximize employment of local people, particularly for unskilled labour positions. Pair skilled and unskilled workers during construction assignments.
Strengthen	Formalize on-the-job training for local unskilled labour with structured learning targets and performance monitoring. Provide classroom-based safety and skills training where appropriate.
Sustain	Document and certify acquired skills through recognized certification bodies (e.g., TEVET). Provide workers with written records of competencies gained.

Responsibility: Contractor

Cost Estimate (USD): 1,000

iv. Source of Government Revenue through Taxes

Cause and Comment:

Implementation of the project will generate revenue for government through taxes, including Pay-As-You-Earn (PAYE), Withholding Taxes, Value Added Taxes (VAT), and corporate taxes. This contributes to national and local economic development by increasing government revenue, which can be reinvested in public services and infrastructure.

Enhancement Measures:

Hierarchy Level	Measure
Enable	Remit all taxes to Malawi Revenue Authority on time as required by law.
Strengthen	Purchase materials from tax-compliant businesses to support formal economic activity.
Sustain	Ensure full compliance with national tax regulations and reporting requirements throughout the project lifecycle.

Responsibility: Contractor

Cost Estimate (USD): Included in contractor obligations

9.1.2.2 Negative Impacts

i. Loss of Vegetation

Cause and Comment:

There will be loss of vegetation during construction. Vegetation will be cleared to accommodate construction activities, primarily grasses, shrubs, and climbers, with very few trees. Vegetation clearance reduces ground cover, which may lead to increased soil exposure, reduced biodiversity, and disruption of ecological functions such as erosion control and water regulation. Although tree cover is limited, removal of grasses and shrubs may still have localized ecological impacts, particularly in sensitive areas near water bodies.

Mitigation Measures (applying mitigation hierarchy: avoid → minimize → restore → offset):

Hierarchy Level	Measure
Avoid	Conduct pre-construction vegetation survey to identify areas of higher ecological value. Mark clearing boundaries with flagging tape before any equipment enters the site. Restrict clearing to the minimum necessary footprint. Avoid clearing within the 200-meter river buffer zone except for essential infrastructure.
Minimize	Clear vegetation in phases rather than all at once. Use hand clearing rather than machinery near water bodies. Time clearing to avoid bird nesting seasons (September–February) where feasible. Retain mature trees wherever possible through micro-siting of infrastructure.
Restore	Re-vegetate cleared areas immediately after construction is complete in each section, using native grass and shrub species. For areas not required for permanent infrastructure, restore to pre-construction condition or better.
Offset	Implement the reforestation programme (1,300,000 trees) targeting native species suitable for semi-arid conditions (<i>Albizia harveyi</i> , <i>Dalbergia melanoxylon</i> , <i>Adansonia digitata</i> , <i>Pterocarpus lucens</i>). Plant at minimum 2:1 ratio (trees planted to trees removed). Prioritize planting in degraded areas, the 200-meter river buffer zone, and along the Shire River catchment.

Additional Measures:

- Collaborate with Department of Forestry and other upstream irrigation schemes on catchment management activities.
- Conduct environmental awareness training for all construction personnel and community members.
- Develop and enforce environmental rules and regulations for contractors with defined penalties for non-compliance.

Responsibility: Contractor, PMT, Department of Forestry

Cost Estimate (USD): 2,000

ii. Disruption of Animal Habitats**Cause and Comment:**

Clearance of vegetation will disturb natural habitats for some animals, especially reptiles, amphibians, and small mammals such as rodents. Habitat disturbance may lead to displacement of species and temporary loss of shelter and breeding grounds. Although large wildlife species are limited in the area, smaller fauna play important ecological roles, and their disturbance may affect local ecosystem balance.

Mitigation Measures (applying mitigation hierarchy):

Hierarchy Level	Measure
Avoid	Restrict clearing to demarcated areas only. Avoid clearing in areas with evidence of burrows, nests, or dens where feasible.
Minimize	Conduct pre-clearance surveys for active nests or dens. If active nests or dens are found, establish a buffer zone (minimum 30 meters) until young have fledged or moved. Time clearing to avoid breeding seasons.
Restore	Re-vegetate cleared areas with native species to restore habitat connectivity. Install artificial habitat features (e.g., nest boxes, brush piles) if displacement of cavity-nesting species is unavoidable.
Offset	Incorporate wildlife habitat features into the reforestation programme (e.g., planting fruiting trees, maintaining thickets).

Additional Measures:

- Conduct environmental awareness discussions with workers and communities on protection of wildlife.

- Prohibit hunting, trapping, or killing of wildlife by workers or contractors; enforce through Code of Conduct.

Responsibility: Contractor, PMT

Cost Estimate (USD): 1,000

iii. Increased Risk of Dust Emission

Cause and Comment:

Excavation of soil and gravel material and speeding construction vehicles are likely to cause dust emission during the construction phase. Dust emissions may affect air quality, reduce visibility, and pose health risks to workers and nearby communities, particularly those with respiratory conditions such as asthma or chronic bronchitis.

Mitigation Measures (applying mitigation hierarchy):

Hierarchy Level	Measure
Avoid	Schedule earthworks during wet season where feasible to naturally suppress dust. Use paved or stabilized surfaces for high-traffic areas.
Minimize	Suppress dust by sprinkling water on exposed surfaces and loose materials at least twice daily during dry conditions. Apply dust suppressants (e.g., calcium chloride) to haul roads if water is scarce. Enforce speed limits for construction vehicles (maximum 30 km/h on unpaved roads). Limit vegetation clearance to reduce exposed soil area.
Restore	Re-vegetate exposed areas as soon as construction in that section is complete.
Offset	Not applicable.

Additional Measures:

- Ensure use of personal protective equipment (e.g., N95 or P100 dust masks) for workers exposed to dusty conditions.

Responsibility: Contractor

Cost Estimate (USD): 1,500

iv. Increased Risk of Soil Erosion

Cause and Comment:

Clearing of vegetation will leave soils bare, potentially leading to soil erosion. Erosion can contribute to sedimentation of surrounding water bodies, including the Shire River, and loss of fertile topsoil. Sedimentation reduces water quality, affects aquatic habitats, and may reduce reservoir and canal capacity over time.

Mitigation Measures (applying mitigation hierarchy):

Hierarchy Level	Measure
Avoid	Minimize area and duration of soil exposure. Phase vegetation clearance so that clearance occurs immediately prior to earthworks, not weeks or months in advance. Avoid earthworks during the peak rainy season (January–March) where feasible.
Minimize	Install silt fences, sediment basins, or straw bale barriers downslope of cleared areas before earthworks begin. Construct diversion drains to channel runoff away from cleared areas. Maintain buffer strips of undisturbed vegetation along water bodies. Cover stockpiles of excavated material with tarpaulins or vegetation.
Restore	Re-vegetate exposed surfaces promptly after construction activities (within 14 days of completion). Use fast-growing native grasses and shrubs for rapid soil stabilization. Apply mulch or erosion control blankets on steep slopes.
Offset	Plant additional vegetation in degraded areas outside the project footprint to compensate for erosion risk.

Additional Measures:

- Develop and enforce environmental rules for contractors with specified erosion control requirements.
- Conduct weekly erosion inspections after rainfall events.

Responsibility: Contractor, Supervision Consultant

Cost Estimate (USD): 2,000

v. Creation of Borrow Pits

Cause and Comment:

Excavation works and extraction of fill materials are likely to create borrow pits that may pose safety and health risks to surrounding communities. Unrehabilitated borrow pits may

accumulate water, posing drowning risks (particularly to children) and serving as breeding grounds for disease vectors such as mosquitoes.

Mitigation Measures (applying mitigation hierarchy):

Hierarchy Level	Measure
Avoid	Minimize number and size of borrow pits by using imported fill where cost-effective. Locate borrow pits away from settlements, schools, and paths.
Minimize	Secure and demarcate borrow pit areas with fencing or warning signs to prevent unauthorized access during construction. Ensure pits are not left open overnight without barriers. Limit depth to prevent permanent water accumulation.
Restore	Rehabilitate all borrow pits progressively after use by backfilling with construction rubble and surplus soil. Grade to match surrounding topography. Re-vegetate with native grasses. For pits that cannot be fully backfilled, grade to safe slopes (maximum 3:1) and install safety ladders.
Offset	For pits that remain as permanent water bodies (with community consent), develop as small reservoirs or fish ponds with appropriate safety measures (fencing, life rings, signage).

Additional Measures:

- Obtain permits from Chikwawa District Council before establishing borrow pits.
- Compensate land owners where borrow pits are created, including loss of land use during construction and any permanent change in land value.

Responsibility: Contractor, PMT, District Council

Cost Estimate (USD): 2,000

vi. Increased Generation of Solid Waste

Cause and Comment:

Construction activities may generate waste such as unused cement mortar, broken bricks, stones, packaging materials, scrap metal, and food remains. Improper disposal may lead to land degradation, visual pollution, and potential contamination of soil and water resources.

Mitigation Measures (applying mitigation hierarchy):

Hierarchy Level	Measure
Avoid	Minimize waste generation through accurate material estimation and ordering. Require suppliers to take back packaging where feasible.
Minimize	Segregate waste streams at source into categories: inert construction waste (concrete, bricks, stones), metal, plastic packaging, organic waste, and hazardous waste (oils, chemicals). Reuse construction waste for backfilling where feasible. Recycle metal, plastic, and paper through licensed recyclers.
Restore	Dispose of non-recyclable waste at designated sites approved by Chikwawa District Council. Maintain disposal records for audit.
Offset	Not applicable.

Additional Measures:

- Promote "Reduce, Re-use, Recycle" practices among workers through training and signage.
- Provide designated waste collection points with separate bins for each waste category.
- Prohibit open burning of waste except in designated incinerators for hazardous medical waste (if any).

Responsibility: Contractor, District Council

Cost Estimate (USD): 2,000

vii. Increased Risk of Water Pollution

Cause and Comment:

Waste from construction materials, oil spills, fuel leaks, and human waste from workers may pollute surrounding water bodies including the Shire River and its tributaries. Water pollution may degrade water quality, affect aquatic life, and reduce availability of safe water for downstream users.

Mitigation Measures (applying mitigation hierarchy):

Hierarchy Level	Measure
Avoid	Locate fueling areas, vehicle maintenance areas, and chemical storage at least 100 meters from any water body. Use drip trays under all stationary equipment.

Hierarchy Level	Measure
Minimize	Ensure fueling areas are bunded and impermeable (concrete or liner) to contain spills. Store fuels, oils, and chemicals in leak-proof, secondary-contained containers. Implement spill response procedures including spill kits at all fueling and maintenance areas.
Restore	If a spill occurs, contain immediately using absorbent materials. Remove contaminated soil to designated hazardous waste facility. Report all spills exceeding 5 liters to MEPA within 24 hours.
Offset	Not applicable.

Additional Measures:

- Sensitize workers on hygiene practices and prohibition of washing equipment or discharging waste into water bodies.
- Conduct daily inspections of fueling and maintenance areas.
- Maintain a spill response log.

Responsibility: Contractor, MEPA (oversight)

Cost Estimate (USD): 3,000

viii. Increased Risk of Noise Pollution

Cause and Comment:

Construction machinery and vehicles will increase noise levels in the area, potentially disturbing nearby communities. Noise levels above 80 dB may cause hearing damage to workers. Prolonged exposure may lead to discomfort, stress, sleep disturbance, and potential health effects for both workers and nearby residents.

Mitigation Measures (applying mitigation hierarchy):

Hierarchy Level	Measure
Avoid	Locate noisy equipment and activities as far from residential areas, schools, and health facilities as site conditions allow. Use electric or hydraulic equipment instead of diesel where feasible.

Hierarchy Level	Measure
Minimize	Fit all machinery with functioning silencers. Maintain equipment regularly to prevent excessive noise. Restrict working hours to 08:00 to 17:00 Monday through Saturday. Avoid high-noise activities near schools during examination periods. Establish noise barriers (earth berms, temporary fencing with sound-absorbing material) for stationary equipment.
Restore	Not applicable (noise is temporary).
Offset	Not applicable.

Additional Measures:

- Provide appropriate PPE (ear muffs with 31 dB NRR or ear plugs) to workers in high-noise zones (>85 dB).
- Post signage at high-noise area boundaries.
- Conduct baseline and periodic noise monitoring at nearest sensitive receptors.

Responsibility: Contractor

Cost Estimate (USD): 1,000

ix. Cultural Heritage and Chance Finds

Cause and Comment:

The project area has been occupied for generations by Mang'anja and Sena communities. While no designated or registered cultural heritage sites (burial grounds, sacred groves, historical structures) have been identified within the irrigation block footprint, the potential exists for chance finds during excavation, earthworks, and land preparation. Chance finds may include archaeological remains (pottery, stone tools, ironworking remnants), human remains, burial sites, or culturally significant objects. Disturbance or destruction of such finds without proper handling would violate the Monuments and Relics Act (1990), cause significant cultural harm to local communities, and risk project delays and reputational damage.

Mitigation Measures (applying mitigation hierarchy):

Hierarchy Level	Measure
Avoid	Conduct a pre-construction cultural heritage walkover survey in areas of ground disturbance (borrow pits, reservoir site, major canal alignments) in consultation

Hierarchy Level	Measure
	with local elders and the Department of Antiquities. Use survey results to avoid known or suspected heritage sites.
Minimize	Include a Chance Find Procedure in the Contractor's site-specific management plans, approved by PMT prior to construction. Train all construction personnel on the Chance Find Procedure. Designate a site officer responsible for receiving and acting on chance find reports.
Restore	Upon discovery of any potential cultural heritage object or human remains, work shall cease within a 50-meter radius. The Contractor shall immediately notify the PMT, who shall notify the Department of Antiquities within 48 hours. No further disturbance shall occur until the Department of Antiquities has assessed the find and issued instructions for salvage, protection, or relocation. If human remains are discovered, the Department of Antiquities shall coordinate with local traditional authorities and the community on appropriate handling and reburial protocols.
Offset	Not applicable.

Responsibility: Contractor (immediate response), PMT (notification and coordination), Department of Antiquities (assessment and direction)

Cost Estimate (USD): 1,000

x. Community Health, Safety and Security Risks

Cause and Comment:

Construction activities introduce multiple risks to surrounding communities beyond those addressed in individual impact subsections. These include risks to community members (particularly children and elderly) from construction traffic, unsecured excavations and borrow pits, unattended construction materials, and unauthorized site access. Security risks include theft of construction materials and equipment (which may lead to community members being injured or arrested), potential conflicts between workers and community members over resources (water, firewood, local services), and increased risk of road traffic accidents. Children are particularly vulnerable to drowning in excavations, borrow pits, or canals.

Mitigation Measures (applying mitigation hierarchy):

Hierarchy Level	Measure
Avoid	Locate construction camps, borrow pits, and high-risk activities away from community settlements, schools, and water points where feasible. Schedule transport of heavy materials outside school opening and closing hours (07:00-08:00 and 13:00-14:00) near schools.
Minimize	Fence or securely barrier all excavations deeper than 1.5 meters, borrow pits, and the Night Storage Reservoir during construction. Install warning signs (in Chichewa, Chisena, and pictograms) around hazardous areas. Enforce speed limits for construction vehicles (maximum 30 km/h on unpaved roads, 15 km/h near schools and settlements). Provide dedicated pedestrian walkways or crossing points where construction traffic routes intersect community pathways. Secure construction sites with fencing or guards after hours to prevent unauthorized entry. Implement a community security awareness programme covering risks of entering construction sites, swimming in borrow pits, and approaching heavy machinery. Establish a Community Liaison Officer position to receive and address community safety concerns.
Restore	Maintain a first-aid post accessible to community members for emergency treatment of injuries. Provide prompt medical referral for any community member injured by project activities, with costs borne by the Contractor.
Offset	Not applicable.

Additional Measures:

- Establish a community reporting mechanism for safety hazards through the GRM.
- Conduct regular community safety meetings to raise awareness and receive feedback.

Responsibility: Contractor, PMT, Community Liaison Officer, GRM Committee

Cost Estimate (USD): 2,000,

xi. Comprehensive Occupational Health and Safety Hazards

Cause and Comment:

Construction and operation of the irrigation scheme expose workers to a wide range of occupational health and safety hazards. The hot semi-arid climate (temperatures exceeding 38°C) creates risks of heat stress, dehydration, and heat stroke. Heavy machinery operation poses risks of struck-by injuries, crushing, entrapment, and rollovers. Working near water

creates drowning risks. Manual handling poses risks of musculoskeletal injury. Noise poses risk of hearing loss. Dust poses respiratory risks. Excavation work poses risks of collapse. Working at height poses fall risks. Electrical hazards exist from pumping systems and solar installations. Agrochemical handling poses risks of poisoning and dermatitis. Fatigue increases accident risk. Psychosocial risks include stress, harassment, and GBV/SEA.

Mitigation Measures (applying hierarchy of controls: elimination → substitution → engineering controls → administrative controls → PPE):

Hazard Category	Specific Hazard	Mitigation Measures (by control hierarchy)
Thermal stress	Heat stroke, dehydration, heat exhaustion	Elimination: Schedule heavy work during cooler hours (06:00-10:00 and 15:00-18:00). Administrative: Mandatory rest breaks (15 minutes every 2 hours in hot conditions); shaded rest areas; acclimatization period for new workers (7 days). PPE: Lightweight, breathable clothing; wide-brimmed hats; sunscreen. Monitoring: Daily temperature monitoring; enforce work cessation when wet bulb globe temperature exceeds 30°C.
Heavy machinery	Struck-by, crushing, rollovers, entrapment	Elimination: Use machinery only where necessary; maintain exclusion zones. Engineering: Backup cameras, audible reverse alarms, rollover protection structures. Administrative: Exclusion zones (minimum 10 meters from operating machinery); spotter for reverse operations; daily pre-start equipment checks; licensed operators only. PPE: High-visibility vests, hard hats, steel-toed boots.
Drowning	Canal, reservoir, borrow pit immersion	Elimination: Fence Night Storage Reservoir and deep excavations. Engineering: Safety ladders in canals; life rings at reservoir. Administrative: No swimming; two-person rule for work near water; life jackets for over-water work. PPE: Life jackets (Type II or III).

Hazard Category	Specific Hazard	Mitigation Measures (by control hierarchy)
Excavation/trenching	Collapse, entrapment, falling objects	Elimination: Avoid trenches deeper than 1.5 meters where possible. Engineering: Shoring, shielding, or sloping (1:1 for cohesive soil, 1.5:1 for granular). Administrative: Competent person daily inspection; spoil piles minimum 1 meter from trench edge; means of egress every 7.5 meters. PPE: Hard hats, steel-toed boots.
Working at height	Falls from elevation	Elimination: Design ground-level maintenance access where feasible. Engineering: Guardrails at 1.1 meters; safety nets. Administrative: Fall arrest systems; ladder inspection; no work at height during high winds. PPE: Full-body harness with lanyard; hard hats.
Noise	Hearing loss, stress	Elimination: Electric pumps instead of diesel where feasible. Engineering: Enclose noisy pumps; silencers on machinery. Administrative: Rotate workers to limit exposure (maximum 8 hours at 85 dB; 50 percent reduction per 3 dB increase); signage at high-noise areas. PPE: Ear muffs (31 dB NRR) or ear plugs; mandatory in >85 dB zones.
Dust	Respiratory illness, silicosis	Elimination: Wet methods for cutting/drilling. Engineering: Dust suppression (water spraying); windbreaks. Administrative: Speed limits on unpaved roads (30 km/h). PPE: N95 or P100 respirators in dusty conditions.
Manual handling	Musculoskeletal injury	Engineering: Mechanical lifting aids (cranes, hoists, wheelbarrows). Administrative: Team lifting (>20 kg requires two persons); training on proper lifting technique; weight limits (maximum 25 kg per person). PPE: Gloves with grip, back belts (as reminder only).

Hazard Category	Specific Hazard	Mitigation Measures (by control hierarchy)
Agrochemical exposure (operation phase)	Poisoning, dermatitis, respiratory illness	Elimination: IPM to reduce chemical use. Substitution: Lower-toxicity chemicals. Engineering: Closed mixing systems; ventilation in storage areas. Administrative: Certified applicators only; restricted entry intervals; washing facilities. PPE: Chemical-resistant gloves, coveralls, respirator, goggles.
Electrical	Shock, electrocution, fire	Elimination: Lockout/tagout (LOTO) for maintenance. Engineering: Ground fault circuit interrupters (GFCIs); insulation; guarding. Administrative: Licensed electricians only; daily visual inspection; LOTO procedures. PPE: Insulated gloves, rubber-soled boots.
Psychosocial	Stress, fatigue, harassment, GBV/SEA	Elimination: Prohibit harassment, GBV/SEA through Code of Conduct with enforcement. Administrative: Maximum 48-hour work week (8 hours/day, 6 days/week); paid leave; worker GRM; confidential reporting mechanism; training on respect and harassment prevention. Support: Access to counseling services; referral pathways for GBV/SEA survivors.

Responsibility: Contractor (construction), Cooperative/WUA (operation), PMT (oversight), Ministry of Labour (compliance monitoring)

Monitoring Indicators:

- Incident frequency rate (IFR) and severity rate (monthly)
- PPE compliance rate (target >95 percent)
- Heat stress incidents (number, severity)
- Near-miss reports by category
- Worker satisfaction with safety (through quarterly surveys)
- GBV/SEA reports and response times

Cost Estimate (USD): 4,000

9.1.3 Operation and Maintenance Phase

9.1.3.1 Positive Impacts

i. Increased Crop Production

Cause and Comment:

The availability of water for irrigation will enable farmers to cultivate more than twice per year, increasing crop production in the project area. Reliable irrigation water supply reduces dependence on erratic rainfall and allows multiple cropping cycles, leading to improved agricultural productivity and more stable food production throughout the year.

Enhancement Measures (applying enhancement hierarchy):

Hierarchy Level	Measure
Enable	Provide access to water-saving irrigation technologies (drip, sprinkler, center pivot) and improved hybrid seeds suitable for the semi-arid climate.
Strengthen	Train farmers on Good Agricultural Practices (GAPs), irrigation scheduling, and crop management through Water User Associations and farmer field schools. Promote climate-resilient crop varieties to enhance sustainability under changing climatic conditions.
Sustain	Establish demonstration plots and farmer-to-farmer extension networks to maintain knowledge transfer beyond the project period.

Responsibility: Cooperative, Extension Services, PMT

Cost Estimate (USD): 2,000

ii. Increased Income at Household Level

Cause and Comment:

People participating in irrigation activities will increase their income through sale of agricultural produce. Increased production and market access will enhance household income, improve purchasing power, and contribute to poverty reduction in the project area.

Enhancement Measures:

Hierarchy Level	Measure
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Enable	Link farmers to reliable markets through contract farming arrangements and cooperative marketing. Provide training in financial management and agribusiness.
Strengthen	Facilitate access to agricultural credit and savings groups. Support value addition through post-harvest handling, storage, and processing.
Sustain	Establish market information systems (mobile-based price alerts) and long-term buyer relationships.

Responsibility: PMT, Cooperative, Agribusiness Specialist

Cost Estimate (USD): 1,500

iii. Improved Nutrition Status of Communities

Cause and Comment:

Increased food availability and diversity in the project area is likely to improve nutrition status of community members. Greater availability of diverse crops contributes to improved dietary diversity and food security, particularly for vulnerable households.

Enhancement Measures:

Hierarchy Level	Measure
Enable	Encourage farmers to grow diverse crops, including legumes, vegetables, and fruits, through seed distribution and training.
Strengthen	Train farmers on nutrition-sensitive agriculture and home gardening. Conduct nutrition awareness campaigns targeting women and caregivers.
Sustain	Integrate nutrition education into WUA activities and school programs.

Responsibility: Extension Services, Department of Health, Cooperative

Cost Estimate (USD): 1,000

iv. Improved Linkage of Farmers to Markets

Cause and Comment:

The Department of Irrigation through SVTP will link farmers to different markets, enabling them to sell produce at better prices. Improved market access reduces post-harvest losses and enhances profitability, thereby incentivizing increased production.

Enhancement Measures:

Hierarchy Level	Measure
Enable	Identify reliable and profitable markets through market assessments. Facilitate contract farming arrangements with off-takers.
Strengthen	Support formation of farmer cooperatives for collective bargaining. Provide storage facilities to allow timing of sales to optimize prices.
Sustain	Establish long-term market linkages and cooperative marketing structures.

Responsibility: PMT, Cooperative, Agribusiness Specialist

Cost Estimate (USD): 1,000

v. Skills Transfer to Farmers

Cause and Comment:

The Department of Irrigation through SVTP will engage consultants to train farmers through Water User Associations on GAPs, water-saving technologies, and value chain development. Capacity building enhances farmers' technical knowledge and improves efficiency, productivity, and long-term sustainability of irrigation practices.

Enhancement Measures:

Hierarchy Level	Measure
Enable	Facilitate farmer field schools and demonstration plots. Provide extension services through trained WUA lead farmers.
Strengthen	Deliver structured training modules covering agronomy, irrigation management, pest control, financial literacy, and cooperative governance.
Sustain	Establish farmer-to-farmer extension networks and refresher training programs. Certify trained farmers where possible.

Responsibility: Extension Services, PMT, Cooperative

Cost Estimate (USD): 1,500

vi. Increased Knowledge Transfer to Agricultural Students

Cause and Comment:

The availability of well-managed irrigation fields will attract students for practical learning. The project area can serve as a demonstration site for irrigation practices, supporting agricultural education and capacity building.

Enhancement Measures:

Hierarchy Level	Measure
Enable	Facilitate access to demonstration plots for agricultural colleges and universities.
Strengthen	Promote partnerships between the scheme and academic institutions for research, internships, and practical training.
Sustain	Develop training materials and case studies based on scheme experience for use in curricula.

Responsibility: Cooperative, PMT, Ministry of Education

Cost Estimate (USD): 1000

vii. Improved Availability of Water to Surrounding Communities

Cause and Comment:

During operation, water stored in the Night Storage Reservoir and flowing through irrigation canals may improve access to water for surrounding communities, particularly during dry months. Improved water availability can support domestic use and small-scale productive activities, enhancing community resilience during dry periods. Note: The project does not include construction of a dam on the Shire River; water abstraction is from the existing Kapichira Dam, which is part of the broader SVTP infrastructure.

Enhancement Measures:

Hierarchy Level	Measure
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Enable	Provide controlled access to water from the Night Storage Reservoir and canals for domestic use by surrounding communities, subject to water availability and quality standards.
Strengthen	Develop agreements between the Cooperative and surrounding communities on water sharing during dry periods.
Sustain	Integrate community water access into WUA water allocation plans.

Responsibility: WUA, Cooperative, NWRA

Cost Estimate (USD): 1,000

viii. Aquatic Biodiversity Conservation

Cause and Comment:

Maintained water flow will support aquatic biodiversity in the catchment. Environmental flows are important for sustaining aquatic ecosystems, maintaining species diversity, and supporting downstream ecological functions.

Enhancement Measures:

Hierarchy Level	Measure
Enable	Release water downstream to sustain aquatic life as required by water abstraction permit conditions. Install fish-friendly screens on pump intakes to prevent fish entrainment.
Strengthen	Monitor water flows and aquatic biodiversity to ensure ecological balance is maintained. Coordinate with other SVTP cooperatives on cumulative flow management.
Sustain	Establish long-term environmental flow commitments in water user agreements.

Responsibility: PMT, NWRA, Cooperative

Cost Estimate (USD): 1,500

9.1.3.2 Negative Impacts

i. Increased Risk of Water Logging Conditions

Cause and Comment:

Poor water application methods can cause accumulation of water in soil pores, leading to waterlogging. This condition reduces soil aeration, adversely affects crop growth, and creates favorable conditions for vector-borne diseases, particularly malaria.

Mitigation Measures (applying mitigation hierarchy):

Hierarchy Level	Measure
Avoid	Design self-draining irrigation structures (field canals with adequate slope). Avoid over-irrigation through proper system design.
Minimize	Train farmers in best irrigation practices, including scheduling based on crop water requirements and soil moisture monitoring. Promote proper irrigation scheduling to avoid over-application of water. Install drainage systems (field drains, collector drains) with adequate capacity.
Restore	Regularly maintain drainage systems to prevent clogging and stagnation. Where waterlogging occurs, install additional drainage or transition to better-drained crops.
Offset	Not applicable.

Responsibility: WUA, Cooperative, Extension Services

Cost Estimate (USD): 2,000

ii. Increased Risk of Child Labour

Cause and Comment:

During operation, some farmers may engage under-aged persons to provide cheap labour. This risk is associated with increased labour demand in irrigated farming systems and weak enforcement of labour standards.

Mitigation Measures (applying mitigation hierarchy):

Hierarchy Level	Measure
Avoid	Engage only persons aged 18 years and above as workers on the scheme. Include age verification in recruitment procedures.

Minimize	Sensitize farmers on dangers of child labour and legal consequences through WUA meetings and IEC materials. Work with local authorities and community leaders to enforce compliance with labour laws (Employment Act 2000). Display child labour prohibition notices at scheme entry points.
Restore	If child labour is detected, report to Ministry of Labour and social welfare authorities. Support referral of child to education or social services.
Offset	Not applicable.

Additional Measures:

- Integrate child protection awareness into WUA activities and cooperative by-laws.
- Conduct regular monitoring of labour practices on scheme farms.

Responsibility: Cooperative, WUA, Ministry of Labour, Local Authorities

Cost Estimate (USD): 1,500

iii. Increased Risk of Disruption of Children's Education

Cause and Comment:

Engagement of school-going children in farming activities may disrupt their education, leading to absenteeism and poor academic performance. This may have long-term socio-economic implications by limiting educational attainment and future opportunities for children.

Mitigation Measures (applying mitigation hierarchy):

Hierarchy Level	Measure
Avoid	Prohibit engagement of school-aged children during school hours. Schedule farm activities that require family labour outside school hours (early morning, late afternoon, weekends, school holidays).
Minimize	Sensitize parents on importance of education through community meetings and schools. Develop cooperative by-laws that penalize members who regularly withdraw children from school for farm work.
Restore	Collaborate with schools and community leaders to monitor school attendance and identify at-risk children. Support re-enrollment of children who have dropped out.
Offset	Not applicable.

Responsibility: Cooperative, WUA, Schools, Local Authorities

Cost Estimate (USD): 1,000

iv. Increased Risk of Pollution of Water from Agrochemicals

Cause and Comment:

Use of fertilizers, herbicides, and pesticides may lead to water and soil pollution. Agrochemical runoff may degrade water quality, affect aquatic ecosystems, and pose health risks to downstream users.

Mitigation Measures (applying mitigation hierarchy):

Hierarchy Level	Measure
Avoid	Promote Integrated Pest Management (IPM) to reduce reliance on chemical inputs. Establish buffer zones (minimum 30 meters) between cultivated areas and water bodies where no agrochemicals are applied.
Minimize	Restrict use to approved pesticides only (registered with Pesticides Control Board). Ensure proper selection, timing, and application rates based on extension recommendations. Train farmers on safe handling, storage, and disposal of agrochemicals. Use precision application equipment to reduce overspray and drift.
Restore	Where contamination occurs, report to MEPA and implement remediation measures (e.g., removal of contaminated soil, bioremediation).
Offset	Not applicable.

Additional Measures:

- Construct toilets for farmers at field locations to prevent open defecation.
- Provide potable water through boreholes to reduce need for surface water use.
- Promote organic farming practices where feasible.
- Implement triple-rinsing of agrochemical containers and disposal through collection systems.

Responsibility: Extension Services, Cooperative, Pesticides Control Board

Cost Estimate (USD): 2,500

v. Risk of Increased Incidences of HIV and AIDS and STIs

Cause and Comment:

Continued interaction between workers, traders, and communities may increase the risk of transmission of HIV and other STIs. Increased economic activity and mobility during operation may sustain behavioral risk factors associated with disease transmission.

Mitigation Measures (applying mitigation hierarchy):

Hierarchy Level	Measure
Avoid	Recruit labour locally where possible to reduce influx of workers from high-prevalence areas.
Minimize	Conduct awareness campaigns on HIV prevention, testing, and treatment through WUA meetings and community events. Distribute condoms at scheme offices and health posts. Provide IEC materials (posters, brochures) in local languages. Partner with local health services to provide on-site voluntary counseling and testing (VCT) services.
Restore	Establish referral pathways to Chikwawa District Hospital and local health centers for HIV care and treatment. Coordinate with District Health Office on post-exposure prophylaxis (PEP) for occupational exposures.
Offset	Not applicable.

Additional Measures:

- Integrate HIV/AIDS education into farmer group activities and cooperative governance training.
- Prohibit discrimination against people living with HIV in employment or cooperative membership.

Responsibility: Department of Health, Cooperative, WUA, NGOs/CSOs

Cost Estimate (USD): 2,000

vi. Increased Risk of Water-Related Diseases

Cause and Comment:

Stagnant water in canals may create conditions for malaria and bilharzia (schistosomiasis). Poor sanitation may lead to diarrheal diseases (cholera, typhoid, dysentery). Irrigation systems can increase exposure to water-related diseases if not properly managed.

Mitigation Measures (applying mitigation hierarchy):

Hierarchy Level	Measure
Avoid	Design canals with adequate slope (minimum 0.05 percent) to prevent stagnation. Avoid creating permanent pools or low-flow zones.
Minimize	Maintain canals and drainage systems regularly to prevent vegetation overgrowth and sediment accumulation that creates vector habitat. Promote use of insecticide-treated nets (ITNs) through distribution campaigns and education. Conduct regular health awareness campaigns on water-related disease prevention. Implement community-led total sanitation (CLTS) to reduce open defecation.
Restore	Where disease outbreaks occur, coordinate with District Health Office on vector control (indoor residual spraying, larviciding) and case management. Provide water treatment supplies (chlorine, Waterguard) during outbreak periods.
Offset	Not applicable.

Additional Measures:

- Encourage use of PPE (boots) in waterlogged areas to reduce bilharzia exposure.
- Construct and maintain adequate toilet facilities at scheme offices and field locations.

Responsibility: Department of Health, WUA, Cooperative

Cost Estimate (USD): 3,000

vii. Increased Risk of Contracting Communicable and Emerging Infectious Diseases (including COVID-19, Mpox, and Cholera)**Cause and Comment:**

Large numbers of people working together may increase transmission risks of communicable diseases. Cholera is endemic in Chikwawa District, with outbreaks typically during the rainy season. COVID-19 remains a risk during periods of new variant circulation. Mpox (monkeypox) has been reported in Malawi, with transmission risks associated with contact with infected animals (rodents, primates) and close human-to-human contact. High interaction levels among farmers and traders facilitate spread.

Mitigation Measures (applying mitigation hierarchy):

Hierarchy Level	Measure
Avoid	Recruit labour locally to reduce disease introduction. Avoid worker camps in flood-prone areas where waterborne disease risk is elevated.
Minimize	Implement vaccination campaigns for workers where vaccines available (cholera, COVID-19) in coordination with District Health Office. Provide handwashing stations with soap and safe water at all project sites. Maintain adequate sanitation facilities. Conduct daily health screening (temperature checks, symptom questionnaires) during outbreak periods. Sensitize workers and communities on transmission routes, symptoms, and prevention measures for cholera, COVID-19, Mpox, and other endemic diseases using IEC materials in local languages. For Mpox specifically: Educate workers to avoid contact with sick or dead animals, practice hand hygiene, use PPE when handling potentially infected animals or persons, and report suspected cases immediately.
Restore	Establish referral pathways to Chikwawa District Hospital for diagnosis and treatment. Stock adequate supplies of oral rehydration solution (ORS) at scheme offices. Coordinate with District Health Office on disease surveillance, contact tracing, and outbreak response. Isolate suspected cases and arrange for medical evaluation without delay.
Offset	Not applicable.

Responsibility: Contractor (construction), Cooperative/WUA (operation), Department of Health, District Health Office

Cost Estimate (USD): 2,000

viii. Increased Risk of Generation of Greenhouse Gases (GHGs)

Cause and Comment:

Irrigated agriculture may generate greenhouse gases such as methane, carbon dioxide, and nitrous oxide. Waterlogged conditions promote methane production. Fertilizer use (particularly nitrogen fertilizers) leads to nitrous oxide emissions. Both are potent greenhouse gases.

Mitigation Measures (applying mitigation hierarchy):

Hierarchy Level	Measure
Avoid	Regulate water application to prevent waterlogging and anaerobic conditions. Use alternate wetting and drying (AWD) irrigation where suitable for crops.
Minimize	Improve fertilizer management through soil testing and precision application. Use nitrification inhibitors or slow-release fertilizers. Promote efficient irrigation practices (drip, sprinkler) over flood irrigation.
Restore	Not applicable.
Offset	Encourage climate-smart agriculture approaches that sequester carbon (agroforestry, conservation tillage, cover cropping). Tree planting programme (1,300,000 trees) will sequester carbon over time.

Responsibility: Extension Services, Cooperative

Cost Estimate (USD): 1,500

ix. Increased Risk of Water Use Conflict

Cause and Comment:

The Shire River is a shared resource, and downstream users (including the Katunga-Maseya Cane Growers Association and other cooperatives) may be affected by upstream abstraction. Competing demands may lead to conflicts, especially during dry periods when river flows are low.

Mitigation Measures (applying mitigation hierarchy):

Hierarchy Level	Measure
Avoid	Design irrigation system for maximum water efficiency (pressurized systems selected) to minimize abstraction volumes.
Minimize	Obtain water abstraction permits from NWRA with clearly defined allowable volumes and periods. Implement WUA-based water allocation systems with transparent rules. Coordinate abstraction schedules with other SVTP cooperatives to manage cumulative impacts. Monitor water abstraction and maintain records for NWRA audit.
Restore	If conflict arises, use GRM and WUA dispute resolution mechanisms. Escalate to NWRA for mediation if needed.

Offset	Not applicable.
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Responsibility: WUA, Cooperative, NWRA, PMT

Cost Estimate (USD): 2,000

x. Increased Risk of Injuries to Maintenance Workers and Farmers

Cause and Comment:

Workers and farmers may be exposed to occupational risks during maintenance of the Night Storage Reservoir, pumping stations, and irrigation infrastructure. Risks arise from working near water, using hand and power tools, operating equipment, and environmental conditions (heat, fatigue).

Mitigation Measures (applying mitigation hierarchy):

Hierarchy Level	Measure
Avoid	Design infrastructure for safe access and maintenance (walkways, guardrails, non-slip surfaces).
Minimize	Provide task-appropriate PPE for maintenance activities (gloves, safety glasses, hard hats, life jackets when working near water). Train workers on safe work procedures and equipment use. Establish lockout/tagout procedures for electrical and mechanical maintenance.
Restore	Maintain first-aid kits and trained first-aiders at scheme offices. Establish emergency response procedures for injuries.
Offset	Not applicable.

Responsibility: Cooperative, WUA

Cost Estimate (USD): 2,000

xi. Reduced Availability of Water Downstream

Cause and Comment:

Abstraction of water from the Shire River for irrigation may reduce downstream flows during dry periods, potentially affecting downstream users (including the Katunga-Maseya Cane Growers Association and other cooperatives) and aquatic ecosystems. The project involves abstraction from the existing Kapichira Dam, which has established operating rules under the broader SVTP.

Mitigation Measures (applying mitigation hierarchy):

Hierarchy Level	Measure
Avoid	Design efficient irrigation system to minimize abstraction volumes relative to irrigated area.
Minimize	Comply with water abstraction permit conditions, including maximum abstraction volumes and periods. Maintain environmental flows as specified by the National Water Resources Authority. Coordinate water abstraction with other SVTP cooperatives to manage cumulative impacts.
Restore	Monitor downstream flows and adjust abstraction if ecological or user impacts are detected. If impacts occur, implement compensatory measures (e.g., water releases during critical dry periods).
Offset	Not applicable.

Responsibility: PMT, NWRA, Cooperative

Cost Estimate (USD): 2,500

xii. Increased Growth and Proliferation of Disease Vectors**Cause and Comment:**

Permanent water bodies (canals, Night Storage Reservoir) may promote breeding of disease vectors, particularly mosquitoes (malaria) and snails (bilharzia/schistosomiasis).

Mitigation Measures (applying mitigation hierarchy):

Hierarchy Level	Measure
Avoid	Design canals with adequate slope and flow velocity to prevent stagnation. Avoid creating permanent pools in drainage systems.
Minimize	Maintain canals regularly to remove vegetation and sediment that create vector habitat. Promote use of insecticide-treated nets. Implement vector control measures (larviciding, biological control using larvivorous fish) in coordination with District Health Office.
Restore	During disease outbreaks, support indoor residual spraying (IRS) and case management.
Offset	Not applicable.

Responsibility: Department of Health, WUA, Cooperative

Cost Estimate (USD): 2,000

xiii. Increased Exposure to Agrochemicals

Cause and Comment:

Handling agrochemicals poses health risks to farmers and workers. Improper use may lead to acute poisoning (skin contact, inhalation, ingestion) and chronic health effects (cancer, reproductive harm, neurological damage).

Mitigation Measures (applying mitigation hierarchy):

Hierarchy Level	Measure
Avoid	Promote IPM and organic farming to eliminate or reduce chemical use.
Minimize	Restrict use of only approved pesticides (registered with Pesticides Control Board). Train farmers on safe handling, mixing, application, storage, and disposal. Implement restricted entry intervals after application (24-72 hours depending on chemical). Provide washing facilities for decontamination.
Restore	If poisoning occurs, provide first aid and transport to health facility. Report occupational poisonings to Ministry of Labour.
Offset	Not applicable.

Additional Measures:

- Provide appropriate PPE (chemical-resistant gloves, coveralls, respirator, goggles) for pesticide applicators.
- Establish no-spray zones near water bodies, homes, and schools.

Responsibility: Extension Services, Cooperative, Pesticides Control Board

Cost Estimate (USD): 2,000

xiv. Increased Generation of Hazardous Waste

Cause and Comment:

Agrochemical use generates hazardous waste (empty containers, unused product, rinsate, contaminated PPE). Improper disposal may contaminate soil and water.

Mitigation Measures (applying mitigation hierarchy):

Hierarchy Level	Measure
Avoid	Minimize chemical use through IPM. Purchase only required quantities.
Minimize	Implement triple-rinse of containers; use rinsate as diluted application. Establish container collection system for recycling (where available) or disposal through licensed hazardous waste facility. Train farmers on safe disposal methods.
Restore	If contamination occurs, report to MEPA and implement remediation.
Offset	Not applicable.

Responsibility: Cooperative, WUA, District Council, Pesticides Control Board

Cost Estimate (USD): 1,500

xv. Increase in Spread of Zoonotic Diseases**Cause and Comment:**

Rearing of livestock (goats, pigs, cattle, poultry) within the scheme may increase risk of zoonotic disease transmission (e.g., anthrax, brucellosis, rabies, leptospirosis, avian influenza) if care is not taken.

Mitigation Measures (applying mitigation hierarchy):

Hierarchy Level	Measure
Avoid	Maintain separation between livestock areas and crop production areas. Exclude livestock from water bodies used for human consumption.
Minimize	Practice proper livestock handling and hygiene (handwashing after contact, use of PPE). Adhere to recommended stocking capacity (maximum 20 livestock units per household). Vaccinate livestock against endemic zoonotic diseases (e.g., anthrax, rabies).
Restore	If zoonotic disease is suspected, report to veterinary and health authorities immediately. Quarantine affected animals.
Offset	Not applicable.

Responsibility: Cooperative, Department of Animal Health and Livestock Development

Cost Estimate (USD): 1,500

xvii. Increase in Generation of Wastewater

Cause and Comment:

Mitigation Measures (applying mitigation hierarchy):

Hierarchy Level	Measure
Avoid	Minimize water use in facilities through water-efficient fittings.
Minimize	Provide pit latrines or septic tanks with soak ways for office and field wastewater.
Restore	If wastewater discharge is necessary, install sedimentation ponds or constructed wetlands to capture and treat effluent before it enters natural waterways.
Offset	Not applicable.

Responsibility: Cooperative

Cost Estimate (USD): 1,500

xviii. Increase in Theft and Vandalism Cases

Cause and Comment:

Availability of farm inputs, equipment, and infrastructure (solar panels, pumps, pipes) at the irrigation block may attract thieves and vandals, leading to economic losses and potential danger to community members involved in theft (electrocution, injury).

Mitigation Measures (applying mitigation hierarchy):

Hierarchy Level	Measure
Avoid	Design infrastructure with anti-theft features (locking mechanisms, concealed wiring, tamper-proof fasteners).
Minimize	Conduct sensitization meetings with communities on consequences of theft and vandalism. Facilitate formation of community policing committees in coordination with Malawi Police Service. Install security lighting, fencing, and where feasible, cameras or alarms at critical

	infrastructure (pump house, solar array, Night Storage Reservoir). Engage night guards for high-value assets.
Restore	If theft or vandalism occurs, report to police immediately. Implement repairs or replacement. Use GRM to receive anonymous tips.
Offset	Not applicable.

Responsibility: Cooperative, WUA, Local Leaders, Malawi Police Service

Cost Estimate (USD): 2,000

xix. Increased Risk of Human-Wildlife Conflict – Hippopotamus and Crocodile

Cause and Comment:

The Shire River supports populations of hippopotamus (*Hippopotamus amphibius*) and Nile crocodile (*Crocodylus niloticus*). Local communities and the SVTP baseline survey have reported that hippos occasionally emerge from the river to forage on crops in fields adjacent to the floodplain, particularly at night. Crocodiles pose risks to humans, livestock, and domestic animals when accessing water points or working near riverbanks. The presence of the irrigation scheme, including the Night Storage Reservoir, canals, and irrigated crops, may increase the attractiveness of the project area to these animals, potentially elevating the frequency of human-wildlife encounters and crop raiding incidents. Risks include fatal or injurious attacks on farmers and workers, loss of livestock, destruction of crops, and psychological distress among community members.

Mitigation Measures (applying mitigation hierarchy):

Hierarchy Level	Measure
Avoid	Site the Night Storage Reservoir, pumping stations, and worker accommodation away from known hippo pathways and crocodile basking areas, based on consultation with local communities and Department of National Parks and Wildlife (DNPW). Design the reservoir with sloping sides or fencing to prevent hippo entry.

Hierarchy Level	Measure
Minimize	Install perimeter fencing (game-proof or chain-link) around the Night Storage Reservoir and critical infrastructure where feasible and cost-effective. Maintain a clear visual buffer (minimum 50 meters of cleared vegetation) around the reservoir and major canals to reduce cover for approaching animals. Install motion-activated lighting or acoustic deterrents at night around high-risk areas (reservoir, pump house). Schedule maintenance and farming activities in high-risk zones during daylight hours only. Train farmers and workers on safe behavior: avoiding the river at dawn/dusk, traveling in groups, maintaining distance from wildlife, and reporting sightings.
Restore	Establish a community-based wildlife reporting and rapid response system linked to DNPW and local police. Coordinate with DNPW on any translocation or management interventions; no unauthorized killing or harming of protected species shall occur. Develop a compensation or insurance mechanism for verified crop losses or livestock predation attributable to hippo or crocodile, in consultation with DNPW and the Cooperative.
Offset	Not applicable.

Responsibility: WUA, Cooperative, DNPW, PMT

Cost Estimate (USD): 2,500

xx. Increased Risk of Salinization

Cause and Comment:

Excessive use of chemical fertilizers and poor drainage can lead to increased soil salinity, acidity, and alkalinity over time. Salinization reduces soil productivity and may render land unsuitable for agriculture.

Mitigation Measures (applying mitigation hierarchy):

Hierarchy Level	Measure
Avoid	Apply fertilizers at recommended rates based on soil testing; avoid over-application. Design drainage systems to prevent waterlogging and salt accumulation.

Hierarchy Level	Measure
Minimize	Apply organic matter (compost, manure) to soils to improve structure and leach salts. Promote effective and efficient use of irrigation water (avoid over-irrigation). Regularly maintain irrigation and drainage channels for improved seepage and flow. Clear clogged channels to allow water to flow. Conduct periodic soil salinity monitoring.
Restore	If salinization is detected, implement remediation measures (leaching, application of gypsum, transition to salt-tolerant crops).
Offset	Not applicable.

Responsibility: Extension Services, Cooperative, WUA

Cost Estimate (USD): 2,000

9.1.4 Decommissioning Phase

9.1.4.1 Positive Impacts

i. Increased Aesthetic Value

Cause and Comment:

Cessation of construction activities and demolition of construction camps will lead to a cleaner environment in the project area.

Enhancement Measures:

Hierarchy Level	Measure
Enable	Rehabilitate all borrow pits created during construction phase. Revegetate all areas stripped of vegetative cover due to construction works.
Strengthen	Remove all construction waste and dispose of in designated areas in liaison with Chikwawa District Council.
Sustain	Maintain restored areas through monitoring and follow-up planting.

Responsibility: Contractor, MEPA, District Council

Cost Estimate (USD): 2,500

ii. Reduced Noise Levels

Cause and Comment:

Cessation of construction works will lead to reduced noise levels as construction machinery will no longer operate on the site.

Enhancement Measures:

Hierarchy Level	Measure
Enable	Service all construction machinery for use in other projects elsewhere.
Strengthen	Not applicable.
Sustain	Not applicable.

Responsibility: Contractor

Cost Estimate (USD): 1000

iii. Reduced Exposure of Workers to Public Health and Safety Risks

Cause and Comment:

Cessation of construction works will reduce exposure of workers to public health and safety risks arising from construction activities.

Enhancement Measures:

Hierarchy Level	Measure
Enable	Encourage surrounding communities to sleep under insecticide-treated mosquito nets.
Strengthen	Rehabilitate all borrow pits created during construction phase to remove drowning and vector breeding hazards.
Sustain	Not applicable.

Responsibility: Contractor, Department of Health

Cost Estimate (USD): 1,000,00

5.3.4.2 Negative Impacts

i. Loss of Employment

Cause and Comment:

After construction activities, the contractor will lay off workers. This impact will certainly occur and reduce incomes for persons who were working under the project. Shortage of incomes would contribute to food insecurity within families. Abrupt loss of income may negatively affect household welfare, particularly for low-income workers who relied on construction employment as their primary livelihood source.

Mitigation Measures (applying mitigation hierarchy):

Hierarchy Level	Measure
Avoid	Phase demobilization to allow workers time to seek alternative employment.
Minimize	Give workers adequate written notice (minimum 30 days) of termination of employment. Provide appropriate terminal benefits at the end of employment as required by the Employment Act. Pay all outstanding wages and dues to minimize disputes.
Restore	Facilitate linkages to alternative employment opportunities where possible (e.g., referral to other contractors, Cooperative for operational-phase employment). Provide basic financial planning or livelihood transition guidance to affected workers.
Offset	Not applicable.

Responsibility: Contractor, PMT

Cost Estimate (USD): 2,000

ii. Reduction of Small-Scale Businesses within the Project Area

Cause and Comment:

Cessation of construction activities will lead to termination of employment for workers, resulting in reduced incomes. This will likely lead to a decline in small-scale businesses within the project area. Local businesses that depended on construction workers as customers may experience reduced demand, leading to income losses and possible closure of informal enterprises.

Mitigation Measures (applying mitigation hierarchy):

Hierarchy Level	Measure
Avoid	Not applicable (business decline is inevitable post-construction).
Minimize	Sensitize service providers and traders on the duration of construction at the outset so they can plan accordingly (e.g., avoid taking loans they cannot repay post-construction).
Restore	Encourage diversification of income sources among local traders. Support linkages to alternative markets beyond the project area, including the operational-phase Cooperative.
Offset	Not applicable.

Responsibility: PMT, District Council

Cost Estimate (USD): 1,500

iii. Increased Generation of Solid Wastes

Cause and Comment:

Demolition of temporary shelters and pit latrines as construction ends will result in increased generation of solid waste within the project area. Improper disposal may lead to land degradation, visual pollution, and potential health risks.

Mitigation Measures (applying mitigation hierarchy):

Hierarchy Level	Measure
Avoid	Design temporary structures for easy disassembly and material recovery.
Minimize	Allow surrounding communities to collect reusable materials (planks, iron sheets, bricks) before demolition. Segregate waste streams.
Restore	Use construction rubble to rehabilitate borrow pits. Dispose of non-recyclable waste at designated sites in liaison with Chikwawa District Council. Ensure proper site clean-up and restoration.
Offset	Not applicable.

Responsibility: Contractor, MEPA, District Council

Cost Estimate (USD): 2,500

10 ENVIRONMENTAL AND SOCIAL MANAGEMENT AND MONITORING PLANS

10.1 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP)

An Environmental and Social Management Plan (ESMP) has been developed to guide the mitigation, management, and monitoring of environmental and social impacts associated with the proposed Chikhambi/Mbenderana Irrigation Scheme under Mwana Alirenji Cooperative. The ESMP translates the impacts identified in Chapter 5 into specific, measurable, and enforceable actions to be implemented throughout the project lifecycle. The ESMP is designed as a living management instrument, recognizing that project risks, environmental conditions, and operational requirements may evolve. Accordingly, the ESMP will be subject to periodic review and updating to ensure continued relevance and effectiveness.

Table 14 presents the ESMP matrix covering pre-construction, construction, operation, and decommissioning phases. The matrix outlines potential impacts, mitigation and enhancement measures, responsible institutions, monitoring indicators, frequency, and associated costs. It serves as the primary implementation and compliance tool for environmental and social management, as well as a reference for supervision and audit.

Table 9: Environmental and Social Management Plan (ESMP)

9.1.1 Planning Phase

Impact	Mitigation / Enhancement Measures	Responsibility	Cost (MMK)	Cost (US\$)
Creation of employment	Engage qualified personnel for planning studies with at least 50% local participation	PMT	500,000	269
Anxiety on loss of land	Conduct stakeholder sensitization meetings and continuous information disclosure	PMT, District Council, Local Leaders	1,500,000	806
	Establish and operationalize GRM to address concerns	PMT, GRM Committees	1,000,000	538

Impact	Mitigation / Enhancement Measures	Responsibility	Cost (MMK)	Cost (US\$)
	Provide clear and accessible project information to affected communities	PMT	500,000	269

10.1.1 Construction Phase

Positive Impacts

Impact	Mitigation / Enhancement Measures	Responsibility	Cost (MWK)	Cost (US\$)
Employment creation	Engage at least 80% local labour; ensure fair wages and equal opportunity	Contractor, PMT	1,000,000	538
Increased economic activity	Promote local procurement and support small businesses	Contractor, PMT, District Council	500,000	269
Skills transfer	Implement structured on-the-job training and skills development programmes	Contractor	1,000,000	538
Government revenue	Ensure full compliance with tax obligations	Contractor		-

Negative Impacts

Impact	Mitigation / Enhancement Measures	Responsibility	Cost (MWK)	Cost (US\$)
Vegetation loss	Minimize clearing; implement reforestation and restoration measures	Contractor, Department of Forestry	3,000,000	1,613

Soil erosion	Install erosion control structures (e.g. drainage, contouring)	Contractor	2,500,000	1,344
Dust emissions	Regular water spraying; enforce speed limits	Contractor	2,000,000	1,075
Water pollution	Provide sanitation facilities; prevent discharge of pollutants	Contractor, MEPA	3,000,000	1,613
Noise pollution	Restrict working hours; maintain equipment	Contractor	1,500,000	806
Solid waste	Implement waste segregation and disposal at approved sites	Contractor, District Council	2,000,000	1,075
Borrow pits degradation	Rehabilitate borrow pits after use	Contractor, MEPA, District Council	2,500,000	1,344
Occupational health and safety risks	Provide PPE; enforce safety procedures; conduct training	Contractor	4,000,000	2,151
Labour influx impacts	Implement worker code of conduct; manage worker-community interactions	Contractor, PMT	2,000,000	1,075
HIV/AIDS and STIs	Conduct awareness campaigns and provide prevention materials	Contractor, Department of Health	2,500,000	1,344
GBV/SEA risks	Enforce Code of Conduct; establish reporting and response mechanisms	Contractor, PMT, NGOs/CSOs	3,000,000	1,613
Child labour	Enforce minimum age requirements and labour compliance	Contractor, PMT	1,000,000	538
Crime and security risks	Coordinate with local leaders and enforce site security measures	Contractor, Local Leaders	1,000,000	538

10.1.2 Operation & Maintenance Phase

Positive Impacts

Impact	Mitigation / Enhancement Measures	Responsibility	Cost (MWK)	Cost (US\$)
Increased crop production	Promote efficient irrigation and improved seed use	Cooperative, Extension Services	2,000,000	1,075
Increased income	Facilitate market access and value chain development	PMT, Cooperative	1,500,000	806
Improved nutrition	Promote crop diversification and nutrition awareness	Extension Services, Department of Health	1,000,000	538
Market linkages	Support formation of cooperatives and market connections	PMT, Cooperative	1,000,000	538
Skills development	Provide continuous training on GAP and irrigation practices	Extension Services	1,000,000	538
Increased water availability	Ensure equitable water distribution through WUAs	WUA, Cooperative	1,000,000	538

Negative Impacts

Impact	Mitigation / Enhancement Measures	Responsibility	Cost (MWK)	Cost (US\$)
Waterlogging	Maintain drainage systems and monitor soil conditions	WUA, Cooperative	2,000,000	1,075
Agrochemical pollution	Promote safe and controlled use of agrochemicals	Extension Services	2,500,000	1,344
Water-related diseases	Conduct awareness and preventive health programmes	Department of Health	3,000,000	1,613

Impact	Mitigation / Enhancement Measures	Responsibility	Cost (MWK)	Cost (US\$)
HIV/AIDS	Continue awareness campaigns and prevention programmes	Department of Health, NGOs/CSOs	2,000,000	1,075
Water conflicts	Implement water allocation schedules and dispute resolution	WUA, NWRA, Local Leaders	2,000,000	1,075
Reduced downstream flow	Maintain environmental flow releases	PMT, NWRA	2,500,000	1,344
Vector proliferation	Control stagnant water and promote hygiene practices	Department of Health, WUA	2,000,000	1,075
Agrochemical exposure	Train farmers and promote PPE use	Extension Services	2,000,000	1,075
Hazardous waste	Promote safe disposal of agrochemical containers	WUA, District Council	1,500,000	806

10.1.3 Demobilisation Phase

Impact	Mitigation / Enhancement Measures	Responsibility	Cost (MWK)	Cost (US\$)
Site restoration	Restore all disturbed areas and infrastructure	Contractor, and MEPA	2,500,000	1,344
Loss of employment	Provide notice and pay terminal benefits	Contractor, PMT	2,000,000	1,075
Decline in local businesses	Inform and support transition of local vendors	PMT, District Council	1,500,000	806
Solid waste	Remove and properly dispose of all construction waste	Contractor, MEPA, District Council	2,500,000	1,344

The ESMP matrix is directly derived from the impacts identified and assessed in Chapter 5, ensuring full traceability between impact identification, mitigation measures, and monitoring requirements.

10.2 IMPLEMENTATION OF ESMP

The implementation of the ESMP will be undertaken through a structured and coordinated institutional framework involving the proponent, contractors, regulatory authorities, and community-level institutions. Clear allocation of responsibilities is essential to ensure accountability, compliance, and effective execution of mitigation measures.

To operationalize this framework, a formal coordination mechanism will be established. This will include monthly coordination meetings involving the PMT, Supervision Consultant, Contractor, and relevant stakeholders. These meetings will review ESMP performance, identify implementation gaps, and agree on corrective actions with defined timelines. All decisions will be documented and tracked.

10.2.1 Ministry of Agriculture and Program Management Team (PMT)

The Ministry of Agriculture, through the Program Management Team (PMT), will have overall responsibility for ESMP implementation and compliance oversight.

The PMT will:

- Provide strategic direction and oversight of environmental and social management;
- Ensure ESMP requirements are integrated into project planning, procurement, and implementation;
- Supervise contractor compliance with ESMP obligations;
- Review and consolidate monitoring reports from the Supervision Consultant;
- Facilitate coordination among stakeholders;
- Initiate and enforce corrective actions in cases of non-compliance, including escalation to regulatory authorities where necessary.

10.2.2 Malawi Environmental Protection Authority (MEPA)

MEPA will provide independent regulatory oversight of ESMP implementation.

Within this ESMP, MEPA will:

- Review environmental compliance and monitoring reports submitted by the PMT;
- Undertake inspections and audits where required;
- Verify rehabilitation of disturbed areas, including borrow pits and construction sites;
- Ensure compliance with ESIA approval conditions and national environmental standards;
- Enforce corrective measures in cases of non-compliance.

MEPA's role introduces an independent layer of accountability and strengthens enforcement of environmental safeguards.

10.2.3 Supervision Consultant

The Supervision Consultant will provide independent technical monitoring and verification of ESMP implementation.

Key responsibilities include:

- Developing detailed monitoring tools and inspection checklists aligned with the ESMP;
- Conducting regular and targeted site inspections;
- Verifying implementation and effectiveness of mitigation measures;
- Identifying non-compliance and recommending corrective actions;
- Facilitating monthly coordination and review meetings;
- Preparing structured monitoring reports for submission to the PMT.

The Supervision Consultant serves as the primary mechanism for continuous compliance verification.

10.2.4 The Contractor

The Contractor will be the primary implementer of all ESMP mitigation and enhancement measures at site level.

The Contractor shall:

- Prepare a Construction Environmental and Social Management Plan (CESMP) aligned with the ESMP;
- Deploy a qualified Environmental and Social Expert on site;
- Implement all mitigation measures specified in the ESMP and CESMP;
- Conduct routine environmental and social monitoring;
- Maintain records of compliance and incidents;
- Submit regular ESMP performance reports.

Compliance with ESMP requirements will be contractually binding. Failure to comply may result in penalties, suspension of works, withholding of payments, or contract termination, as determined by the PMT.

Site-Specific Management Plans

To operationalize ESMP requirements, the Contractor shall prepare detailed site-specific management plans, including:

- Waste Management Plan

- Occupational Health and Safety Plan
- HIV/AIDS Workplace Policy
- Code of Conduct (CoC)
- Grievance Redress Mechanism (GRM)
- Chance Find Procedure
- Cholera Response Plan
- Drinking Water Management Plan

All site-specific plans shall be submitted to the PMT for review and approval prior to commencement of construction activities. No construction activities shall begin until these plans have been formally approved.

All plans shall be prepared in a format accessible to workers and translated into local language (Chichewa) where necessary.

10.2.5 Mwana-Alirenji Cooperative

The Mwana-Alirenji Cooperative will play a central role during the operation phase, particularly in community-level ESMP implementation.

Its responsibilities include:

- Supporting implementation of environmental and social measures within the irrigation scheme;
- Monitoring compliance at community level;
- Facilitating communication between project structures and local communities;
- Supporting grievance redress processes;
- Coordinating Water User Associations (WUAs) in water management.

The Cooperative is critical for ensuring long-term sustainability and local ownership of ESMP measures.

10.2.6 Other Key Stakeholders

Other stakeholders will contribute to ESMP implementation through clearly defined, project-specific roles:

Chikwawa District Council

- Monitor and supervise waste management practices;
- Participate in inspections and compliance verification;
- Support enforcement of sanitation and environmental measures;
- Facilitate local stakeholder engagement and issue resolution.

National Water Resources Authority (NWRA)

- Monitor compliance with approved water abstraction limits;
- Support water allocation and distribution mechanisms through WUAs;
- Facilitate resolution of water use conflicts;
- Verify adherence to environmental flow requirements.

Department of Forestry

- Support implementation of reforestation and vegetation restoration activities;
- Provide technical guidance on species selection and planting;
- Monitor effectiveness of catchment management interventions.

Department of Health

- Support implementation of health-related mitigation measures;
- Monitor incidence of water-related and communicable diseases;
- Provide technical input on public health risk management.
- Local Leaders and Community Structures (VNRMCs, WUAs)
- Mobilize communities for ESMP implementation;
- Monitor compliance with agreed practices at local level;
- Facilitate grievance reporting and conflict resolution;
- Support enforcement of community by-laws.

NGOs and CSOs

- Support delivery of awareness and capacity-building programmes;
- Assist in implementation of GBV/SEA prevention and response measures;
- Facilitate inclusive participation of vulnerable groups.

10.2.7 6.3 Environmental and Social Management Plan (ESMP) Matrix

Table 9.1 provides the detailed ESMP matrix outlining mitigation measures, responsibilities, monitoring indicators, frequency, and associated costs.

10.3 ESMP BUDGET SUMMARY

The ESMP budget provides an aggregated estimate of the resources required to implement environmental and social mitigation, monitoring, and management measures. The budget includes both standalone ESMP costs and costs embedded within contractor obligations. It reflects the relative scale and significance of identified risks and provides a basis for financial planning and resource allocation.

10.4 MONITORING AND REPORTING

Environmental and social monitoring will be undertaken throughout the project lifecycle to ensure effective implementation of mitigation measures, compliance with regulatory requirements, and timely identification and resolution of emerging environmental and social risks. Monitoring will be based on clearly defined, measurable indicators derived from the Environmental and Social Management Plan (ESMP), with emphasis on both biophysical and socio-economic parameters. These include, but are not limited to:

- Vegetation clearance and restoration;
- Soil erosion and land degradation;
- Surface and groundwater quality;
- Waste management and disposal practices;
- Occupational health and safety performance;
- Community health and safety risks;
- Grievance registration and resolution;
- Livelihood restoration and economic impacts.

Monitoring of social impacts will be closely linked to the Grievance Redress Mechanism (GRM), which will serve as a key tool for capturing community concerns and identifying emerging risks.

Monitoring will be implemented through a multi-tiered system of responsibility and verification, as follows:

- The Contractor will undertake routine, day-to-day monitoring of site activities, maintain detailed records, and ensure immediate corrective action at source;
- The Supervision Consultant will carry out independent verification through scheduled and unannounced inspections, validate monitoring data, and assess effectiveness of mitigation measures;
- The Program Management Team (PMT) will review consolidated monitoring reports, track compliance trends, and enforce corrective actions;
- Regulatory oversight will be provided by the Malawi Environmental Protection Authority (MEPA) and other relevant institutions through audits and compliance reviews.

Monitoring activities will be undertaken in accordance with the Environmental and Social Monitoring Plan presented in Table 6.2.

10.5 DATA MANAGEMENT AND QUALITY ASSURANCE

All monitoring data will be systematically recorded, stored, and managed to ensure accuracy, consistency, and traceability. Standardized monitoring templates and checklists will be used across all project sites.

Data quality assurance will include:

- Cross-verification of contractor data by the Supervision Consultant;
- Periodic field validation by the PMT;
- Documentation of evidence (photographs, logs, laboratory results);
- Maintenance of auditable records for compliance verification.

Capacity building will be undertaken to ensure that all implementing entities, including contractors and community structures, are adequately equipped to carry out monitoring activities and maintain data quality standards.

10.6 REPORTING FRAMEWORK

Environmental and social monitoring reports will be prepared and submitted at defined intervals:

- Daily/Weekly reports (internal) by the Contractor for site management;
- Monthly reports by the Contractor to the Supervision Consultant;
- Quarterly consolidated reports by the PMT to regulatory authorities and development partners.

Reports will include:

- Status of ESMP implementation;
- Monitoring results against defined indicators;
- Non-compliance incidents and corrective actions taken;
- Emerging risks and recommended mitigation measures.

All environmental and social incidents, including accidents, pollution events, and community grievances, will be recorded using standardized incident reporting formats. Serious incidents will be reported to the PMT within 24 hours and escalated to relevant regulatory authorities, including MEPA, in accordance with national requirements.

10.7 COMPLIANCE AND CORRECTIVE ACTION MECHANISM

Compliance with ESMP requirements will be assessed against predefined performance thresholds. Where monitoring indicators fall below acceptable limits (e.g., PPE compliance

below 80%, grievance resolution beyond 30 days, or failure to meet environmental flow requirements), corrective actions will be triggered immediately.

A structured corrective action process will be applied as follows:

1. Identification and documentation of non-compliance;
2. Issuance of corrective action instructions by the Supervision Consultant or PMT;
3. Implementation of corrective measures within defined timelines;
4. Verification of compliance through follow-up inspections.

For significant or repeated non-compliance:

- The PMT will enforce corrective action plans;
- Contractual penalties or sanctions may be applied;
- The issue will be escalated to MEPA for regulatory intervention where required.

10.8 INDEPENDENT VERIFICATION AND AUDITS

Periodic independent audits may be conducted to assess compliance with ESMP requirements and verify monitoring results. These audits will provide an additional layer of assurance and support continuous improvement of environmental and social performance.

10.9 ADAPTIVE MANAGEMENT

Monitoring outcomes will be used to continuously improve ESMP implementation. Where monitoring indicates that mitigation measures are ineffective or insufficient:

- Mitigation strategies will be revised;
- Additional control measures will be introduced;
- Implementation approaches will be adjusted to respond to site-specific conditions.

This adaptive approach ensures that environmental and social management remains responsive, effective, and aligned with evolving project risks.

Table 10: Environmental and Social Monitoring Plan (E&SMP)

Planning Phase

Impact	Parameter	Indicator	Verification	Frequency	Responsibility	Cost (MWK)
Employment creation	Local employment	≥50% local staff engaged	Employment records	Once	PMT	3,500,000
Anxiety on land loss	Stakeholder engagement	No. of meetings; % of PAPs reached	Meeting reports	Monthly	PMT, District Council, Local Leaders	4,500,000
	Grievances	% resolved within 30 days	GRM logs	Monthly	PMT, GRM Committees	4,000,000
	Information disclosure	Availability of project info	Notices, reports	Continuous	PMT	3,500,000

Construction Phase – Positive Impacts

Impact	Parameter	Indicator	Verification	Frequency	Responsibility	Cost (MWK)
Employment	Local workforce	≥80% local labour	Payroll	Monthly	Contractor, PMT	4,000,000
Economic activity	Local procurement	No. of vendors; procurement value	Records	Monthly	Contractor, PMT, District Council	3,500,000
Skills transfer	Training	No. trained	Training records	Monthly	Contractor	4,000,000
Govt revenue	Tax compliance	Tax receipts	Certificates	Quarterly	Contractor	Included

Construction Phase – Negative Impacts

Impact	Parameter	Indicator	Verification	Frequency	Responsibility	Cost (USD)
Vegetation loss	Clearing limits	Area cleared vs restored	Site reports	Monthly	Contractor, Department of Forestry, Supervision Consultant	3,000
Soil erosion	Control measures	No. of structures	Inspection	Weekly	Contractor, Supervision Consultant	2,500
Dust	Air quality	Complaints; spraying frequency	Logs	Weekly	Contractor	2,000
Water pollution	Water quality	Contamination levels	Lab tests	Monthly	Contractor, MEPA, Supervision Consultant	3,000
Noise	Noise levels	Complaints	Records	Weekly	Contractor	1,500
Waste	Waste handling	% properly disposed	Logs	Weekly	Contractor, District Council	2,000
Borrow pits	Rehabilitation	No. restored	Inspection	Monthly	Contractor, MEPA, District Council	2,500
OHS risks	Worker safety	Incident rate; $\geq 90\%$ PPE use	Reports	Daily/Monthly	Contractor	4,000
Labour influx	Social conflict	No. of complaints	GRM logs	Monthly	Contractor, PMT, Local Leaders	2,000
HIV/AIDS	Awareness	No. of campaigns	Reports	Quarterly	Contractor, Department of Health	2,500

GBV/SEA	Safeguards	Cases reported/handled	GRM reports	Monthly	Contractor, PMT, NGOs/CSOs	3,000
Child labour	Compliance	Verified age records	Records	Monthly	Contractor, PMT	1,000
Crime	Security	Incident reports	Police/community	Monthly	Contractor, Local Leaders	1,000

Operation & Maintenance Phase – Positive Impacts

Impact	Parameter	Indicator	Verification	Frequency	Responsibility	Cost (USD)
Crop production	Yield	Yield/ha; ≥2 cycles/year	Farm records	Seasonal	Cooperative, Extension Services	2,000
Income	Earnings	% income increase	Surveys	Annual	Cooperative, PMT	1,500
Nutrition	Food diversity	Dietary diversity score	Surveys	Annual	Department of Health, Extension Services	1,000
Market access	Linkages	No. of contracts	Records	Annual	PMT, Cooperative	1,000
Skills	Training	No. trained	Records	Seasonal	Extension Services	1,500
Water access	Availability	No. of users	Reports	Seasonal	WUA, Cooperative	1,000
Biodiversity	Flow	Environmental flows maintained	Flow data	Continuous	PMT, NWRA	1,500

Operation & Maintenance Phase – Negative Impacts

Impact	Parameter	Indicator	Verification	Frequency	Responsibility	Cost (USD)
Waterlogging	Drainage	Area affected	Inspection	Seasonal	WUA, Cooperative	2,000
Agrochemicals	Usage	Compliance rate	Records	Seasonal	Extension Services	2,500

Impact	Parameter	Indicator	Verification	Frequency	Responsibility	Cost (USD)
Diseases	Health	No. of cases	Health data	Quarterly	Department of Health	3,000
HIV/AIDS	Awareness	Campaigns	Records	Quarterly	Department of Health, NGOs/CSOs	2,000
Water conflict	Allocation	No. of conflicts	GRM logs	Monthly	WUA, NWRA, Local Leaders	2,000
Downstream flow	Compliance	Flow levels	Monitoring data	Continuous	PMT, NWRA	2,500
Vectors	Breeding sites	No. identified/controlled	Inspection	Quarterly	Department of Health, WUA	2,000
Chemical exposure	PPE use	≥80% compliance	Surveys	Seasonal	Extension Services	2,000
Hazardous waste	Disposal	Proper handling rate	Logs	Seasonal	WUA, District Council	1,500

Demobilisation Phase

Impact	Parameter	Indicator	Verification	Frequency	Responsibility	Cost (USD)
Site restoration	Land condition	≥90% restored	Inspection	Once	Contractor, MEPA, Supervision Consultant	2,500
Job loss	Worker transition	Benefits paid	Records	Once	Contractor, PMT	2,000
Business decline	Economic activity	No. supported	Reports	Once	PMT, District Council	1,500
Waste	Cleanup	≥95% cleared	Inspection	Once	Contractor, MEPA, District Council	2,500

10.10 BUDGET FOR THE IMPLEMENTATION OF THE ESMP

The successful implementation of the Environmental and Social Management Plan (ESMP) requires adequate allocation of financial, technical, and human resources. In line with

international best practice, ESMP costs are typically estimated as a proportion of total project costs, often in the range of 2–5%, depending on project scale and risk profile. For this project, a structured budgeting approach has been applied to ensure that all mitigation, monitoring, and institutional strengthening requirements are adequately resourced. The ESMP budget has been developed based on the identified mitigation measures (Table 16), monitoring requirements (Table 6.2), and institutional responsibilities outlined in this report. It covers costs associated with environmental and social mitigation, monitoring and reporting, capacity building, stakeholder engagement, and implementation support. The total estimated cost for ESMP implementation is **USD 81,052.63**, inclusive of a contingency provision to address unforeseen environmental and social management requirements. Details of the ESMP budget are presented in Table 14.

Table 11: Overall Cost of the ESMP

Budget Category	Cost (MWK)	Cost (USD)	Percentage of Total ESMP Budget
Environmental and Social Management Plan (Mitigation and Enhancement Measures)	76,000,000	40,000.00	49.4%
Environmental and Social Monitoring Plan (Monitoring Activities)	50,000,000	26,315.79	32.5%
Capacity Building and Orientation Programmes	14,000,000	7,368.42	9.1%
Subtotal	140,000,000	73,684.21	91.0%
Contingency (10%)	14,000,000	7,368.42	9.1%
Total ESMP Budget	154,000,000	81,052.63	100%

11 CONCLUSION AND RECOMMENDATIONS

The Environmental and Social Management Plan (ESMP) for the Chikhambi/Mbenderana Irrigation Scheme provides a comprehensive assessment of the potential environmental and social impacts associated with the planning, construction, operation, and decommissioning phases of the project. The analysis confirms that while the project will generate certain adverse impacts, these are localized, largely reversible, and can be effectively managed through the implementation of appropriate mitigation measures and good environmental and social practices.

The project is expected to deliver significant and sustained positive outcomes, including increased agricultural productivity, improved household incomes, enhanced food and nutrition security, strengthened market integration, and expanded livelihood opportunities. These benefits are consistent with Malawi's national development priorities and are aligned with the objectives of the Shire Valley Transformation Programme.

This ESMP has been developed as a fully integrated and implementation-oriented framework, explicitly linking identified impacts (Chapter 5) with mitigation and enhancement measures (Table 6.1), monitoring and verification mechanisms (Table 6.2), institutional arrangements (Section 6.2), and budget provisions (Table 6.3). This integrated approach ensures that environmental and social management is embedded within the overall project design, planning, and execution processes.

The institutional framework established under this ESMP provides clear lines of accountability and coordination, with the Ministry of Agriculture through the SVTP-2 Project Management Team (PMT) assuming overall responsibility for ESMP oversight. Implementation will be undertaken by the Contractor, with independent verification by the Supervision Consultant, and regulatory oversight by the Malawi Environmental Protection Authority (MEPA) and other relevant government institutions. This multi-layered system strengthens compliance assurance and supports effective enforcement of ESMP provisions.

The Environmental and Social Monitoring Plan introduces measurable performance indicators, defined monitoring frequencies, and structured reporting protocols, enabling systematic tracking of environmental and social performance throughout the project lifecycle. The inclusion of compliance thresholds, incident reporting requirements, and corrective action procedures ensures that deviations from ESMP requirements are promptly identified and addressed.

In addition, the ESMP incorporates a functional and accessible Grievance Redress Mechanism (GRM) to ensure timely and transparent resolution of community concerns, thereby reinforcing stakeholder engagement, trust, and social accountability.

The ESMP budget provides adequate and realistic financial allocations to support mitigation, monitoring, institutional strengthening, and capacity development. This ensures that environmental and social management measures are fully resourced and can be effectively implemented without compromising project performance.

The ESMP is consistent with national environmental regulatory requirements and aligned with international best practice and development partner safeguard expectations, including those of the African Development Bank. It therefore provides a credible basis for ensuring that project implementation remains environmentally sustainable and socially responsible.

Based on the findings of this assessment, it is concluded that:

- The Chikhambi/Mbenderana Irrigation Scheme is environmentally and socially feasible and sustainable;
- The identified adverse impacts can be effectively mitigated through proper implementation of the ESMP;
- The anticipated socio-economic benefits of the project significantly outweigh the potential negative impacts;
- The proposed institutional, monitoring, and management systems are adequate and robust to ensure compliance and effective environmental and social performance.

Recommendations

To ensure effective implementation of the ESMP and long-term sustainability of project outcomes, the following recommendations are made:

1. The ESMP should be formally integrated into all project contracts and procurement documents, ensuring that compliance is a contractual obligation for all implementing entities;
2. Adequate financial, technical, and human resources should be secured and maintained throughout the project lifecycle to support ESMP implementation, monitoring, and reporting;
3. Targeted capacity building and training programmes should be implemented for the PMT, Contractor, and local stakeholders to strengthen environmental and social management capabilities;
4. The Grievance Redress Mechanism should be operationalized prior to commencement of construction and maintained throughout all phases of the project;
5. Continuous and structured stakeholder engagement should be maintained to promote transparency, inclusiveness, and community ownership of the project;

6. An adaptive management approach should be applied, allowing mitigation measures and management strategies to be adjusted based on monitoring results and emerging risks;
7. Regular monitoring and compliance reports should be submitted to regulatory authorities and development partners, ensuring accountability and facilitating oversight.

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13 ANNEXURE

ANNEX I: TERMS OF REFERENCES

Our Reference No: MEPA /
Your Reference No:
Communications should be addressed to:
The Director General



Malawi Environment Protection Authority
P/ Bag 317
Lilongwe 3
Tel: +265 1771111

Protecting the environment, Protecting life

14th February, 2023

The Project Coordinator
Shire Valley Transformation Programme
Private Bag 379
Blantyre

Dear Sir,

**RE: DEVELOPMENT OF ENVIRONMENTAL AND SOCIAL MANAGEMENT PLANS
FOR IRRIGATION BLOCKS IN SVTP COMMAND AREA**

Reference is made to your letter dated 4th February 2023 in which you are enquiring on the environmental requirements of the Irrigation blocks in the SVTP command area.

I write to advise that you are required to prepare site specific Environmental and Social Management Plans (ESMP) for each irrigation block prior to implementation of activities on the proposed blocks. This level of environmental assessment has been recommended because the approved Environmental and Social Impact Assessment (ESIA) report for SVTP already covered the development of irrigation blocks.

Meanwhile, find the attached Terms of Reference for preparing the ESMPs. Should you require any further information on the foregoing, please do not hesitate to contact us.

Yours Faithfully,

MALAWI ENVIRONMENT PROTECTION AUTHORITY

Tawonga Mbale-Luka
ACTING DIRECTOR GENERAL

Attd: Terms of Reference for ESMP

ESMP TERMS OF REFERENCE FOR DEVELOPMENT OF IRRIGATION BLOCKS IN SVTP COMMAND AREA

1. Provide a brief description of the nature and location of the proposed project with respect to the name of the proponent, postal address, aim and objectives of the project, the spatial location of the site with aid of appropriate topographical maps of the area (at least at a scale 1: 50,000); the estimated cost of the project, the size of land for the proposed irrigation block, the number of people to work on the project (provide a breakdown of males and females, locals and non-locals).
2. Provide a site-specific visible map of the area (scale 1: 50,000) showing the proposed site and (1:10,000) showing existing establishments in the area and surrounding areas including natural endowments like rivers and streams. A site plan for the project should be provided. All maps should be in color to portray the themes clearly and must be printed on A3 paper.
3. Provide a brief description of the existing biophysical characteristics and the socio-economic environmental status of the proposed area.
4. Briefly review the legal framework pertaining to the proposed project and indicate their impacts on the project. Reference should at least be made to Environment Management Act, Agriculture Policy, Fertilizer Policy, New Land Acts, Water Resources Act, National Water Policy, Malawi National Land Policy, Public Health Act, Occupational Safety, Health and Welfare Act, Pesticides Act, National irrigation Policy, Land Resources Management Policy and Strategy and other policies and pieces of legislations.
5. Briefly describe main activities to be undertaken for the project. In the description include nature of the project including detailed description of project component, the type of machinery to be used, type of infrastructure associated with the irrigation blocks, land acquisition and ownership, nature and estimated quantity of wastes (both solid and liquid) that will be generated, circularity to waste management i.e. state the means of reducing waste to a minimum by reusing and recycling of waste, facilities for appropriate disposal of waste that cannot be recycle or reused, including estimated costs for the activities
6. Propose an Environmental and Social Management Plan (ESMP) for the project. The ESMP should be in tabular form and should specify the predicted impacts, mitigation measures/enhancement measures. Also indicate the budget for the recommended mitigation measures, specifications of who will be responsible for these measures and the schedule when these measures will take place.

ANNEX II: CONSULTATION LIST

Stakeholder participation involved engaging institutions within the project impact area and selected public institutions who expressed their views about the proposed project. The stakeholder participation process tried to ensure that due consideration will be given to stakeholder values, concerns and preferences when decisions regarding the project are made.

The purpose of stakeholder involvement was to:

1. Inform the stakeholders about the proposal and its likely effects;
2. Canvass their inputs, views and concerns; and
3. Take account of the information and views of the public in the ESMP and decision making.

The key objectives of stakeholder involvement were to:

- Facilitate consideration of alternatives, mitigation measures and trade-offs (if any);
- Ensure that important impacts are not overlooked and benefits are maximized;
- Reduce chances of conflict through early identification of contentious issues;
- Provide an opportunity for the stakeholders to influence project design in a positive manner (thereby creating a sense of ownership of the proposal);
- Improve transparency and accountability of decision-making; and
- Increase public confidence in the Environmental and Social Management Plan process.

The comments stakeholders raised were collated and analysed to see which issues are of concern and should be addressed through the ESMP study and are presented in Table below

A2.1 Key Comments stakeholders raised

SN	Name of the person(s) who raised the issue	Issue Raised	How document has addressed the issue (Mitigation/ Enhancement)
1	Construction Phase		
1.1	Positive Impacts		
1.1.1	Joseph Jeke	Employment opportunity to the community there by reducing poverty levels.	Adherence to minimum wages requirements for the government
	Austin Kamanula		Employ mostly those from communities around the site (communities advocating for at least 50% of local people to be employed by the contractor)

SN	Name of the person(s) who raised the issue	Issue Raised	How document has addressed the issue (Mitigation/ Enhancement)
		Economic Improvement will grow up	Involving chiefs and the WUA interim committee in recruiting capable locals from within the community and surrounding areas.
1.1.2	Thokozani Yasino	Skill transfer to the local communities who might be involved in construction phase	Contractor to provide skills transfer through recruitment of locals who can also gain experience in carrying out future routine maintenance of the structures,
			Recruitment process needs to be transparent
			Some few communities to be specially trained in carrying out small maintenances of the scheme and other areas (e.g. engage communities to be trained in solar maintenances and mechanical maintenances of the pipes and other related structures)
1.1.3	Mac Nell Shire	Opportunity for small scale business around the construction site	Loans or good payment to workers to help boost those businesses
	Cathreen Andrea		Provide safe business shelters for local businesses trading around the area.
			Deliberate directive/policy to buy materials from local people
1.1.4	Lukia Ngomario	Reduced crime rates and other unruly behaviours within the communities due to involvement in employment especially to the youth	Small local businesses should be allowed to trade around the construction site
			Ensure that more community members are employed at the construction site
			Conduct community sensitisation and produce ToRs on how the local communities will be involved in the project

SN	Name of the person(s) who raised the issue	Issue Raised	How document has addressed the issue (Mitigation/ Enhancement)
1.1.5	Leah Malimbasa	Improvement of the infrastructure within the area	Ensure that the contractor improves the infrastructure being used during construction phase e.g. roads, availability of enough medicine at nearby health centre, and other corporate social responsibility
1.2	Negative Impacts		
1.2.1	Godfrey Banda Wilson Maduka	Disturbance to girl child education (Dropouts, Pregnancies) due to outsiders/workers who may come with money to convince girls into sexual relationships	Contractors should have initiative to protect vulnerable people
			The contractors to have a child protection and HIV/Aids policy
			Civic education and sensitisation to girls and community in general
			By-laws to protect girls
			Sensitize communities on a need to report cases of abuse or child labour (local chiefs and nearby police officers)
			Children/Pupils should not be allowed at construction site
1.2.2	Peter Ngondo	Spread of HIV and AIDS	Provide awareness to community
			Distribute condoms
			VDC and Chiefs to conduct awareness to families
			Strict laws on relationships among co-workers
1.2.3	Shammah Mlenga	Noise from construction site	Construction works should be restricted to day time only
			Construction vehicles should be well serviced
			Minimise idling of machinery to control noise levels
			Isolate the construction site through construction of temporary fencing to control noise levels (in noisy places)
			Noisy equipment to be placed away from villages
	Loyd		Equipment, machinery and other construction

SN	Name of the person(s) who raised the issue	Issue Raised	How document has addressed the issue (Mitigation/ Enhancement)
	Kachonde		vehicles should well service. Choose noise free machinery to be used onsite
1.2.4	Chikumbutso Kafe.	Clearing of trees/vegetation.	Replanting trees (choose tree species suitable for the area)
	Mc dolnard Kanyongolo	Degradation of Land.	Planting trees around the community college area to compensate for the cleared trees. The trees will also act as wind breaks, to protect the built infrastructure, especially in areas where there will be solar panels
1.2.5	Wilson Maduka	Disturbance to school going children who may come to see/watch construction works	Children should not be allowed at site
1.2.6	Chimwemwe Malupia	Dust emissions.	Using water browsers to sprinkle water around construction premises
		Pollution of sources of Water and Land	Enforce speed limits for vehicles moving around the sites
			Cordoning off the area with fencing to trap some dust emissions.
1.2.7	Thokozani Mwilih	Generation of waste	Proper disposal as recommended by District council
1.2.8	Wilson Maduka.	Injuries to workers and risks of other related accidents	Using PPE, and following engineering safety controls
	Cathreen Andrea		Sensitise communities in safety regarding to operation of machinery and other community safety issues
1.2.9	Austin Kamanula	Child labour issues	Ministry of labour should be involved during the employment procedures to regulate and police child labour issues
1.2.10	Sydney Chikafa	Lifestyle changes among employed locals.	Educating and sensitizing employed locals on the consequences of reckless behaviour

SN	Name of the person(s) who raised the issue	Issue Raised	How document has addressed the issue (Mitigation/ Enhancement)
		Women employment challenges	
			Women employ 60-40 at minimum
1.2.11	Victoria Nkasale	Destruction of marriages due to presence of workers. Marriage breakups	Chiefs should educate their people to stick to their partners
1.2.12	Peter Jali	Increase in theft and vandalism	People found should be persecuted as per laws of the country Chiefs to sensitise their people on disadvantages of theft and vandalism
1.2.13	Chimwemwe Nyoni. Robert Mackion	Environmental degradation due to the use of environmentally unfriendly materials	Prohibit the use of burnt bricks for construction works Use energy and water efficient building technologies
1.2.14	Shammah Lenga	Disruption of local pathways /access roads due to construction of the irrigation scheme	Contractor will need to liaise with the local leaders and communities before blocking or destruction of the local routes/roads
1.2.15	Chikumbusto Kefa	Charcoal production as a result of the presence of the	Promotion of IGAs Cut tress if and only if necessary Access to microfinance institutions and reliable markets

SN	Name of the person(s) who raised the issue	Issue Raised	How document has addressed the issue (Mitigation/ Enhancement)
		large labour force during construction.	Promotion of conservation agriculture
			Sensitization meetings
			Tree planting program
			Local employment as casual labourers
		Loss of biodiversity.	
			Enforcement of scheme and forestry by-laws
2	Operation Phase		
2.1	Positive Impacts		
2.1.1	Lloyd Kachonde	Best use of available land which is currently underutilised due to poor rainfall patterns in the area	Ensure that the construction works should commence quickly as the communities have been waiting for the project for over 9 years
	Treazer Mwalija.		Ensure that the structures to be built are of high standards to prevent frequent maintenance of the scheme
			Form, train and empower the WUA committee in management of the scheme
			Train farmers in production of high value crops for profitability (choose profitable value chains)
			Link the farmers to existing markets or create new markets for the produce from farmers
			Sensitise more farmers regarding to advantages of irrigation farming
			Conduct land demarcation properly for the command area in the early stages of project to prevent land conflict issues which might arise in the future. Ensure that the copies of the demarcated land are available to the land owners
2.1.2	Mac Nell Shire	Enhanced development and	Provide for more infrastructure association with the irrigation scheme

SN	Name of the person(s) who raised the issue	Issue Raised	How document has addressed the issue (Mitigation/ Enhancement)
		economic activity in the area. Attract a lot of developers.	Provide for loan opportunities to the youth Link the farmers to the large scale buyers and form corporative for collective bargaining of prices
			Strengthen structures
2.1.3	Peter Jali	Reduction in crime rates	More people will be involved in irrigation farming which will enable them to be economically active hence reduced crime rates
2.1.4	Elizabeth Khumbenyiwa	Opportunity to grow other crops which are not known to the communities	Train the communities on good value chains which are profitable Sensitisation on crop diversity practices to ensure that they income levels are depended on different types of crops
2.1.5	Leah Malimbasa	Reduced cases of hunger in the community (improved food security)	Encourage more farmers to be involved in irrigation farming
2.1.6	Chimwemwe Malupia	Reduced cases of malnutrition	Encourage more farmers to practices crop diversification to ensure sustainability
	Lovemore Tadikire	Help a lot on food security during drought	Disaster management trainings
2.2	Negative Impacts-operation phase		
2.2.1	Victoria Nkasale	Spread of STIS and HIV and AIDS	Community sensitisation Conduct awareness on sexually transmitted diseases
2.2.2	Annie Magombo	Destruction of natural resources	Adopt agro-biodiversity and agro-forestry practices

SN	Name of the person(s) who raised the issue	Issue Raised	How document has addressed the issue (Mitigation/ Enhancement)
		due to clearance of land in some patches	Follow sustainable land management practices during the operation of the scheme
2.2.3	Peter Ngondo	Increased cases of diseases/illness due existence of the scheme e.g. malaria, bilharzia, cholera, schistosomiasis etc.	Work hand in hand with local health centre to prevent and treat the disease cases. Rearing ducks and fish
2.2.4	Maximoss Govesuar	Increased cases of theft or vandalism to equipment e.g. Solar panels, pumps	Provide more security personnel Sensitise people Construct perimeter fencing around the solar panels and also the pumping areas
2.2.5	Lloyd Kachonde	Destruction /disturbance of aquatic biodiversity	Protect the aquatic biodiversity by provision of nets/mesh on the pumps to prevent fish or other aquatic animals from getting trapped in the pipes
2.2.6	Wilson Maduka	Cases of children and animals drowning /injuries. Injury to operators	Night reservoir storage tanks will need to be fenced in order to prevent access to the tanks by children or animals. Provide PPE.
2.2.7	Maximoss Govesuar Joseph Jeke	Cases of land disputes	Train the community leaders and WUA committee on handling of disputes and management of the scheme Ensure that land demarcation exercise is done in early stages of the project in collaboration with the communities

SN	Name of the person(s) who raised the issue	Issue Raised	How document has addressed the issue (Mitigation/ Enhancement)
			A need for assurance to the communities that nobody will lose land due to irrigation development
2.2.8	Sydney Chikafa	Cases of crocodile attacks	Use pipes instead of canals in the main pipes from the Shire river to the tanks
			Safety committees
			Ensure that the command areas is designed away from the Shire river to prevent the crocodiles from getting into the fields
2.2.9	Lukia Ngamario	Flooding of the irrigation scheme.	Construction of flood protection bunds
			Control run off.
			Provision of cut-off drainage, water outlets;
			Rely on conservation agriculture
			Afforestation and re afforestation
			Observe areas not to be cultivated
			Planting of vertiver
2.2.10	Annie Magombo	Collapsing of Water reservoir	Incorporate safety features in design and construction
2.2.11	Lloyd Kachonde	Formation of gullies due to field paths	Raising the footpath
			Planting of vegetative cover, star grass,
	Osward Kanyunga	Value for land will be high	Selling of customary land not prohibited where people are trying to do so
3	Decommissioning phase		
3.1	Positive impacts		
3.1.1	Mwana Alijenji Cooperative	The communities stressed that there will not be any positive impacts due to closure of the project.	

SN	Name of the person(s) who raised the issue	Issue Raised	How document has addressed the issue (Mitigation/ Enhancement)
3.2	Negative impacts		
3.2.1	Steven Kamorere John Chimbwebwa	Reduced income levels, livelihoods, loss of jobs. Settlement patterns	Ensure that the project should have a long life to prevent early loss of benefits to the communities. Urban structure plans. Workers compensation unions.

ANNEX III: LIST OF STAKEHOLDERS CONSULTED

No.	Name	Organization OR Company	Phone Number	Signature
1	Chimwenwe N'kpa	SUTP	0999950008	Chimwenwe N'kpa
2	Thandwe Ngalande	CK-DC	0888591931	Thandwe Ngalande
3	Austin Kamauka	CK-LABOUR	0999193253	Austin Kamauka
4	Etienne Khumbonyisa	MACOM	0994170010	Etienne Khumbonyisa
5	Sydney Chikafa	CK-DC	0996002795	Sydney Chikafa
6	Chimwenwe Malupisi	CK-DC	0889364578	Chimwenwe Malupisi
7	Lloyd Kachonde	CK-DAD	0884141761	Lloyd Kachonde
8	Wilson Maduka	CK-S/welt	088940178	Wilson Maduka
9	Maxwell Shiro	CK-DC Youth	0884164796	Maxwell Shiro
10	Victoria Nkavale	CK-DC Gender	0995728160	Victoria Nkavale
11	Leah Malimbasa	CK-DC Information	0888404251	Leah Malimbasa
12	Xinjie Magumba	CK-DC Fishing	0888318585	Xinjie Magumba
13	Chikumbutso Uefa	CK-DC Forestry	0994856600	Chikumbutso Uefa
14	Miriam Gwerner	CK-DC-CD	0995691616	Miriam Gwerner
15	Peter Ngondo	CK-DAD	0999157374	Peter Ngondo
16	Thokozi Mkhahle	CK-DC	0882730572	Thokozi Mkhahle
17	Peter Jali	CK-DC	0991158088	Peter Jali
18	Shamash Mlungu	CK-DAD	0995254694	Shamash Mlungu
19	Thokozeni Zama	LAFE	0996444155	Thokozeni Zama
20	Lucia Ngomano	CK-DC MSE	0885155648	Lucia Ngomano
21	Steven Kanyore	CK-DC DOT	0997886838	Steven Kanyore

No.	Name	Organization OR Company	Phone Number	Signature
44	Grey chintwenta	Mwanaalilenji	0884970528	GBRA
45	Osward Kanyaga	Mwanaalilenji	098843215	OK
46	JOSEPH JEKE	Mwanaalilenji	0886104474	JE
47	Lavomere Tadidone	Mwanaalilenji	0881745470	LA
48	TREAZER Mwalya	Mwana Alireny	0991954277	TITA
49	ROBERT MAGEON	Mwanaalilenji	0882716320	RM
50	Cathreen andrea	Mwana Alilenji	0883638710	C.A
51	MCdolnad Kanyaga	Mwana Alireny	099323008	MC
52	Godfrey Bante	Mwanaalireny	0881216528	GB
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ANNEX IV: SUMMARY OF KEY EXPERTS

	Name	Qualifications	Area for Expert	Position
2	Daniel Chirembo	MSc (Industrial Chemistry), BSc (Industrial Chemistry).	Environment, Water and Soil	Team Leader: Environmental Specialist
2	Dr. Peter Ngoma	Ph.D in Resource Economics MS in Agricultural Economics BSc (Distinction,) in Agricultural Economics	Project Management	Executive Director: LAPE
3	Mr. Andrea Gondwe Mjuma	Ph.D in Resource Economics - Pending Master of Arts Economics Bachelor of Commerce (Accountancy)	Agribusiness	Agribusiness Specialist
4	Mr. Aubrey Qabaniso Nyekanyeka	University of Malawi, Bunda College, Faculty of Environmental Science, Department of Natural Resources Management. 2007 - 2011 Bachelor of Science in Natural Resources Management	Environmental Science	Environmental Health Specialist

	Name	Qualifications	Area for Expert	Position
5	Mr. Everson Nkonya	University of Malawi, Polytechnic 2009 BSc Civil Engineering	Irrigation Engineer	Irrigation specialist

ANNEX IV: DETAILS OF KEY EXPERTS

CV FOR THE TEAM LEADER AND OTHERS

1. PERSONAL PARTICULARS:

SURNAME : Chirembo
FIRST NAME : Daniel
DATE OF BIRTH : 15th October, 1964
MARITAL STATUS : Married
SEX : Male

2. ACADEMIC QUALIFICATION:

BSc. : Majoring in Chemistry
BSc. (Hons) : Majoring in Industrial Chemistry
MSc. : Majoring in Industrial Chemistry

3. QUALIFICATION RELATING TO QUALITY MANAGEMENT AND FOOD SAFETY MANAGEMENT SYSTEMS:

- (a) Implementation of ISO 9001 Quality Management System
- (b) Internal Quality Auditor Certificate
- (c) Quality Costs Certificate
- (d) Statistical Techniques Certificate
- (e) Standardisation Techniques Certificate

- (f) Implementation of ISO 17025 up to Accreditation
- (g) Technical Assessor Certificate
- (h) Production Management
- (i) Food Hygiene
- (j) Application of HACCP
- (k) Implementation of ISO 22,000

4. GIVEN TRAINING ON THE FOLLOWING GENERAL MANAGEMENT AREAS:

- (a) Managerial Skills
- (b) Supervisory Skills
- (c) Effective Communication
- (d) Superior Customer Service
- (e) Industrial Relations

5. WORK EXPERIENCE:

- (a) Quality Assurance Manager for Malawi Pharmacies Limited (from 1992-1999)
- (b) Quality Assurance Manager for Universal Industries Limited (from 1999-2002)(c)
- Lecturer in Quality Management, Occupational Health and Safety, Food Safety Management Systems and Environmental Management Systems at The Malawi Polytechnic (from 2003 – up-to-date)

6. TRAINING/CONSULTANCY WHICH I HAVE PROVIDED TO THE PRIVATE SECTOR/PUBLIC INSTITUTIONS:

- (a) Food Hygiene

- (b) Application of HACCP
- (c) Production Management
- (d) Total Quality Management
- (e) Application of ISO 9001 Quality Management System
- (f) Internal Quality Auditor Training
- (g) Supervisory Management
- (h) KAP Survey for Chibuku Products Limited
- (i) Implementation of a Food Safety Management System according to ISO 22,000

7. PROFESSIONAL EXPERIENCE

Environment, Occupational Health and Safety

Dates	Company/ Organisati on	Location	Position	Description
Nov- Dec, 2017	Mwalija Irrigation Scheme	Chikwawa	Team Leader	Conducted water quality assessment and pesticide and concentration residuals
June- Aug, 2020	ILLOVO (Dwangwa Operation s)	Dwangwa	Environme ntal Expert	Conducted ESIA for extension farming land
Yearly	ILLOVO (Nchalo Operation)	Nchalo	Environme ntal Expert	Conducting Environmental Compliance Audit

Jan-Apr, 2019	RAKGAS	Salima, Dedza, Mangochi and Machinga	Air Quality Expert	Conducted ESIA for gas and oil exploration
Nov-Dec, 2019	BWANJE Limestone Project	Bwanje	Air Quality Expert	Conducted ESIA for limestone mining
Jan-Feb, 2022	Pyxus Agriculture	Lilongwe	Team Leader	Conducted ESIA for the groundnut shelling factory
Yearly	Alliance One Tobacco Company	Lilongwe	Team Leader	• Conducting Occupational Health and Safety Training • Conducting hygiene Survey • Conducting Safety, Health and Environmental Compliance Audit.
Yearly	JTI Tobacco	Lilongwe	Team Leader	• Conducting Occupational Health and Safety Training • Conducting a hygiene survey
Yearly	UNITRANS Malawi	Nchalo and Dwangwa	Team Leader	• Conducting hygiene survey and training on Occupational Health and Safety
2012 to date	Total Malawi	Blantyre, Lilongwe, Dwangwa, Nchalo	Team Leader	• Producing Environmental management plans for 5 filling stations (Tsiranana, Admarc, Kristwick, Area 6 and Gateway Mall) • Carried out a contamination audit of their operations within ILLOVO • ESIA for Kanengo Fuel Storage Depot
Nov, 2022	Gala Macadamia	Namitete	Environmental Expert	ESMP for Macadamia factory
July to date	Shire Valley Transformation Program	Chikwawa	EHS expert	ESMPs and EHS training

Jan-April, 2019	Liverpool Welcome Trust	Blantyre	Environmental Expert	ESIA for a 5-story research and training building
Feb-Dec, 2023	Liverpool Welcome Trust	Blantyre	Occupational Health and Safety Expert	Implementing an Occupational Health and Safety Management system according to ISO 45001 Std

Curriculum Vitae for Dr. Peter Ngoma – Team Leader

Position Title and No.	Team Leader
Name of Expert:	Dr. Peter Ngoma
Date of Birth:	28 th September 1977
Country of Citizenship/Residence	Malawi

Education:

Institution	Year	Degree/Diploma Obtained
University of Cape Town (UCT), South Africa	2010	Ph.D in Resource Economics
University of Malawi, Bunda College of Agriculture	2003	MS in Agricultural Economics
University of Malawi, Bunda College of Agriculture	2001	BSc (Distinction,) in Agricultural Economics

Employment record relevant to the assignment:

Period	Employing organization and your title/position. Contact info for references	Country	Summary of activities performed
Jan, 2017 – to date	LAPE Consultants Ltd P.O. Box 30510, Capital City, Lilongwe 3, Malawi.	Malawi	Main responsibilities: - Defining and implementing the strategic goals of the firm. - Providing leadership and management of the firm, staff, finances and budgets.

	E-mail: lape.consultants2016@gmail.com Position: Executive Director		• Developing and defending proposals. • Managing assignments including report writing, formatting and presentation. • Quality control of all projects under LAPE. • Establishing and maintaining effective networks and partnerships. • Lead Consultant in Economic and Financial analysis; Policy, Strategy and Budget Analysis; Baselines, Mid-term and End Evaluations; Program and Project Development; Capacity Assessments, etc.
May, 2017 – Oct, 2018	Shire River Basin Agency – under Shire River Basin Management Programme funded by the World Bank Position: Consultant - Water Resources Economist For References: Dr. Geoffrey Chavula Director – Shire River Basin Agency Tel: +265992035144 E-mail: gchavula@gmail.com	Malawi	• Providing the necessary economic analysis for the Shire River Basin Management Plan; • Undertaking monitoring and evaluation of the Management Plan; • Conducting research to aid in solving economic problems in the Basin and contribute to the basin knowledge base; • Contributing to the development of integrated hydro-economic modelling of the Shire River Basin, water resources valuation, design and evaluation of water policy instruments, including water markets, and the economics of water supply, irrigation and hydropower investments in the Basin; • Applying economic models and statistical techniques to analyze economic data and compile reports explaining economic phenomena and forecast trends in the Basin; • Conceptualizing policy issues and conduct necessary research to formulate economic policy for the Basin; • Evaluating the changing value of water in its different uses and the economic

			trade-offs, and advise on water resource management strategies that are ecologically, socially and economically sustainable; - Analyzing existing and proposed programs and developments in the Shire River Basin in order to determine their economic impacts in relation to poverty reduction, water use and environmental management; - Providing socio-economic analysis of the performance of existing and proposed short, medium and long term strategic interventions; - Providing strategic support and operational leadership on issues of socio-economic analysis; - Leading implementation of financial and investment models for the SRBA, and provide advice on strategy development and investment planning; and - Assisting to establish and build collaborative partnerships and relationships with stakeholders (including academia) working in the Basin.
From Sept 2011 to Dec 2016	Malawi Institute of Management (MIM) Position: Chief Management Development Consultant; Head of Consultancy & Advisory Services Directorate	Malawi	Main responsibilities: - Defining and sharing the strategic vision, goal and objectives of the directorate; - Developing plans necessary to achieve those goals and objectives; - Overseeing implementation of activities to attain the strategic vision, goal and objectives; - Initiating the development of consultancy proposals; - Updating the databank of consultants in

	For references: Mr. Precious Givah (Executive Director) Tel: +265995645747 e-mail: pbgivah@mim.co.mw		various specialist areas relevant to the core activities of MIM; • Allocating work and supervising consultants for quality delivery, including certification of completion of consultancy projects according to standards; • Conducting research for publication and development of case studies for the training programmes; • Setting and meeting quarterly and annual targets for the directorate; • Attending to complaints and queries related to consultancy and advisory services; • Coordinating the formulation of Directorate's budgets and prudently managing resources allocated in compliance with financial policies and practices; • Administering performance management systems for subordinates in the directorate; • Promoting and evaluating of new consultancy business; • Compiling consultancy programmes reports; • Representing MIM at different fora and carrying out other responsibilities as assigned by the Executive Director from time to time; • Participating in the development and delivering of courses and seminars; • Handling and following up complaints and queries related to consultancy and advisory services matter; • Assisting the Executive Director in the development of the Faculty Department;
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			Performing any other duties relevant to the post.
2009-2011	Lovellpark Consulting Group (Lilongwe) Position: Managing Director For references: Dr. Thomas Munthali, (Director), African Capacity Building Foundation, Harare, Zimbabwe Tel: +265999803140 e-mail: tbmunthali@yahoo.co.uk	Malawi	Main responsibilities: - Managing the firm, staff, finances and budgets. - Developing and defending proposals. - Managing assignments including report writing, formatting and presentation. - Lead Consultant in Economics, Policy and Budget Analysis.
2006-2009	University of Cape Town Position: Ph.D. Research Fellow For references: Dr. Jane Turpie (Senior Lecturer) Tel no: +27824595960 e-mail: Jane.Turpie@uct.ac.za	South Africa	Main responsibilities: - Undertake stakeholder analysis. - Undertake value chain analysis. - Conduct research on welfare, livelihood and vulnerability analysis on Zambezi Basin natural resources (fisheries). - Writing working papers under the University of Cape Town. - Writing papers for peer reviewed journals. - Writing and defending Ph.D. thesis: "Welfare Value of Small scale Fisheries in the Zambezi Basin".

2004-2007	Land O' Lakes Inc. Position: Monitoring and Evaluation Specialist For references: William Luka (Finance Manager) Tel no: +265999955829 e-mail: lukewms1@excite.com	Malawi	Main responsibilities • Developing program M&E system and tools. • Training frontline staff in M&E. • Supervising frontline staff in M&E. • Programme monitoring and evaluation. • Quarterly and annual reporting writing and submission to USAID mission.
2001-2004	Government of Malawi, Ministry Economic Planning and Development Position: Economist For references: Dr. Steve Donda (Deputy Director) Tel no: +265999950035 e-mail: stevedonda@gmail.com	Malawi	Main responsibilities: • Advising on economic matters related to fisheries sector. • Reviewing of economic activities related to fisheries sector. • Developing M&E system. • Reviewing policies and strategies. • Proposal development. • Project coordination. • Project planning and budgeting. • Monitoring and evaluation. • Project reporting.

Membership in Professional Associations and Publications:

- World Economics Association (WEA)

- Economics Association of Malawi (ECAMA)

Publications:

- Ngoma, P. (2018). Cost and Benefit Analysis of Flood Risk Management Structures in the Shire River Basin Management Programme, Ministry of Agriculture, Irrigation and Water Development, financed by the World Bank, Lilongwe, Malawi.
- Ngoma, P., Hussein, M., Kachaka, W., Mwakilama, S., Mbuna, J. and Dilawo, J. (2016). Accelerating Progress in Education in Malawi: A focus on financing and political economy. A research paper submitted to the International Commission on Financing Global Education Opportunities, New York, USA financed by the Rockefeller Foundation.
- Ngoma, P. (2015). Methodology for ecosystem products valuation of selected forest reserves in the Shire River Basin in Malawi. Working Paper for LTS International, UK. Contracted by the Ministry of Water Development and Irrigation, Malawi financed by GEF.
- Ngoma, P. (2013). The Economic Significance of the Shire River Basin: Its contribution to Gross Domestic Product (GDP) in Malawi. The Second Shire River Basin Conference, 19-22 November, 2013, Hotel Victoria, Blantyre, Malawi. Organized by the Ministry of Water Development and Irrigation, financed by World Bank.
- Ngoma, P, Emerging issues in modern day Consultancy. Key note address on 1st Annual Research Conference for the Institute of Development Management, 5-8 October, 2013, Gaborone Botswana.
- Ngoma, P., The Economic Costs of not Reforming the Public Sector: The case of public fleet management, Economics Association of Malawi (ECAMA) Annual Conference, 7-9 September, 2012, Nkopola Lodge, Mangochi.
- Ngoma, P., Kafere, G., Alide, Y. and Chapuma, M. (2012). Evaluating the Effectiveness of Performance Management System in the Civil Service: The case of Ministry of Labour and Vocational Training, University of Malawi, Chancellor College, Social Science Conference, Zomba, Malawi.
- Ngoma, P. (2010). Forecasting Malawi's Future Economic Growth Scenarios (2010- 2030) for estimating water demand. Working Paper for National Water Resources Investment Strategy, WS Atkins International Ltd, UK. Contracted by the Ministry of Water Development and Irrigation, financed by World Bank, Lilongwe, Malawi.
- Ngoma, P. (2010). The welfare value of inland small-scale floodplain fisheries of the Zambezi River Basin. Ph.D. thesis, University of Cape Town, South Africa.
- Ngoma, P. (2010). The welfare and social protection values of inland small-scale fisheries of the Kafue Floodplain in Zambia. Working Paper, University of Cape Town, South Africa.

- Ngoma, P. (2010). Rethinking the management of small-scale African fisheries towards people-centred versus production-centred approaches. Working Paper, University of Cape Town, South Africa.
- Ngoma, P. (2009). The role of inland small-scale floodplain fisheries in reducing seasonal economic vulnerability: Evidence from rural fisher-farming community in Malawi. Working Paper, University of Malawi, South Africa.
- Ngoma, P. (2009). The effect of climate change on the role of small-scale inland fisheries as a risk spreading strategy among farming households in Malawi. Working Paper, University of Cape Town, South Africa.
- Béné, C., Chiwaula, L., Ngoma, P., Turpie, J., Waibel, J. and Witt, R. (2009). Technical Guidelines for Economic Valuation of Inland small-scale Fisheries in Developing Countries. Technical Paper. The WorldFish Center. Penang, Malaysia.
- Valdivia, F., Ngoma, P., Lai, C. and Odumbe, M. (2007). Evaluating Cooperatives Using Organizational Capacity Building Index. Paper presented at American Association of Monitoring and Evaluation Workshop. November 5-11. Baltimore, Maryland, USA.
- Ngoma, P. (2006). Monitoring Dairy Projects in Malawi. Trainers' Manual. Land O' Lakes Malawi. Lilongwe. Malawi.
- Ngoma, P. (2005). Trampling poverty with a cow. In: Land O' Lakes, Inc. International Outlook. Volume 13, No 3. St. Paul, MN, USA.
- Ngoma, P., Donda, S. and Banda, M. (2004). Fish supply, demand, marketing and food security in Malawi. In: WorldFish Center Fish and Food Security in Malawi. Workshop Proceedings, Malawi Institute of Management, Lilongwe. Malawi.

Language Skills:

<u>Command of Languages</u>	<u>Reading</u>	<u>Writing</u>	<u>Speaking</u>
English	Excellent	Excellent	Excellent
Chichewa	Excellent	Excellent	Excellent
French	Fair	Fair	Fair
Tumbuka	Fair	Fair	Fair

Adequacy for the Assignment:

Detailed Tasks Assigned	Reference to Prior Work/Assignments that Best Illustrates Capability to Handle the Assigned Tasks
	1. Team Leader: Smallholder Owned Commercial Farms Development Service Provider 2022 - present; 2. Team Leader: Independent Verifier for the Performance Based Grants Institutions in Watershed Management, 2021 - Present 3. Team Leader: Baseline Survey on the Current Manual Public Procurement System in Malawi for the Government of Malawi 2022- Present 4. Team Leader: Tariff Assessment, Affordability Analysis and Willingness to Pay for Northern Region Water Board, 2021 - 2022 5. Team Leader: Baseline Survey of Lilongwe Water and Sanitation Project, April – August, 2019; 6. Team Leader: Baseline Survey for Sustainable Rural Water and Sanitation Infrastructure for Improved health and livelihoods Project, June – December, 2016; 7. Team Leader: Assessment of cassava value chain as an anchor for structural transformation in Africa, Promoting Regional value chains in Africa, African Union Commission, Department of Industry and Trade, Addis Ababa, Ethiopia, November, 2018. 8. Team Leader: Facilitation of ecosystem mapping of the cassava value chain for Job and Wealth Creation for Youth and Women in Africa, African Union Commission, Department of Industry and Trade, Accra, Ghana, September, 2018. 9. Team Leader: Facilitation on SMEs Cassava Value Chain Analysis for African Union Commission, Department of Industry and Trade, Accra, Ghana, March, 2018. 10. Team Leader: Facilitation of African Union Training in Intellectual Property and Competitiveness of SMEs in Africa, African Union Commission and WIPO, Department of Industry and Trade, Casablanca, Morocco, 2017.

	11. Team Leader: Facilitation of African Union Regional Training in Cassava Value Chain Analysis, African Union Commission, Department of Industry and Trade, Kigali, Rwanda, October, 2016. 12. Team Leader: Feasibility Study of business incubation in COMESA countries funded by SIDA through NEPAD: The case studies of Kenya, Burundi, Sudan and Swaziland, FEMCOM-COMESA, January – July, 2015. 13. Team Leader: Market Survey for Institute for Development Management in Botswana, Lesotho and Swaziland, Institute for Development Management, Gaborone, Botswana, April – November, 2012. 14. Team Leader: Creating linkages between research, advocacy and media in Southern Africa, Southern Africa Trust, Pretoria, March – June, 2010. 15. Team Leader: Socio-economic assessment of inland small-scale floodplain fisheries of the Kafue flood plains, WorldFish Centre, Lusaka, Zambia, June – August, 2008. 16. Team Leader: Commercial Agriculture for Smallholders and Agribusiness (CASA) funded by Foreign, Commonwealth and Development Office's (FCDO) - formerly known as DFID, Jan, 2021; 17. Team Leader: Review of the National Water Policy (2005) funded by African Development Bank, August – December, 2020. 18. Team Leader: Technical Audit of the Social Cash Transfer Program in World Bank funded districts, August – November, 2020; 19. Team Leader: Analytical study on building climate change resilience livelihoods through pigeon pea agricultural value chain and enhanced local ecosystems in the Shire River Basin, January – May, 2020; 20. Team Leader: Preparation of technical and economic feasibility study for Mzuzu City Sanitation, Hygiene and Sewerage Project funded by BADEA, September, 2019 to March, 2020. 21. Team Leader: Market Analysis and Value Chain Analysis for Programme for Rural Irrigation Development (PRIDE), November, 2019 – April, 2020;
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	22. Team Leader: End of Project Review of the Skills Development Project, October – December, 2019; 23. Team Leader: Endline Survey and Project Completion Report of Mzimba Urban Integrated Water and Sanitation Project, September – December, 2019; 24. Team Leader: Shire River Basin Management Programme, Basin Agency, funded by the World Bank, May, 2018 to October, 2019. 25. Team Leader: Transport and Trade Facilitation Assessment Study for Malawi funded by African Development Fund, Nov, 2018 – May, 2019. 26. Team Leader: Training Consultancy for agribusiness promotion, HIV/AIDS prevention and other STIs among project affected people along the Karonga Songwe Road, January, 2018 – June, 2019; 27. Team Leader: Development of National Agribusiness Strategy, December, 2017 – June, 2018; 28. Team Leader: Mid-Term Evaluation of the Skills Development Project, June – September, 2017; 29. Team Leader: Development of a Resource Mobilisation Strategy for the NAC HIV Pool Fund, March – May, 2017; 30. Team Leader: Development of Gender Sensitive Labour Market Strategy, March – May, 2017; 31. Team Leader: 2016/17 National Budget tracking study in the sectors of health, education, social welfare, WASH and youth with emphasis on the wellbeing of children, January – April, 2017; 32. Team Leader: Formulation of the National Fisheries and Aquaculture Communication Strategy for the Fisheries Sector funded by USAID under PACT, Sept – Nov, 2016. 33. Team Leader: Development of financing strategy for education sector in Malawi: A focus on SDGs education outcomes – Malawi Country Research Report, June – December, 2016; 34. Team Leader: Sanitation and Hygiene Investment Plan for Mzimba Plan funded by African Development Bank, Mar – Nov, 2016.
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	35. Team Leader: Beneficiary Technical Audit for Social Cash Transfer for Local Development Fund (LDF) Dedza and Nkhata Bay districts, June – December, 2015; 36. Team Leader: Ecosystems Products Valuation Assessment, Shire River Basin Management Programme, funded by World Bank and GEF, 2015 – 2017. 37. Team Leader: Beneficiary Assessment and Technical Audit for Crisis Response Programme, Local Development Fund, funded by World Bank, March – June, 2014; 38. Team Leader: Institutional, Policy Research, Analysis and development for the gender, sports and youth sector working group, May – September, 2012; 39. Team Leader: Sector Budget Review for Local Development Fund funded by World Bank, 2012. 40. Team Leader: Assessment of improvements attained in nutrition, HIV and AIDS and their socio-economic impacts in Malawi, April – August, 2011; 41. Team Leader: UNICEF Global study on Child Poverty and Disparities, March – August, 2010. 42. Team Leader: Agriculture Sector Assessment, Mt Mulanje Conservation Trust funded by USAID, May – July, 2010. 43. Team Leader: Development of National Water Investment Strategy funded by World Bank, 2009-2010.
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Expert's contact information: Cell: +265-992516821; +265-880587148,

E-mail: peter@lapemw.com

Certification:

I, the undersigned, certify that to the best of my knowledge and belief, this CV correctly describes myself, my qualifications, and my experience. I understand that any misstatement or misrepresentation described herein may lead to my disqualification or dismissal by the Client, and/or sanctions by the Bank.

Dr. Peter Ngoma
February 2024



27th

Name of Expert	Signature	Date
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Dr. Peter Ngoma
February 2024



27th

Name of authorized Representative of the Consultant	Signature	Date
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Curriculum Vitae for Mr. Andrea Gondwe Mjuma – Agribusiness Specialist

Position Title and No.	Agribusiness Specialist
Name of Expert:	Mr. Andrea Gondwe Mjuma
Date of Birth:	5 th November, 1982
Country of Citizenship/Residence	Malawi

Education:

Institution	Year	Degree/Diploma Obtained
LUANAR, Bunda College Campus	2024	Ph.D in Resource Economics - Pending
University of Malawi, Chancellor College	2013	Master of Arts Economics
University of Malawi, The Polytechnic	2001	Bachelor of Commerce (Accountancy)

Employment record relevant to the assignment:

Period	Employing organization and your title/position. Contact info for references	Country	Summary of activities performed
April 2021 to date	Organization: National Audit Office Position: Chief Performance Auditor	Malawi	Main responsibilities: • Providing leadership, supervision and coordination of section activities; • Conducting sector risks assessments; • Preparing annual budgets and work plans; • Preparing audit plans and programmes for individual audit

			assignments; • Directing and supervising auditors during planning, execution, reporting and follow-up phases of individual audit assignments; • Providing coaching and mentorship to auditors; • Reviewing audit inspection reports, auditor's reports and management letters; • Compiling quarterly progress reports for audit assignments carried out; • Undertaking specialized audits: Donor-funded projects audits, Audit of extractive industries, environmental audits and Performance information audits; • Compiling Annual Report Notes to incorporate in Annual Report of the Auditor General; and • Performing and coordination of general administrative duties
March 2018 to date	Organization: Lilongwe University of Agriculture and Natural Resources (LUANAR) Position: Part-time Lecturer	Malawi	Main responsibilities: • Providing lectures to undergraduate and postgraduate students; • Supervising research projects by undergraduate and postgraduate students; • Conducting field and survey research and disseminating research findings; and • Supervising enumerators, analyzing data and drafting research reports.
Jul 2016	Organization: DMI-St John Baptist University-Mangochi Campus	Malawi	Main responsibilities: • Teaching students the courses of Managerial Accounting and Business Law

to Nov 2016	Position: Part-time Lecturer for Managerial Accounting and Business Law		• Developing teaching materials for students • Assessing students through administration of assignments and examinations
Jan 2015 to June 2015	Organization: Catholic University of Malawi Position: Lecturer for Industrial Economics and Money and Banking	Malawi	Main responsibilities: • Teaching the students courses of Industrial Economics and Money and Banking. • Developing teaching materials for students. • Assessing students through administration of assignments and examinations. • Developing lesson plans
Feb 2015 to Jun 2015	Organization: Malawi College of Accountancy- School of Business Position: Lecturer for Strategic Human Resources Management and Business Policy and Strategy	South Africa	Main responsibilities: • Teaching the students courses of Strategic Human Resources Management and Business Policy. • Developing teaching materials for students • Assessing students through administration of assignments and examinations • Developing lesson plans
From Jul 2007 to Aug 2007	Organization: Ministry of Education Position: Secondary School Teacher for Mathematics and Physical Science	Malawi	Main responsibilities: • Teaching the students the courses of Industrial Economics and Money and Banking • Developing teaching materials for students • Developing lesson plans • Assessing students through administration of assignments and examinations
Nov	Organization: Hi-Profile	Malawi	Main responsibilities:

2005 to Jul 2007	BusinessCollege Position: Lecturer in courses offered by the Malawi Public Accountants Examination (P.A.E.C) and the Association of Business Executives (A.B.E)		• Teaching the students courses offered by the Malawi Public Accountants Examination (P.A.E.C) and the Association of Business Executives (A.B.E) • Developing teaching materials for students • Assessing students through administration of assignments and examinations • Developing lesson plans
2003 to 2005	Organization: National Smallholder Farmers Association of Malawi (NASFAM) Position: Audit and Finance Systems Advisor from 2003 to 2005	Malawi	Main responsibilities: • Reviewing accounting and internal control systems, and recommending improvements; • Examining financial data, and testing transactions and account balances; • Performing reviews of compliance with internal policies, external regulations and state laws; • Conducting investigations of fraud, collusion and corruption; • Auditing of financial statements; and • Preparing and presenting management letters monthly, quarterly and annually.

Publications:

- PhD research project (on-going): '**Participation in Fisheries Co-Management, Choice of Climate Change Adaptation Strategies and Implications for Household Food Security:** The Case of Lakeshore District of Salima-Malawi'.
- Mjuma, A.G. and Abdil-Khalil E. (2018). Estimating Tariff Equivalent Effects of Non-

- Tariff Measures on Intra-SADC Trade (Unpublished term paper); and
- Mjuma, A.G. (2014). Economic Growth and Total Factor Productivity Growth in Sub-Saharan Africa: Links to Regional Integration (Unpublished Masters thesis)

Language Skills:

<u>Command of Languages</u>	<u>Reading</u>	<u>Writing</u>	<u>Speaking</u>
English	Excellent	Excellent	Excellent
Chichewa	Excellent	Excellent	Excellent
Tumbuka	Fair	Fair	Fair

Adequacy for the Assignment:

Detailed Tasks Assigned	Reference to Prior Work/Assignments that Best Illustrates Capability to Handle the Assigned Tasks
	1. Agribusiness Specialist: Smallholder Owned Commercial Farms Development Service Provider 2022 - present; 2. Agribusiness Specialist: Individual Consultant of business plans preparation for agricultural cooperatives under the Agricultural Commercialization (AGCOM)-Ministry of Agriculture 3. Agribusiness Specialist for the Agriculture Comparative Economic Study (CEA) in July 2018. Farmers Union of Malawi (FUM) engaged value chain experts to conduct a study on value chains' gross margins, comparative advantage and export competitiveness of field and plantation crops as well as daily for Malawi;

	4. Agribusiness Specialist: for the Comparative Advantage and Export Competitiveness (CAEC) Study in November 2019. Based on the Agriculture Comparative Economic (CEA) Study, Farmers Union of Malawi (FUM) in partnership with Export Development Fund (EDF) engaged value chain experts to conduct CAEC study. The study was a comprehensive Value Chain Analysis of the following enterprises; cotton, groundnuts, pigeon peas, soya beans, sunflower, red kidneybeans, red speckled beans, dairy, coffee, chillies, sugar, tea, Macadamia and Cassava. .
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Expert's contact information: Cell: +265-881921175; +265-980680133,

E-mail: agmjuma82@gmail.com

Certification:

I, the undersigned, certify that to the best of my knowledge and belief, this CV correctly describes myself, my qualifications, and my experience. I understand that any misstatement or misrepresentation described herein may lead to my disqualification or dismissal by the Client, and/or sanctions by the Bank.

Mr. Andrea Gondwe Mjuma
February, 2024



27th

Name of Expert	Signature	Date
Dr. Peter Ngoma February 2024		27 th
Name of authorized	Signature	Date
Representative of the Consultant		

CV for Mr. Everson Nkonya - Irrigation Engineer

Position Title and No.	Irrigation Engineer
Name of Expert:	Everson Nkonya
Date of Birth:	28 th September 1985
Country of Citizenship/Residence	Malawi

Education:

Institutions	University of Malawi, Polytechnic
Date	2009
Degree	BSc Civil Engineering

Employment Record:

Period	Employing Organization and Title. Contact info for references	Country	Summary of Activities performed relevant to the Assignment
2021 to Date	L. Gravam Consulting Services Ltd Position: Civil/Irrigation Engineer	Malawi	Design and supervision of irrigation system, hydraulic structures, damsetc
Sep 2018 to 2021	Willy & Partners Engineering Services (WPES) Position: Civil/Irrigation Engineer	Malawi	Hydraulic and water supply infrastructure design for Lifani, Malosa, Old Chingale, Zomba South and Zomba West Gravity Fed Systems
January 2018 to June 2018	Willy & Partners Engineering Services (WPES)	Malawi	Hydraulic and structural analysis and Design of Mpira Mini Earth Dam.

August 2015 to 2018	Norplan AS Consulting Engineers & Planners (Norway) Position: Civil Engineer	Malawi	Construction supervision for the new bridge (Rafter foundations, Piers, Abutments and the deck), Energy dissipaters (Stilling basins), Weedboom anchor foundations, Jib crane/weed collector foundations, installation of new radial gates and stop log guides, earth cofferdams and steel sheet pile walls, Concrete retaining walls, Rehabilitation of old barrage/bridge piers, upgraded asphalt roads and Water intake Structures for SRWB-Liwonde.
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January 2015 to July 2015	Willy & Partners Engineering Services (WPES) Position: Water Supply Engineer	Malawi	Hydraulic and water supply infrastructure design and construction supervision.
June 2013 to Dec 2014	IGIP (Germany) Position: Water Supply Engineer	Malawi	Construction of the elevated pressed steel tanks, pipeline network and the intake, administration buildings)
Jan 2012 to Dec 2013	SSI (South Africa) Position: Water Supply Engineer	Malawi	Construction of water treatment plant (Aerators, Flocculators, Clarifiers, Rapid Gravity Sand filters, Clear water tanks, ground RC tanks, Installation of Pumps).
July 2010 to Dec 2011	Gibb Africa (Kenya) Position: Irrigation Engineer	Malawi	Construction of lined canals, earthdams, installation of radial gate, irrigation control structures, intake weirs, spillway structures, flow measuring flumes, concrete bridges, access earth roads, flood protection

			bunds.
Jan 2010 – June 2010	N3 Construction Company Position: Civil Engineer	Malawi	Construction of School blocks (Classrooms, Libraries, Laboratories, Pit Latrines, Staff houses, access roads and play fields).
Jan 2009- Sep2009	MKAKA Construction Company Position: Civil Engineer	Malawi	Construction of chip sealing roads, asphalt roads and Box culverts Position

Membership of Professional Associations and Publication:

- Graduate Member, Malawi Board of Engineers.

Languages Skills: Indicate competence on a scale of 1 to 5 (1 - excellent; 5 - basic)

Language	Reading	Speakin g	Writing
	Mother tongue		
English	1	1	1
Chichewa	1	1	1

Adequacy for the Assignment:

Detailed Tasks Assigned	Work Undertaken that Best Illustrates Capability to Handle the Tasks Assigned
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	Name of the assignment: Detailed Feasibility and Design Studies and Construction Supervision of 3500ha New Irrigation Schemes Period: 2019 to 2021 Location: Malawi Client: Ministry of Agriculture, Irrigation and Water Development Main Project Features: • Develop 3500 ha of land into irrigation farming • Preparation of detailed feasibility study reports for the targeted irrigation schemes • Preparation of climate resilient detailed engineering designs for the targeted irrigation schemes • Preparation of detailed bidding documents for the works • Provision of engineering supervision and quality services during the construction works Position Held: Irrigation Design Engineer Activities: • Conducted hydraulic analysis of the pipe network using Epanet • Complete all aspects of climate resilient detailed designs of all the irrigation schemes whose detailed feasibility reports have been accepted • Prepare Construction Drawings, Bills of Quantities (BoQs), Bidding Documents • Technical Specifications as well as any other documents needed to fulfil the objectives of this assignment.
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Name of the Assignment or Project: – Design of the Reconstruction of 1000 ha Mwananjobvu Irrigation Scheme Client: Greenbelt Authority Location: Ngabu, Chikwawa Main Project Features: • 6No floating pumps • 3 lines x 900mm dia GRP conveyance line from intake to pump station • Weir intake • Pipe network for supply line, secondary pipeline • 3No. NSR • Earthen tertiary line • Road network Position held: Structural Engineer Activities Performed: • Structural analysis of the pump foundation, thrust blocks, weir intake structure, siphon etc
Name of the assignment: Design and supervision of the construction of solar powered irrigation system at the proposed Liwonde Spicy Project Period: 2020 - 2021 Location: Malawi Client: Total Land Care Main Project Features: • 6No. x 7.5 KW Solar powered closed coupled surface pumps • 6No. Solar farms supplying power to the pumps • 15.4 Km pipe network • Approach channels from Lake Malombe Position Held: Supervising Engineer Activities Performed: Supervised the contractors during the installation of the pumps, pipelines and the irrigation equipment

Name of the Assignment or Project: – Design of New water sources/Intakes and conveyance systems for Rural Gravity Fed Piped Water Supply Schemes in drought affected districts in Malawi.

Location: Zomba District

Client: Government of Malawi – Ministry of Agriculture, Irrigation and Water Development (MoAIWD)

Main Project Features: Hydraulic and water supply infrastructure design for Lifani, Malosa, Old Chingale, Zomba South and Zomba West Gravity Fed Systems

Position held: Hydraulic Design Engineer

Activities Performed:

- Review of previous designs and relevant documents
- Technical Assessment of piped water supply and groundwater (Boreholes);
- Intake Flow measurements;
- Preliminary and Detailed Design for piped water supply systems (Intakes, transmission lines treatment works facilities and storage reservoirs).
- Preparation of Cost Estimates, drawings and Tender Documents for Piped water supply systems in liaison with proposed budgets.
- Preparation of Technical Specifications

Name of the Assignment or Project: Feasibility Study to Realisation of Developing Mpira Mini Dam in Machinga District.

Location: Machinga District

Client : Malawi Government: Ministry of Natural Resources and Mining-(GEF, UNDP and LDCF)

Main Project Features: Hydraulic and structural analysis and Design of Mpira Mini Earth Dam.

Position held: Design Engineer

Activities Performed:

- Review previous reports, maps and other relevant documents
- Preliminary aerial and topographic survey using GPS Equipment;
- Production of contour maps using Surfer 8 & Arc Map-GIS;
- Preliminary and Detailed Design of the dam (Embarkment/earth dam, Spillway and Filter drain);
- Production of construction drawings using AutoCAD;

Preparation of Bill of Quantities and Technical Specifications.

Name of the Assignment or Project: Upgraded Kamuzu Barrage

Location: Liwonde, Machinga District, Malawi

Client: Ministry of Agriculture, Irrigation and Water Development (MoAIWD).

Main Project Features: Construction supervision for the new bridge (Rafter foundations, Piers, Abutments and the deck), Energy dissipaters (Stilling basins), Weedboom anchor foundations, Jib crane/weed collector foundations, installation of new radial gates and stop logguides, earth cofferdams and steel sheet pile walls, Concrete retaining walls, Rehabilitation of old barrage/bridge piers, upgraded asphalt roads and Water intake Structures for SRWB- Liwonde. Position held: Site Civil Engineer **Activities Performed:**

- Construction supervision of the structures.
- Reviewing revised drawings before submission to Contractor
- Checking on-site designs and liaising with designers for possible adjustments of designs to suit site conditions.
- Daily work inspection, checking steel sheet piles, rebars and formwork if fixed according to drawings and technical specifications
- Checking and verifying the setting out of structures if done according to drawing plans;
- Check and verify measured quantities for certification of Contractor 's Payment Certificates
- Calculation of earthworks (Cofferdams), steel sheet piles and re-bar quantities for payment certificates • Issuing site instructions;
- Receiving and attending to requests from the Contractor for inspections;
- Receiving and checking material/product data sheets if they are according to contract's specifications.
- Receiving and checking laboratory tests results (Concrete, steel, cement, admixtures, curing agents, etc) for approval.
- Receiving and checking civil work method statements from the Contractor
- Proactively monitoring compliance by the Contractor with the approved Health and Safety Plan (HSP) and Environmental Protection Plan (EPP), including recording observed non-compliances and the Contractor's proposed remedial actions on the daily site diary forms;
- Proactively monitoring compliance by the Contractor with the specifications and the approved Quality Plan (QP) including full-time attendance during critical activities
e.g. concrete pouring, concrete surface and joint repairs, application of corrosion protection coatings, plant and equipment commissioning and testing.

Name of the Assignment or Project: Design and Construction Supervision of Nkope Water Supply Scheme.

Location: Nkope, Mangochi District,

Client: Malawi Association for Christian Support (MACS).

Main Project Features: Hydraulic and water supply infrastructure design and construction supervision. Position held: Water Supply Engineer

Activities Performed:

- Technical Assessment.
- Engineering surveying for the pipeline routes;
- Preliminary and Detailed Design of piped water supply network (Intake design, Pump size design, Pipeline network design, Structural design of RC ground tank);
- Preparation of Cost Estimates & Tender Documents
- Preparation of Technical Specifications

Name of the assignment or Project: Construction Supervision of Mangochi Water Supply Scheme.

Location: Mangochi District

Client: Southern Region Water Board (SRWB)

Main Project Features: Construction of the elevated pressed steel tanks, pipeline network and the intake, administration buildings) Position held: Site Engineer

Activities Performed:

- Construction supervision for the water intake, Pipeline network, elevated tanks, administration buildings.
- Daily work inspection, check and verify measured quantities for certification of Contractor's Payment Certificates;
- Checking Contractors payment certificates.
- Ensuring quality control;
- Receiving and attending to requests from the Contractor for inspections;
- Receiving and checking laboratory tests results for approval
- Receiving and checking material/product data sheets if they are according to contract's specifications.
- Receiving and checking civil work method statements from the Contractor
- Issuing site instructions

Name of the Assignment or Project: Upgrading and rehabilitation of Zomba and Mangochi Water Supply Schemes

Location: Zomba and Mangochi Districts - Malawi

Client: Southern Region Water Board (SRWB)

Main Project Features: Construction of water treatment plant (Aerators, Flocculators, Clarifiers, Rapid Gravity Sand filters, Clear water tanks, ground RC tanks, Installation of Pumps).

Position held: Site Engineer

Activities Performed:

- Construction supervision of Water Treatment Units.
- Daily work inspection, check and verify measured quantities for certification of Contractor 's Payment
- Certificates;
- Ensuring quality control;
- Receiving and attending to requests from the Contractor for inspections;

- Issuing site instructions;
- Receiving and attending to requests from the Contractor for inspections;
- Receiving and checking material/product data sheets if they are according to contract's specifications.
- Receiving and checking laboratory tests results (Concrete, steel, cement, admixtures, curing agents, etc) for approval.
- Receiving and checking civil work method statements from the Contractor
- Liaising with designers for possible adjustments of designs to suit site conditions

Name of the Assignment or Project: – Rehabilitation of Likangala Irrigation Complex Schemes.

Location: Zomba District

Client: Government of Malawi – Irrigation Rural Livelihood and Agricultural Development Projects (IRLADP)

Main Project Features: Construction of lined canals, earth dams, installation of radial gate, irrigation control structures, intake weirs, spillway structures, flow measuring flumes, concrete bridges, access earth roads, flood protection bunds.

Position held: Site Engineer

Activities Performed:

- Construction supervision of irrigation schemes, Review of previous designs and relevant documents, On-site designs, Observing the Contractors quality of work.
- Verifying and performing any measurement and quantity computation and issuance of the interim payment certificates.
- Supervising the works and examining any materials to be used or workmanship employed in connection with compliance with contract drawings and specifications.
- Inspecting at delivery and installation such electrical and mechanical materials, machinery and plant supplied to be used for project implementation.
- Reviewing the contractor's proposed procedures for investigation, material testing and monitor these activities to ensure conformance with the contract documents and work schedule, Issuing site instructions, Checking and approving shop drawings.

Expert's contact information:

LAPE Consultants Ltd, Email: lape.consultants2016@gmail.com, Cellphone: 0992516821

Certification:

I, the undersigned, certify that to the best of my knowledge and belief, this CV correctly describes myself, my qualifications, and my experience, and I am available, as and when necessary, to undertake the assignment in case of an award. I understand that any misstatement or misrepresentation described herein may lead to my disqualification or dismissal by the Client, and/or sanctions by the Bank.

Everson Nkonya



27th February, 2024

Name of Expert

Signature

Date

Dr. Peter Ngoma



27th February, 2024

Representative of the Consultant

Signature

Date

CV for Mr. Aubrey Qabaniso Nyekanyeka - Environmental Health Specialist

Position Title and No.	Environmental Health Specialist
Name of Expert:	Aubrey Qabaniso Nyekanyeka
Date of Birth:	06/03/1989
Country of Citizenship/Residence	Malawi

Education:

Institution:	University of Malawi, Bunda College, Faculty of Environmental Science, Department of Natural Resources Management.
Dates Attended:	2007 - 2011
Degrees Obtained:	Bachelor of Science in Natural Resources Management

Employment record relevant to the assignment:

Period	Employing organization and your title/position. Contact info for references	Country	Summary of activities performed relevant to the Assignment
July 2021 - Present	Organization: SDE Consulting Title: Environment and Disaster Risk Management Expert Reference: Name: Chawanangwa Kayira Title: Managing Partner Tel: +265996618222 e-mail: chwkayira@yahoo.co.uk chawakayira@gmail.com	Malawi	Key Activities/Responsibilities - Development of Environmental and Social Management Plans - Review of WUA Implementation Frameworks - Environmental and Social Impact Assessment

July 2021 - Feb 2022	Organization: C12 Consultants/JICA Title: Environment and Disaster Risk Management Expert Reference: Name: Rob Hartley Luis Title: ESIA Specialist/Senior Consultant Tel: +265992389891 e-mail: rhartleylouis@ctwelve.org	Malawi	Key Activities/Responsibilities - Environmental and Social Impact Assessment - Review of Environmental and Social Management Plans - Review of Agriculture sector Business Continuity Plans - Capacity and Vulnerability Assessment
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Jan 2018 - Jun 2021	Organization: Agriculture and Natural Resources Management (ANARMAC) Title: Programme Manager Reference: Name: Ian Kumwenda Title: Managing Director Tel: +265 999 199 796 email: iankumwenda2003@gmail.com	Malawi	Key Activities/Responsibilities - Value Chain Analysis and Development - Development Integrated Agriculture Framework - Development of Waste Management Plans - Development of Environmental and Social Management Plans
Sep 2012 to Aug 2017	Organization: Cooperazione Internazionale Title: Project Coordinator Reference: Name: Mwiriha Kapondam'gaga Title: Programme Coordinator Tel: +265 999 91 09 05 email: mvkaponda@yahoo.com	Malawi	Key Activities/Responsibilities - Environmental and Disaster Risk Management Contingency Planning - Capacity and Vulnerability Assessment - Development of Waste Management Plans - Development of Environmental and Social Management Plans - Catchment Management

Jun to Jul 2012	Organization: Pump Aid Malawi Title: Quality Assurance Officer Reference: Name: Sekaone Phiri Title: Program Manager email: sekaonep@gmail.com	Malawi	Key Activities/Responsibilities - Water Quality Assessment - Site Identification
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Membership in Professional Associations and Publications:

- Wildlife and Environmental Society of Malawi (WESM)

Language Skills (indicate only languages in which you can work):

Language	Reading	Speaking	Writing
English	Excellent	Excellent	Excellent
Chewa	Excellent	Excellent	Excellent

Adequacy for the Assignment:

Detailed Tasks Assigned on Consultant's Team of Experts:	Reference to Prior Work/Assignments that Best Illustrates Capability to Handle the Assigned Tasks
	Consultancy to develop and empower the water users' associations in six (6) irrigation schemes, Ministry of Forestry and Natural Resources, Malawi Resilience and Disaster Risk Management Project (December 2021) - Assignment Implemented under SDE Consulting
	Development of the flagship program on effective management, participation and empowerment of women and youth in agriculture, under the Ministry of Agriculture, Irrigation and Water Development (MoAIWD) 2019 – 2020 - Assignment Implemented under ANARMAC
	Development of Concept Notes and Business Plans for Cooperatives under the Agriculture Commercialization (AGCOM) project (2020); - Assignment Implemented under ANARMAC and the Lilongwe Agriculture Development Division (ADD)

	Development of the M'mbelwa District Trust Cannabis Business Plan (2020) - Assignment Implemented under ANARMAC
	Organizational, Capacity and Training Needs Assessment and Catchment Management (Natural Resources Management for District Staff, Extension Staff and Community Groups) - IFAD/Government of Malawi (2021): - Assignment Implemented under ANARMAC
	Development of Environmental and Disaster Risk Management Contingency Plans including ESMP, Hazard and Vulnerability Mapping at Community, District and National Level under the ECRP-DISCOVER Program - Assignment Implemented under Cooperazione Internazionale (COOPI) Malawi
	Formation of Water User Associations and Cooperatives in the Districts of Nkhata Bay (Linga) and Nkhotakota (Dwambazi), Ministry of Agriculture, Irrigation and Water Development, Agricultural Infrastructure and Youth in Agribusiness Project (AIYAP) (2021) - Assignment Implemented under SDE Consulting

Expert's contact information:

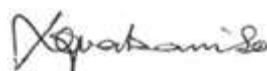
LAPE Consultants Ltd, Email: peter@lapemw.com

Cellphone: 0992516821

Certification:

I, the undersigned, certify that to the best of my knowledge and belief, this CV correctly describes myself, my qualifications, and my experience, and I am available, as and when necessary, to undertake the assignment in case of an award. I understand that any misstatement or misrepresentation described herein may lead to my disqualification or dismissal by the Client, and/or sanctions by the Bank.

Aubrey Nyekanyeka



27th February, 2024

Name of Expert

Signature

Date

Dr. Peter Ngoma



27th February, 2024

Representative of the Consultant

Signature

Date

