Environmental Management Plan for the Proposed Water Supply Systems to Support Community Irrigation Demonstration Plots in the Kavango East Region

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Table of Contents

List of Tables ..... *i*

ACRONYMS ..... *ii*

Executive Summary ..... *iii*

1 The Environmental Management Plan *1*

1.1 Purpose of the EMP **1**

1.2 Disciplinary Action **2**

1.3 Compliance to the EMP **2**

2 Project Description *3*

3 Legal Policy framework *3*

3.1 Roles and Responsibility **5**

4 The EMP table *8*

4.1 Irrigation Activities Applicable to All Producer organizations (POs) **8**

4.2 Borehole Drilling Activities under the Construction Phase (Thikanduko, Mukuvi, and Hoha POs) **15**

4.3 Borehole Operational Phase EMP Table **26**

4.4 River Water Abstraction Activities under the Construction Phase **33**

4.5 River Water Abstraction Activities under the Operational Phase **39**

4.6 General Management Plans Socio Economic and Heritage Resources **51**

5 Decommissioning and Rehabilitation Plan *54*

5.1 River Water Abstraction **54**

5.2 Borehole Drilling Activities **54**

6 Conclusion and Recommendations *56*

6.1.1 River Water Abstraction 56

6.1.2 Borehole Drilling Activities 57

LIST OF TABLES

Table 1: Legal and Policy Frameworks 1

Table 2. Roles and Responsibility 5

Table 3. EMP Table for Irrigation Activities Applicable to All Producer Organizations (POs) 8

Table 4. Construction Phase of Borehole Drilling Activities at Thikanduko, Mukuvi, and Hoha Producer Organizations 15

Table 5. Aquifer Conservation - Borehole Drilling 23

Table 6. Operational Phase of Borehole Water Supply Systems at Thikanduko, Mukuvi, and Hoha Producer Organizations 26

Table 7. Construction Phase of River Water Abstraction Infrastructure for Producer Organizations along the Kavango River 33

Table 8. Operational Phase of River Water Abstraction Activities for Producer Organizations along the Kavango River 39

Table 9. Socio-Economic Consideration 51

Table 10. Heritage Resources 52

ACRONYMS

AIDS	ACQUIRED IMMUNE DEFICIENCY SYNDROME
CC	CLOSE CORPORATION
DAPP	DEVELOPMENT AID FROM PEOPLE TO PEOPLE (DAPP NAMIBIA)
ECC	ENVIRONMENTAL CLEARANCE CERTIFICATE
ECO	ENVIRONMENTAL COMPLIANCE OFFICER
EIA	ENVIRONMENTAL IMPACT ASSESSMENT
EMA	ENVIRONMENTAL MANAGEMENT ACT
EMP	ENVIRONMENTAL MANAGEMENT PLAN
HIV	HUMAN IMMUNODEFICIENCY VIRUS
ILO	INTERNATIONAL LABOUR ORGANIZATION
MEFT	MINISTRY OF ENVIRONMENT, FORESTRY AND TOURISM
PO	PRODUCER ORGANISATION (PRODUCER ORGANISATIONS)
PPE	PERSONAL PROTECTIVE EQUIPMENT
SSO	SAHARA AND SAHEL OBSERVATORY

EXECUTIVE SUMMARY

This Environmental Management Plan (EMP) accompanies the Environmental Impact Assessment (EIA) for a climate-resilience and livelihood-improvement project in Kavango West, implemented by DAPP Namibia with funding from the Sahara and Sahel Observatory. The project's primary objective is to increase reliable water access for irrigation and domestic use through controlled abstraction from the transboundary Kavango River (shared with Angola), and to strengthen rural livelihoods via demonstration plots linked to Producer Organisations. This EMP applies specifically to activities and sites within Kavango East.

Project rationale and objectives

- Enhance community resilience to climate change by improving water availability and promoting sustainable, higher-yield agricultural practices.
- Reduce reliance on erratic rainfall and recurrent droughts by introducing small-scale, community-level irrigation systems and building local capacity.

Site selection and technical approach

- Water-supply solutions will be matched to site conditions: controlled surface-water abstraction for river-adjacent sites and borehole development for inland locations.
- Most proposed sites are already disturbed or in agricultural use; no significant biodiversity or cultural-heritage constraints were identified during site appraisal.

Environmental risk profile

- Anticipated impacts are assessed as low to moderate, primarily relating to water abstraction, local soil disturbance, erosion, and routine agricultural inputs and practices.
- Potential cumulative impacts on transboundary water resources are considered and addressed through sustainable abstraction rates and monitoring.

Mitigation, monitoring and management

- The EMP sets out proportionate mitigation measures, environmental monitoring indicators, and operational controls to prevent or reduce adverse impacts (e.g., sustainable abstraction limits, erosion control, water-quality protection, and Good Agricultural Practices).
- Roles and responsibilities for implementation, reporting requirements, and adaptive management triggers are defined to ensure ongoing compliance and responsiveness to monitoring results.

Expected outcomes

- Improved food production and food security, strengthened practical skills among participating communities, and progression toward more productive, sustainable, and climate-resilient livelihoods in Kavango East.

This EMP provides the framework to integrate environmental safeguards throughout project planning, construction and operation, ensuring that benefits are realized while environmental and transboundary water-resource risks are effectively managed.

1 THE ENVIRONMENTAL MANAGEMENT PLAN

1.1 Purpose of the EMP

This Environmental Management Plan (EMP) has been developed for the proposed water supply systems intended to support irrigation demonstration plots linked to Producer Organizations (POs) in the Kavango East Region. The EMP provides a practical framework for managing, monitoring, and minimizing potential environmental and social impacts associated with river water abstraction, borehole drilling, installation of irrigation infrastructure, water storage systems, solar-powered pumping systems, and associated agricultural activities.

The primary objective of this EMP is to ensure that all project activities are implemented in an environmentally sustainable, socially responsible, and legally compliant manner. The EMP therefore serves as a comprehensive environmental management tool that outlines mitigation, monitoring, and management measures required to minimize impacts on the biophysical and social environment throughout the planning, construction, operational, rehabilitation, and decommissioning phases of the project.

This EMP further:

- identifies environmental and social risks associated with the project;
- establishes mitigation and monitoring measures to reduce identified impacts;
- defines environmental management roles and responsibilities;
- promotes compliance with environmental and social safeguards;
- provides procedures for environmental monitoring and reporting; and
- supports climate resilience, sustainable agriculture, improved food security, and enhanced community livelihoods.

The EMP is intended to function as a living document and may be updated where necessary to accommodate changes in project activities, environmental conditions, or regulatory requirements.

1.2 Disciplinary Action

Failure to comply with the provisions of this EMP, site environmental procedures, or applicable environmental legislation may result in disciplinary action, removal from site, suspension of activities, or legal enforcement measures.

All contractors, workers, and project personnel shall be informed that non-compliance with environmental and safety requirements will not be tolerated. Serious offences such as pollution, illegal dumping, reckless water use, destruction of vegetation, poaching, or damage to irrigation infrastructure may result in immediate disciplinary action and reporting to the relevant authorities.

1.3 Compliance to the EMP

This EMP is a legally binding environmental management document under the Environmental Management Act, 2007 (Act No. 7 of 2007). All project activities associated with river water abstraction, borehole drilling, irrigation infrastructure installation, and operation of the demonstration plots shall be undertaken in accordance with the provisions of this EMP and conditions attached to the Environmental Clearance Certificate (ECC).

DAPP Namibia, contractors, sub-contractors, Producer organizations (POs), and all personnel involved in the project shall comply with the environmental management requirements and mitigation measures contained in this EMP.

Compliance monitoring shall include:

- regular environmental inspections;
- monitoring implementation of mitigation measures;
- monitoring water abstraction activities;
- monitoring waste management and occupational health and safety measures; and
- environmental performance reporting where required.

2 PROJECT DESCRIPTION

The proposed project involves the development and improvement of water supply systems to support irrigation demonstration plots linked to Producer organizations (POs) across the Kavango East Region of Namibia. The project forms part of a broader climate resilience and food security initiative aimed at improving agricultural productivity and strengthening community livelihoods through irrigation-supported horticultural production.

Key project activities include:

- river water abstraction from the Kavango River;
- borehole drilling for inland sites;
- installation of solar-powered pumping systems;
- installation of irrigation infrastructure, storage tanks, and conveyance pipelines; and
- operation and maintenance of irrigation demonstration plots.

Water supply options have been selected based on site-specific conditions, with river water abstraction proposed for sites located within approximately 500 metres of the Kavango River, while inland sites are proposed for borehole development.

The project aims to improve year-round agricultural production, strengthen food security, support climate-smart agriculture, build community capacity through practical training, and reduce dependence on rain-fed farming systems.

3 LEGAL POLICY FRAMEWORK

The proposed project shall comply with all applicable Namibian environmental, water resource, labour, public health, and sustainable development legislation. The legal and policy framework provides guidance for environmental protection, sustainable water abstraction, occupational health and safety, public participation, and climate-resilient agricultural development. The implementation of the project shall therefore be undertaken in accordance with the following legal and policy instruments:

Table 1: Legal and Policy Frameworks

Legislation / Policy	Relevant Authority	Applicability to the Project
The Namibian Constitution	Government of the Republic of Namibia	The Namibian Constitution is the supreme law of the country and provides for environmental protection and sustainable development under Article 95(l), which requires the State to actively promote and maintain ecosystems, essential ecological processes, and biological diversity while ensuring sustainable use of natural resources for present and future generations. The proposed project supports these principles through sustainable water resource development, climate resilience, and improved food security.
Environmental Management Act No. 7 of 2007	Ministry of Environment, Forestry and Tourism (MEFT)	The Environmental Management Act promotes sustainable management of natural resources and requires environmental assessment for listed activities that may not be undertaken without an Environmental Clearance Certificate (ECC). The proposed river water abstraction and borehole drilling activities fall within listed water resource development activities requiring environmental assessment and environmental authorization.
Environmental Impact Assessment Regulations, 2012	MEFT	The EIA Regulations provide procedures for environmental assessment, public participation, impact identification, and environmental management planning. The regulations guide the environmental scoping process, stakeholder consultation, and development of this EMP.

Legislation / Policy	Relevant Authority	Applicability to the Project
Environmental Assessment Policy for Sustainable Development and Environmental Conservation (1995)	MEFT	The policy promotes integrated environmental management and emphasizes the importance of environmental assessments in ensuring sustainable development. The policy requires that environmental impacts and mitigation measures be incorporated into project planning and implementation.
Water Resources Management Act No. 11 of 2013	Ministry of Agriculture, Fisheries, Water and Land Reform (MAFWLR)	This Act provides the legal framework for integrated water resources management, sustainable abstraction, groundwater protection, and water use regulation. Water abstraction and borehole development associated with the project must comply with the provisions of this Act and any relevant water abstraction permits or authorizations.
Water Resources Management Regulations, 2023 (GN 269/2023)	Ministry of Agriculture, Fisheries, Water and Land Reform (MAFWLR)	These Regulations establish the statutory framework for integrated water resources management, sustainable water abstraction, groundwater protection, and the regulation of all surface and subsurface water use. Any water abstraction activities and borehole drilling operations associated with the project must comply with the provisions of GN 269/2023, including the requirement to secure the appropriate water use authorisations and drilling permits from the competent authority prior to commencement.

Legislation / Policy	Relevant Authority	Applicability to the Project
Labour Act No. 11 of 2007	Ministry of Labour, Industrial Relations and Employment Creation	The Labour Act regulates labour practices, worker welfare, and occupational safety within Namibia. Contractors and project personnel shall comply with fair labour practices, working conditions, and employee safety requirements during implementation of the project.
Public Health Act No. 36 of 1919	Ministry of Health and Social Services	The Public Health Act aims to protect public health and prevent environmental conditions harmful to human health. The project shall ensure proper waste management, sanitation, and pollution prevention measures to protect both workers and surrounding communities.
National Water Policy	MAFWLR	The National Water Policy promotes integrated and sustainable water resources management, equitable water access, and conservation of water resources. The proposed irrigation systems and water abstraction activities align with the policy objectives of improving water access while promoting sustainable water use.
National Policy on Climate Change for Namibia	MEFT	The policy supports climate adaptation and resilience-building initiatives aimed at reducing vulnerability to climate variability and drought. The project contributes towards climate adaptation by promoting irrigation-supported agriculture and reducing dependence on unreliable rainfall.

Legislation / Policy	Relevant Authority	Applicability to the Project
Harambee Prosperity Plan and National Development Plans	Government of the Republic of Namibia	The project supports national development objectives relating to food security, rural development, poverty reduction, climate resilience, and sustainable natural resource management.
Vision 2030	Government of the Republic of Namibia	The project contributes towards sustainable socio-economic development, improved livelihoods, and environmental sustainability in line with Namibia's Vision 2030 objectives.

3.1 Roles and Responsibility

To promote accountability, effective implementation of mitigation measures, and continuous environmental performance improvement, it is essential to assign clear delegation of roles and responsibilities across all levels of the project. **Table 2** below outlines the key roles and their associated responsibilities to ensure the successful implementation of the EMP.

Table 2. Roles and Responsibility

Role	Responsibility
Proponent: DAPP Namibia	1) Overall responsibility for ensuring compliance with the Environmental Management Act, 2007 and other applicable legislation. 2) Ensure effective implementation of the EMP throughout all project phases. 3) Allocate adequate financial and technical resources for environmental management. 4) Coordinate environmental awareness and capacity-building programmes. 5) Liaise with MEFT, MAFWLR, traditional authorities, and other stakeholders. 6) Ensure compliance with ECC conditions and water abstraction permits. 7) Ensure environmental monitoring and reporting requirements are implemented.
Environmental Compliance Officer (ECO) / Environmental Officer	1) Monitor and ensure compliance with the EMP, environmental regulations, and site-specific requirements. 2) Conduct regular site inspections to verify the implementation of mitigation measures. 3) Coordinate with project personnel to ensure proper, pollution control, and health safety protocols are followed.

Role	Responsibility
	4) Prepare regular environmental performance reports, including monitoring results and corrective actions, and submit these reports to the project proponent and relevant authorities. 5) Lead training sessions for project personnel. 6) Act as the primary point of contact for environmental matters and regulatory agencies. 7) Modifying or improving mitigation measures for purposes of corrective action
Site Manager	1) Ensure the project's overall operations are conducted in accordance with the EMP and approved environmental permits. 2) Supervise all activities to ensure they align with environmental guidelines and other key relevant standards 3) Work closely with the ECO to implement corrective actions when environmental non-compliance is identified. 4) Ensure that all personnel are appropriately trained in environmental procedures and that they adhere to the safety protocols established in the EMP. 5) Supervise day-to-day project activities. 6) Coordinate contractors, workers, and PO members 7) Prevent pollution, illegal dumping, and unnecessary vegetation clearing. 8) Report environmental incidents and non-compliance. 9) Ensure rehabilitation and maintenance activities are undertaken.
Contractors and Subcontractors	1) Implement mitigation measures specific to their scope of work as outlined in the EMP and ensure that they are properly maintained. 2) Implement mitigation measures relevant to construction activities. 3) Ensure workers receive environmental and safety induction. 4) Prevent pollution and unsafe working conditions. 5) Ensure proper handling and disposal of waste materials.

Role	Responsibility
	6) Report environmental incidents and spills immediately.
Producer organizations (POs) / Site Committees	1) Support implementation of the EMP during operation and maintenance activities. 2) Ensure responsible and sustainable use of water resources. 3) Monitor irrigation infrastructure and report damages. 4) Promote environmental protection and proper waste management. 5) Participate in environmental awareness and training programmes. 6) Support implementation of grievance redress procedures.
Ministry of Environment, Forestry and Tourism (MEFT)	1) Review and consider the Environmental Scoping Report and EMP. 2) Issue the Environmental Clearance Certificate (ECC). 3) Conduct inspections and compliance monitoring. 4) Provide regulatory oversight regarding environmental management.
Ministry of Agriculture, Fisheries, Water and Land Reform (MAFWLR)	1) Regulate water abstraction and groundwater use. 2) Issue relevant water abstraction and borehole permits. 3) Monitor compliance with water resource management requirements. 4) Provide technical guidance relating to sustainable water use.

4 THE EMP TABLE

4.1 Irrigation Activities Applicable to All Producer organizations (POs)

The operation and maintenance of irrigation demonstration plots across the Producer Organizations (POs) may result in environmental and social impacts associated with water use, soil degradation, waste generation, infrastructure damage, occupational health and safety, and biodiversity disturbance. The mitigation measures presented in Table 3 are intended to minimize identified impacts and ensure that irrigation activities are implemented in an environmentally sustainable and socially responsible manner throughout the operational lifespan of the demonstration plots.

Table 3. EMP Table for Irrigation Activities Applicable to All Producer Organizations (POs)

Environmental / Social Impact	**Objective**	**Proposed Mitigation Measures**	**Monitoring Indicator**	**Responsible Party**
Unsustainable water use	Promote efficient and sustainable water utilization	1. Irrigation shall be undertaken in a controlled and efficient manner. 2. Irrigation activities should preferably be conducted during early morning or late afternoon hours to minimize evaporation losses. 3. Leaking pipes, taps and tanks must be repaired immediately. 4. Over-irrigation and unnecessary water wastage shall be prohibited.	• Evidence of leak repairs • Water wastage observations • Awareness training records • Routine inspection records available.	PO Members / Site Committee

Environmental / Social Impact	Objective	Proposed Mitigation Measures	Monitoring Indicator	Responsible Party
		5. PO members shall receive awareness training on water conservation practices. 6. Irrigation pipelines, tanks, and fittings shall be inspected regularly to identify and repair leakages. 7. Prolonged water leakages and uncontrolled discharge of water shall not be permitted.		
Soil erosion and land degradation	Prevent soil degradation and maintain soil productivity	1. Excessive irrigation that may cause runoff and soil erosion shall be avoided. 2. Irrigation water shall be distributed evenly across cultivated areas. 3. Mulching and organic soil cover shall be encouraged to reduce soil erosion and moisture loss. 4. Disturbed areas around tanks and irrigation lines shall be rehabilitated where necessary.	• Evidence of erosion • Condition of cultivated land • Presence of mulching practices	PO Members
Soil and water contamination	Protect soil and water resources	1. Only organic fertilizers, compost, and organic manure shall be used within the demonstration plots.	• Physical inspection of farming inputs	PO Members / DAPP Namibia

Environmental / Social Impact	Objective	Proposed Mitigation Measures	Monitoring Indicator	Responsible Party
from agricultural inputs	from contamination	2. The use of synthetic chemical fertilizers, pesticides, and hazardous agrochemicals shall not be permitted under the project. 3. Compost and manure shall be stored in designated areas away from water sources. 4. Excessive application of manure shall be avoided to minimize nutrient runoff.	• Evidence of compost storage areas • Absence of chemical fertilizers on site	
Use and handling of pesticides	Improper use, storage, or disposal of pesticides may result in contamination of soil and water resources, harm to human health, destruction of beneficial organisms, and	1. The use of pesticides shall be minimized as far as reasonably possible and integrated pest management (IPM) practices shall be encouraged. 2. Only approved and legally registered pesticides shall be used where necessary. Pesticides shall be applied strictly in accordance with manufacturer instructions and recommended application rates. 3. Pesticides shall be stored in designated, secure, and well-ventilated areas away from water sources, food items, and public access.	• No visible signs of soil or water contamination. • Proper pesticide storage observed. • PPE usage observed during pesticide application. • No improper disposal of pesticide containers observed. • Training and awareness records maintained.	PO Members / Site Committee /

Environmental / Social Impact	Objective	Proposed Mitigation Measures	Monitoring Indicator	Responsible Party
	negative impacts on surrounding biodiversity	4. Empty pesticide containers shall not be reused and shall be disposed of at approved disposal facilities. 5. Mixing, washing, or disposal of pesticides near rivers, boreholes, or water storage infrastructure shall be strictly prohibited. Protective clothing and equipment shall be used during handling and application of pesticides. 6. Community members and workers involved in pesticide application shall receive appropriate training on safe handling procedures, storage, emergency response, and environmental protection measures. 7. Spillages shall be cleaned immediately and contaminated materials disposed of appropriately.		
Waste generation	Ensure proper waste management practices	1. Waste generated during irrigation activities shall be collected and disposed of appropriately. 2. No dumping or burning of waste shall be permitted within the project sites.	• Site cleanliness • Presence of waste collection areas • Waste disposal records	PO Members

Environmental / Social Impact	Objective	Proposed Mitigation Measures	Monitoring Indicator	Responsible Party
		3. Organic waste should be reused for composting where feasible. 4. Damaged irrigation materials shall be removed from site and disposed at approved disposal areas.		
Damage to irrigation infrastructure	Ensure proper maintenance and longevity of infrastructure	1. Solar pumps, pipes, tanks, and irrigation fittings shall be inspected regularly. 2. Damaged infrastructure shall be repaired promptly. 3. Unauthorized tampering with irrigation infrastructure shall be prohibited. 4. Community members shall be trained on basic maintenance procedures.	• Maintenance records • Functionality of irrigation system • Evidence of infrastructure damage	PO Members
Health and safety risks	Protect community members and workers	1. Community members shall be trained on safe use of irrigation infrastructure. 2. Open water storage structures shall be secured where necessary. 3. Electrical components associated with solar pumps shall be protected from unauthorized access.	• Safety awareness records • Presence of secured infrastructure • Incident reports	PO Members

Environmental / Social Impact	Objective	Proposed Mitigation Measures	Monitoring Indicator	Responsible Party
		4. Children shall not be allowed to play around water infrastructure and storage tanks. 5. First aid kits shall be available where feasible.		
Mosquito breeding and stagnant water accumulation	Prevent public health risks associated with stagnant water	1. Water leakages and stagnant water accumulation shall be prevented. 2. Drainage around tanks and taps shall be maintained. 3. Standing water shall be drained immediately. 4. Irrigation schedules shall avoid unnecessary ponding of water.	• Evidence of stagnant water • Drainage condition around infrastructure	PO Members
Biodiversity disturbance	Protect surrounding vegetation and fauna	1. Unnecessary clearing of natural vegetation surrounding the irrigation plots shall be avoided. 2. Hunting, trapping, and killing of wildlife shall be strictly prohibited. 3. Existing trees around the plots should be retained where possible.	• Vegetation condition • Evidence of wildlife disturbance • Cleanliness of surrounding environment	PO Members

Environmental / Social Impact	Objective	Proposed Mitigation Measures	Monitoring Indicator	Responsible Party
		4. Domestic waste shall not be discarded into nearby natural habitats.		
Conflict among community members regarding water use	Promote fair and equitable access to water resources	1. Water use schedules and management procedures shall be agreed upon by PO members. 2. Community grievances shall be reported through the established Grievance Redress Mechanism (GRM). 3. Water use conflicts shall be resolved through consultation with community leadership and project coordinators.	• Reported grievances • Meeting records • Community feedback	Site Committee / Traditional Authority
Failure of climate-smart agricultural practices	Promote sustainable and climate-resilient agriculture	1. Climate-smart agricultural practices shall be promoted among all PO members. 2. Organic farming methods and sustainable land management practices shall be encouraged. 3. Crop rotation and soil moisture conservation practices should be implemented.	• Training attendance registers • Evidence of sustainable farming practices • Crop performance observations	DAPP Namibia / PO Members

Environmental / Social Impact	Objective	Proposed Mitigation Measures	Monitoring Indicator	Responsible Party
		4. Agricultural awareness and training programmes shall be conducted regularly.		

4.2 Borehole Drilling Activities under the Construction Phase (Thikanduko, Mukuvi, and Hoha POs)

The construction phase associated with borehole drilling activities at Thikanduko, Mukuvi, and Hoha Producer Organizations (POs) may result in temporary environmental and social impacts including vegetation disturbance, soil degradation, dust emissions, noise generation, waste production, occupational health and safety risks, and potential disturbance to heritage resources. The mitigation measures outlined in Table 4 are intended to minimize these impacts and ensure environmentally responsible implementation of borehole drilling activities.

Table 4. Construction Phase of Borehole Drilling Activities at Thikanduko, Mukuvi, and Hoha Producer Organizations

Environmental/Social Aspect	Potential Impact	Objective	Mitigation and Management Measures	Monitoring Indicators	Responsible Party
Noise and vibration	Drilling activities may disturb nearby	Minimize noise disturbance	1. Drilling activities shall be restricted to normal daytime working hours.	• No major community complaints received.	Contractor / Environmental Officer

Environmental/Social Aspect	Potential Impact	Objective	Mitigation and Management Measures	Monitoring Indicators	Responsible Party
	communities and surrounding environment	during drilling activities	2. Machinery and drilling equipment shall be maintained regularly to minimize excessive noise. 3. Communities shall be informed prior to commencement of drilling activities. 4. Unnecessary idling of machinery shall be avoided.	• Equipment maintained in good condition. • Drilling activities limited to daytime hours.	
Borehole Water Siting / Hydrogeological Survey	Poor borehole siting may result in low-yielding boreholes, groundwater contamination risks, and wasted project resources	Ensure the borehole is located in a technically suitable and environmentally acceptable area	1. Borehole siting must be undertaken by a qualified hydrogeologist or groundwater specialist prior to drilling. 2. Geophysical investigations and hydrogeological	• Hydrogeological report available. • Approved drilling point identified. • No conflicts regarding borehole location.	Hydrogeologist / Groundwater Specialist Proponent DAPP Namibia

Environmental/Social Aspect	Potential Impact	Objective	Mitigation and Management Measures	Monitoring Indicators	Responsible Party
			assessments should guide siting. 3. Boreholes must be located away from pit latrines, waste disposal sites, livestock kraals, fuel storage areas, and other contamination sources. 4. Avoid siting boreholes near graves, heritage resources, homesteads, or ecologically sensitive areas. 5. PO members and local leadership must be consulted before finalizing the drilling location.	• Borehole located away from contamination sources.	

Environmental/Social Aspect	Potential Impact	Objective	Mitigation and Management Measures	Monitoring Indicators	Responsible Party
Staff Induction and Environmental Awareness	Workers may unknowingly cause environmental damage or safety incidents	Ensure workers understand environmental, social, and safety obligations	1. All workers must undergo environmental and safety induction before commencing work. 2. Induction should include waste management, spill response, biodiversity protection, heritage chance-find procedures, and occupational health and safety requirements. 3. Attendance registers for induction training should be maintained.	• Induction records available. • Workers aware of environmental and safety procedures. • Reduced environmental incidents onsite.	Contractor Environmental Officer
Employment Creation	Unfair employment opportunities may	Promote fair and transparent employment opportunities	1. Local community members should be prioritized for unskilled and semi-skilled	• Local people employed where feasible.	Contractor Proponent

Environmental/Social Aspect	Potential Impact	Objective	Mitigation and Management Measures	Monitoring Indicators	Responsible Party
	create community dissatisfaction	for local communities	employment opportunities where feasible. 2. Recruitment processes should be fair and transparent. 3. PO committees and local leadership should be informed of employment opportunities.	• No complaints regarding recruitment processes.	
Skills and Knowledge Transfer	Communities may lack technical capacity to manage borehole infrastructure sustainably	Strengthen local capacity for long-term infrastructure management	1. Community members and PO representatives should be trained on borehole operation, water conservation, and basic maintenance procedures. 2. Awareness sessions should be conducted during project implementation.	• Training conducted. Community members demonstrate operational knowledge. • Attendance registers maintained.	Contractor DAPP Namibia PO Committee

Environmental/Social Aspect	Potential Impact	Objective	Mitigation and Management Measures	Monitoring Indicators	Responsible Party
Biophysical Considerations	Drilling activities may disturb vegetation, fauna, soils, and surrounding ecosystems	Protect the surrounding biophysical environment during construction activities	1. Vegetation clearing must be limited strictly to areas required for drilling activities. 2. Existing access routes should be utilized where feasible. 3. Open trenches and excavations should not be left unattended. 4. Spill prevention measures should be implemented to avoid soil and groundwater contamination. 5. Disturbed areas should be rehabilitated after completion of works.	• Minimal vegetation disturbance observed. • No wildlife injuries reported. • Disturbed areas rehabilitated. • No major spills reported.	Contractor Environmental Officer

Environmental/Social Aspect	Potential Impact	Objective	Mitigation and Management Measures	Monitoring Indicators	Responsible Party
Heritage and Archaeology	Drilling activities may disturb graves, archaeological resources, or culturally sensitive areas	Protect heritage and archaeological resources from disturbance or destruction	1. Drilling activities must avoid known graves, heritage sites, and culturally sensitive areas. 2. Community consultations should identify heritage concerns before activities commence. 3. If archaeological materials or human remains are discovered, work must stop immediately and relevant authorities informed. 4. Workers should be trained on chance-find procedures.	• No disturbance to heritage resources observed. • Chance-find procedures implemented where necessary. • Community consultations conducted.	Contractor Environmental Officer Local Leadership

Environmental/Social Aspect	Potential Impact	Objective	Mitigation and Management Measures	Monitoring Indicators	Responsible Party
General Waste Management	Improper waste disposal may result in pollution and health risks	Ensure proper handling and disposal of waste generated during construction	1. Waste generated during drilling activities must be collected and disposed of at approved disposal sites. 2. Hazardous waste such as used oils and fuel containers must be stored separately and disposed of appropriately. 3. No waste should be dumped or burned onsite. 4. Waste bins should be provided at work areas.	• Site kept clean. • No illegal dumping observed. • Waste disposed of appropriately.	Contractor Environmental Officer

Aquifer Conservation - Borehole Drilling

Table 5. Aquifer Conservation - Borehole Drilling

Environmental / Social Aspect	Objective	Action Required	Monitoring Indicator	Party responsible
Water abstraction	To conserve the aquifer	1. Do not abstract more than what is allocated by the permit. 2. Develop and implement a ground water monitoring plan. 3. Install automatic measuring gauge to monitor abstraction. 4. Carry out periodic pumping yield to assess aquifer sustainability. 5. Monitor local vegetation and report their unusual health status. 6. Undertake systematic water quality assessment.	• Abstraction reports • Ground water monitoring plan • Report of test pumping • Physical verification of vegetation • Water quality	Proponent
Ecology	Rangeland Management	1. Monitor the vegetation health condition during abstraction and vice versa.	• Vegetation monitoring	Proponent

Environmental / Social Aspect	Objective	Action Required	Monitoring Indicator	Party responsible
Skill and Knowledge transfer	To build local capacity	1. Identify and train competent people (Preferable youth) to do basic maintenance of the borehole and its supporting infrastructure.	• Training report	Proponent
Risk of water infrastructure destruction buy elephant	To prevent infrastructure destruction by elephant	1. Build high and thick enough that will prevent elephants access to the water tank and solar infrastructures.	• Elephant incident report	Proponent
Conflict of water use buy the communities	To prevent conflict among communities of the borehole	1. Raise awareness of the indented purpose of the borehole. 2. Ensure no one is made to be entitled to owning or have controlling power on who should use the borehole	• Community consultation and awareness raising report	Proponent
Corrosion of borehole metal casing	To ensure the casing are not corroded that could affect pump	1. Use non-corrosive casing.	• Corrosion monitoring reports	Proponent

Environmental / Social Aspect	Objective	Action Required	Monitoring Indicator	Party responsible
	yields and water quality			

4.3 Borehole Operational Phase EMP Table

The operational phase of borehole-supported irrigation systems at Thikanduko, Mukuvi, and Hoha Producer Organizations may result in impacts associated with groundwater abstraction, infrastructure maintenance, ecological disturbance, water use conflicts, and long-term sustainability of water resources. The mitigation measures presented in Table 6 are intended to promote sustainable groundwater utilization, protect environmental resources, and support the long-term functionality of borehole infrastructure.

Table 6. Operational Phase of Borehole Water Supply Systems at Thikanduko, Mukuvi, and Hoha Producer Organizations

Environmental/Social Aspect	Potential Impact	Objective	Mitigation and Management Measures	Monitoring Indicators	Responsible Party
Groundwater Abstraction	Excessive abstraction may reduce groundwater levels and affect water sustainability	Promote sustainable groundwater utilization	1. Water abstraction rates must remain within sustainable yield limits determined during pump testing. 2. Water use should be monitored regularly. Water-saving irrigation practices should be implemented.	• Water abstraction records maintained. • Stable borehole performance observed. • No evidence of excessive drawdown.	Proponent PO Members

Environmental/Social Aspect	Potential Impact	Objective	Mitigation and Management Measures	Monitoring Indicators	Responsible Party
			3. Boreholes should not be over-pumped beyond recommended abstraction rates.		
Ecology and Biodiversity	Borehole operation and human activity may affect surrounding ecosystems	Protect surrounding ecological systems and biodiversity	1. Water use should be managed responsibly to reduce pressure on groundwater-dependent ecosystems. 2. Vegetation clearing around borehole infrastructure should remain minimal. 3. Wildlife should not be intentionally harmed or disturbed.	• Minimal ecological disturbance observed. • No reported wildlife harm. • Vegetation maintained around borehole areas.	PO Committee Environmental Officer
Skills and Knowledge Transfer	Communities may lack long-term	Strengthen community	1. Continuous training should be provided on	• Ongoing training conducted.	DAPP Namibia PO Committee

Environmental/Social Aspect	Potential Impact	Objective	Mitigation and Management Measures	Monitoring Indicators	Responsible Party
	operational knowledge	capacity for sustainable borehole management	borehole operation, maintenance, water conservation, and irrigation scheduling. Technical support should be provided where necessary.	• Improved community operational capacity observed.	
Borehole Maintenance and Infrastructure Management	Poor maintenance may lead to infrastructure failure, leakages, and service interruptions	Ensure long-term functionality and sustainability of borehole infrastructure	1. Routine inspection and maintenance of pumps, tanks, pipelines, solar systems, and associated infrastructure must be conducted regularly. 2. Leakages and damaged infrastructure should be repaired immediately.	• Maintenance records available. • Functional infrastructure maintained. • Reduced equipment breakdowns reported.	PO Committee DAPP Namibia

Environmental/Social Aspect	Potential Impact	Objective	Mitigation and Management Measures	Monitoring Indicators	Responsible Party
			3. Preventive maintenance schedules should be implemented.		
Risk of Water Infrastructure Damage by Elephants and Wildlife	Elephants and wildlife may damage tanks, pipelines, pumps, and solar systems	Protect water infrastructure from wildlife-related damage	1. Water infrastructure should be reinforced or protected where feasible. 2. Damaged infrastructure should be repaired promptly. 3. Community monitoring of wildlife-related risks should be encouraged.	• Reduced wildlife-related damage incidents. • Infrastructure maintained in functional condition.	PO Committee Proponent
Conflict Over Water Use by Community Members	Competition over water access may create social conflict within communities	Promote fair and equitable access to water resources	1. Water management rules should be agreed upon by PO members and local leadership. 2. Community awareness should be conducted	• Community water-use agreements implemented.	PO Committee Community Leadership

Environmental/Social Aspect	Potential Impact	Objective	Mitigation and Management Measures	Monitoring Indicators	Responsible Party
			regarding responsible water use. 3. Grievance mechanisms should be available for water-related disputes.		
Corrosion of Borehole Metal Casing and Infrastructure	Corrosion may reduce infrastructure lifespan and compromise water quality	Prevent deterioration of borehole infrastructure	1. Corrosion-resistant materials should be used where feasible. 2. Borehole casing and metal infrastructure should be inspected regularly for signs of deterioration. 3. Damaged components should be repaired or replaced promptly.	• Reduced corrosion observed. • Infrastructure maintained in functional condition. • Inspection records available.	Proponent PO Committee
Water Quality Deterioration	Poor maintenance may result in groundwater contamination	Maintain acceptable water quality standards	1. Borehole surroundings should be maintained in a clean and sanitary condition.	• Clean borehole surroundings maintained.	PO Committee Proponent

Environmental/Social Aspect	Potential Impact	Objective	Mitigation and Management Measures	Monitoring Indicators	Responsible Party
			2. Waste disposal and sanitation facilities should not be located near boreholes. 3. Water quality monitoring should be conducted periodically where necessary.	• Water quality monitoring conducted.	
Leakage and Water Losses	Damaged pipelines and fittings may lead to unnecessary water losses	Minimize water losses and improve water-use efficiency	1. Pipelines, taps, valves, and storage systems should be inspected regularly for leakages. 2. Damaged infrastructure must be repaired immediately. 3. Water conservation awareness should be promoted among users.	• Reduced leakages observed. • Efficient water use maintained.	PO Committee

Environmental/Social Aspect	Potential Impact	Objective	Mitigation and Management Measures	Monitoring Indicators	Responsible Party
Health and Safety During Operations	Unsafe infrastructure and electrical systems may pose risks to users	Protect users and operators from operational hazards	1. Borehole infrastructure and electrical systems should be maintained in safe working condition. 2. Exposed wiring should be avoided. Hazardous operational areas should be controlled where necessary.	• Safe infrastructure maintained. • No major accidents reported.	PO Committee Proponent

4.4 River Water Abstraction Activities under the Construction Phase

The construction phase associated with river water abstraction infrastructure may result in environmental and social impacts including riverbank disturbance, vegetation clearing, dust generation, waste production, disturbance to aquatic and riparian habitats, and occupational health and safety risks. The mitigation measures outlined in Table 7 are intended to minimize environmental disturbance and ensure that construction activities are undertaken in a safe and environmentally responsible manner.

Table 7. Construction Phase of River Water Abstraction Infrastructure for Producer Organizations along the Kavango River

Environmental/Social Aspect	Potential Impact	Objective	Mitigation and Management Measures	Monitoring Indicators	Responsible Party
Groundwater Abstraction	Excessive abstraction may reduce groundwater levels and affect water sustainability	Promote sustainable groundwater utilization	1. Water abstraction rates must remain within sustainable yield limits determined during pump testing. 2. Water use should be monitored regularly. Water-saving irrigation practices should be implemented. 3. Boreholes should not be over-pumped beyond	1. Water abstraction records maintained. 2. Stable borehole performance observed. 3. No evidence of excessive drawdown.	Proponent PO Members

Environmental/Social Aspect	Potential Impact	Objective	Mitigation and Management Measures	Monitoring Indicators	Responsible Party
			recommended abstraction rates.		
Ecology and Biodiversity	Borehole operation and human activity may affect surrounding ecosystems	Protect surrounding ecological systems and biodiversity	1. Water use should be managed responsibly to reduce pressure on groundwater-dependent ecosystems. 2. Vegetation clearing around borehole infrastructure should remain minimal. Wildlife should not be intentionally harmed or disturbed.	• Minimal ecological disturbance observed. • No reported wildlife harm. • Vegetation maintained around borehole areas.	PO Committee Environmental Officer
Skills and Knowledge Transfer	Communities may lack long-term operational knowledge	Strengthen community capacity for sustainable	1. Continuous training should be provided on borehole operation, maintenance, water conservation, and irrigation scheduling.	• Ongoing training conducted. • Improved community	DAPP Namibia PO Committee

Environmental/Social Aspect	Potential Impact	Objective	Mitigation and Management Measures	Monitoring Indicators	Responsible Party
		borehole management	2. Technical support should be provided where necessary.	operational capacity observed.	
Borehole Maintenance and Infrastructure Management	Poor maintenance may lead to infrastructure failure, leakages, and service interruptions	Ensure long-term functionality and sustainability of borehole infrastructure	1. Routine inspection and maintenance of pumps, tanks, pipelines, solar systems, and associated infrastructure must be conducted regularly. 2. Leakages and damaged infrastructure should be repaired immediately. 3. Preventive maintenance schedules should be implemented.	• Maintenance records available. • Functional infrastructure maintained. • Reduced equipment breakdowns reported.	PO Committee DAPP Namibia
Risk of Water Infrastructure Damage by Elephants and Wildlife	Elephants and wildlife may damage tanks, pipelines, pumps, and solar systems	Protect water infrastructure from wildlife-related damage	1. Water infrastructure should be reinforced or protected where feasible.	• Reduced wildlife-related damage incidents.	PO Committee Proponent

Environmental/Social Aspect	Potential Impact	Objective	Mitigation and Management Measures	Monitoring Indicators	Responsible Party
			2. Damaged infrastructure should be repaired promptly. 3. Community monitoring of wildlife-related risks should be encouraged.	• Infrastructure maintained in functional condition.	
Conflict Over Water Use by Community Members	Competition over water access may create social conflict within communities	Promote fair and equitable access to water resources	1. Water management rules should be agreed upon by PO members and local leadership. 2. Community awareness should be conducted regarding responsible water use. 3. Grievance mechanisms should be available for water-related disputes.	• Reduced community conflicts reported. • Community water-use agreements implemented.	PO Committee Community Leadership

Environmental/Social Aspect	Potential Impact	Objective	Mitigation and Management Measures	Monitoring Indicators	Responsible Party
Corrosion of Borehole Metal Casing and Infrastructure	Corrosion may reduce infrastructure lifespan and compromise water quality	Prevent deterioration of borehole infrastructure	1. Corrosion-resistant materials should be used where feasible. 2. Borehole casing and metal infrastructure should be inspected regularly for signs of deterioration. 3. Damaged components should be repaired or replaced promptly.	• Reduced corrosion observed. • Infrastructure maintained in functional condition. • Inspection records available.	Proponent PO Committee
Water Quality Deterioration	Poor maintenance may result in groundwater contamination	Maintain acceptable water quality standards	1. Borehole surroundings should be maintained in a clean and sanitary condition. 2. Waste disposal and sanitation facilities should not be located near boreholes. 3. Water quality monitoring should be conducted periodically where necessary.	• Clean borehole surroundings maintained. • Water quality monitoring conducted.	PO Committee Proponent

Environmental/Social Aspect	Potential Impact	Objective	Mitigation and Management Measures	Monitoring Indicators	Responsible Party
Leakage and Water Losses	Damaged pipelines and fittings may lead to unnecessary water losses	Minimize water losses and improve water-use efficiency	1. Pipelines, taps, valves, and storage systems should be inspected regularly for leakages. 2. Damaged infrastructure must be repaired immediately. 3. Water conservation awareness should be promoted among users.	1. Reduced leakages observed. 2. Efficient water use maintained.	PO Committee
Health and Safety During Operations	Unsafe infrastructure and electrical systems may pose risks to users	Protect users and operators from operational hazards	1. Borehole infrastructure and electrical systems should be maintained in safe working condition. 2. Exposed wiring should be avoided. 3. Hazardous operational areas should be controlled where necessary.	• Safe infrastructure maintained. • No major accidents reported.	PO Committee Proponent

4.5 River Water Abstraction Activities under the Operational Phase

The operational phase of river water abstraction activities for irrigation demonstration plots may result in impacts associated with water abstraction, alteration of river flow dynamics, impacts on aquatic systems, biodiversity disturbance, infrastructure maintenance, and community health and safety. The mitigation measures presented in Table 8 are intended to minimize identified impacts and promote sustainable utilization of the Kavango River while maintaining the ecological integrity of the riverine environment.

Table 8. Operational Phase of River Water Abstraction Activities for Producer Organizations along the Kavango River

Environmental / Social Aspect	Potential Impact	Management Objective	Mitigation / Management Measures	Monitoring Indicator	Responsible Party
Alteration of river flow regime and impacts on aquatic systems	Excessive or uncontrolled river water abstraction may alter natural river flow patterns, disturb aquatic habitats, and negatively	Protect the ecological functioning of the Kavango River and maintain sustainable river flow and aquatic ecosystem health	1. Water abstraction volumes shall be controlled to avoid excessive abstraction from the Kavango River. 2. Abstraction activities shall comply with approved water abstraction permits and applicable regulatory requirements.	• No visible deterioration of river conditions observed. • No pollution incidents reported. • Compliance with abstraction permit conditions.	PO Members / DAPP Namibia / MAFWLR

Environmental / Social Aspect	Potential Impact	Management Objective	Mitigation / Management Measures	Monitoring Indicator	Responsible Party
	affect aquatic biodiversity and ecosystem functioning		3. Water abstraction infrastructure shall be designed and operated in a manner that minimizes disturbance to river flow and aquatic habitats. 4. Direct pollution, waste disposal, fuel spills, and discharge into the river shall be strictly prohibited. 5. Maintenance activities near the river shall minimize disturbance to aquatic vegetation and riverbank habitats. 6. Water abstraction shall be reduced or temporarily suspended where abnormal	• Minimal disturbance to aquatic habitats observed.	

Environmental / Social Aspect	Potential Impact	Management Objective	Mitigation / Management Measures	Monitoring Indicator	Responsible Party
			environmental conditions or significant ecological impacts are observed.		
Human-Wildlife Conflict (HWC) and safety risks near river abstraction points	Protect community members and workers from wildlife-related incidents	Protect community members and workers from wildlife-related incidents	1. Community members operating near river abstraction points shall be trained on wildlife awareness and safety procedures. 2. Abstraction activities should preferably be undertaken during daylight hours only. 3. Community members should avoid working alone at abstraction points where crocodiles, hippos, or elephants may occur. Vegetation surrounding abstraction points should be	• No wildlife-related injuries reported. • Safety awareness records maintained. • Visibility around abstraction points maintained.	PO Members / Site Committee / Community Leadership

Environmental / Social Aspect	Potential Impact	Management Objective	Mitigation / Management Measures	Monitoring Indicator	Responsible Party
			maintained to improve visibility. 4. Any wildlife incidents or risks observed shall be reported immediately to community leadership and relevant authorities where necessary.		
River Water Abstraction	Excessive abstraction may reduce river flow and affect downstream users and aquatic ecosystems	Ensure sustainable and controlled abstraction of river water	1. Water abstraction volumes shall be regulated to avoid over-abstraction. 2. Water shall only be abstracted at approved abstraction points. Abstraction activities shall comply with conditions of the relevant water abstraction permit. 3. Water use shall be monitored regularly to avoid wastage. Irrigation schedules shall be	• No visible over-abstraction impacts. • Water abstraction records maintained. • Compliance with permit conditions.	PO Members DAPP Namibia MAWLR

Environmental / Social Aspect	Potential Impact	Management Objective	Mitigation / Management Measures	Monitoring Indicator	Responsible Party
			implemented to optimize efficient water use.		
Water Infrastructure Maintenance	Damage or poor maintenance of pumps, pipelines, tanks and fittings may result in leakages, water loss and system failure	Maintain efficient and functional irrigation infrastructure	1. Regular inspection and maintenance of pumps, pipelines, tanks and valves shall be undertaken. 2. Leakages shall be repaired immediately. 3. Damaged infrastructure shall be replaced promptly. 4. Preventive maintenance schedules shall be implemented.	• Functioning irrigation infrastructure. • Reduced leakages and water losses. • Maintenance records available.	PO Members DAPP Namibia
Safety of Water Infrastructure	Theft, vandalism or misuse of infrastructure may compromise	Promote community ownership and protection of water infrastructure	1. PO members and the surrounding community shall be encouraged to develop a sense of ownership of the infrastructure.	• Reduced cases of theft and vandalism. • Infrastructure remains functional.	PO Members Community Leaders DAPP Namibia

Environmental / Social Aspect	Potential Impact	Management Objective	Mitigation / Management Measures	Monitoring Indicator	Responsible Party
	project sustainability		2. Community awareness regarding protection of project infrastructure shall be conducted. 3. Water pumps, solar panels and other equipment shall be secured properly. 4. Access to critical infrastructure shall be controlled where necessary.	• Community participation in safeguarding infrastructure.	
Irrigation Water Management	Poor irrigation practices may result in water wastage and reduced efficiency	Promote efficient and sustainable irrigation practices	1. Irrigation shall be undertaken during appropriate times to minimise evaporation losses. 2. Over-irrigation shall be avoided. 3. Water-efficient irrigation methods shall be promoted.	• Efficient water use observed. • No excessive standing water. • Improved crop productivity.	PO Members DAPP Namibia

Environmental / Social Aspect	Potential Impact	Management Objective	Mitigation / Management Measures	Monitoring Indicator	Responsible Party
			4. PO members shall receive training on proper irrigation management.		
Soil Degradation and Waterlogging	Continuous irrigation may lead to soil erosion, waterlogging or reduced soil quality	Protect soil quality and maintain agricultural productivity	1. Irrigation volumes shall be controlled to prevent oversaturation. Existing vegetation outside cultivation areas shall be retained where possible. 2. Organic farming practices shall be encouraged. 3. Proper drainage around irrigated areas shall be maintained.	• No visible soil erosion or waterlogging. Soil productivity maintained.	PO Members
Use of Organic Fertilisers	Improper application of organic	Promote environmentally	1. Only approved organic fertilizers shall be used.	• No visible contamination of water sources.	PO Members

Environmental / Social Aspect	Potential Impact	Management Objective	Mitigation / Management Measures	Monitoring Indicator	Responsible Party
	fertilisers may contaminate water resources	sustainable farming practices	2. Fertilizers shall be applied in controlled quantities. 3. Fertilizers application near the riverbank shall be avoided. 4. Composting practices shall be properly managed.	• Proper fertilizer storage and application observed.	
Waste Management	Poor disposal of agricultural and domestic waste may pollute the environment	Maintain cleanliness and prevent pollution	1. Waste generated during operation shall be collected and disposed of at approved disposal sites. 2. No dumping of waste into the river or surrounding environment shall be allowed. 3. Waste separation and recycling shall be encouraged where feasible.	• Clean operational area. • No illegal dumping observed.	PO Members
Occupational Health and Safety	Injuries may occur during operation and	Ensure safe working	1. PO members shall receive basic health and safety awareness training.	• Reduced incidents and injuries.	PO Members DAPP Namibia

Environmental / Social Aspect	Potential Impact	Management Objective	Mitigation / Management Measures	Monitoring Indicator	Responsible Party
	maintenance activities	conditions for PO members	2. Protective clothing and equipment shall be used where necessary. 3. Unsafe practices around pumps and electrical equipment shall be prohibited. 4. First aid kits shall be accessible on-site.	• PPE usage observed. • Availability of first aid kits.	
Impacts on aquatic systems	River abstraction activities may disturb aquatic habitats, affect aquatic biodiversity, and contribute to deterioration of river	Protect aquatic ecosystems and maintain the ecological integrity of the Kavango River	1. River water abstraction activities shall be undertaken in a manner that minimizes disturbance to aquatic habitats and riverine ecosystems. 2. Direct disposal of waste, wastewater, fuel, oils, or any pollutants into the river shall be strictly prohibited. 3. Maintenance and refueling of machinery or pumps shall not	• No visible water pollution observed. • No fish mortality incidents reported. • Riverbanks and aquatic vegetation remain stable. • No evidence of uncontrolled discharge or spillages.	PO Members / Site Committee / DAPP Namibia / MAFWLR

Environmental / Social Aspect	Potential Impact	Management Objective	Mitigation / Management Measures	Monitoring Indicator	Responsible Party
	ecosystem health		be undertaken directly adjacent to the riverbank. 4. Disturbance to aquatic vegetation and riparian habitats shall be minimized during installation, operation, and maintenance activities. 5. Water abstraction infrastructure shall be inspected regularly to prevent leakages, spillages, and uncontrolled discharge into the river. 6. Community members will be sensitized on the importance of protecting aquatic ecosystems and maintaining good environmental practices around abstraction points.	• Environmental awareness records maintained.	

Environmental / Social Aspect	Potential Impact	Management Objective	Mitigation / Management Measures	Monitoring Indicator	Responsible Party
			7. Any signs of fish mortality, water contamination, or deterioration of river conditions shall be reported immediately to the relevant authorities.		
Biodiversity and Aquatic Ecology	Disturbance to riverbanks and aquatic habitats may occur	Protect riverine ecosystems and biodiversity	1. Riverbank disturbance shall be minimized. 2. Clearing of vegetation near abstraction points shall be limited. 3. No pollution or discharge into the river shall be permitted. 4. Abstraction infrastructure shall avoid unnecessary disturbance to aquatic habitats.	• Riverbanks remain stable. • No visible pollution. • Minimal disturbance to surrounding vegetation.	PO Members DAPP Namibia
Community Health and Safety	Open water infrastructure may pose risks to community	Protect surrounding communities	1. Water infrastructure shall be operated safely at all times. 2. Hazardous areas shall be identified and controlled.	• No community-related accidents reported.	PO Members Community Leaders

Environmental / Social Aspect	Potential Impact	Management Objective	Mitigation / Management Measures	Monitoring Indicator	Responsible Party
	members and children	from operational hazards	3. Community awareness on safe use of water infrastructure shall be conducted.	• Safe infrastructure operation observed.	
Employment Creation and Livelihood Improvement	Positive socio-economic impacts from irrigation activities	Enhance food security and community resilience	1. Local community members shall continue participating in project activities. 2. Skills and knowledge transfer on climate-smart agriculture shall be promoted. 3. Agricultural production shall support household food security and income generation.	• Increased agricultural participation. • Improved crop production. • Skills transfer initiatives implemented.	DAPP Namibia PO Members

4.6 General Management Plans Socio Economic and Heritage Resources

Table 9. Socio-Economic Consideration

Environmental / Social Impact	Objectives	Proposed Mitigation Measures	Monitoring Indicator	Party Responsible
Staff induction	To ensure that all staff / employees are familiar with the requirements of the EMP	1. All employees must go through an induction course for the provision of the EMP. 2. Ensure that a copy of the EMP is kept on site	• Induction Minutes and Attendance Register, Physical verification of the EMP on site.	Contractor
Employment Socio-Economic advancement for local	To ensure that general work created during the project is reserved for local people	1. Ensure that all general work is reserved for local people 2. Fair compensation and labour practise as per Namibian Labour Laws must be followed	• Employee register • Wages for employee • Complains about payment	Contractor
Skill and Knowledge transfer	To build local capacity	1. Identify and train competent people (Preferable youth) to do basic maintenance of the borehole and its supporting infrastructure	• Training report	Contractor

Environmental / Social Impact	Objectives	Proposed Mitigation Measures	Monitoring Indicator	Party Responsible
General waste	To manage solid waste To prevent littering, pollution, contamination of water and general environmental health hazards	1. Provide well labelled waste drums 2. No onsite burying / dumping or burning of waste material is permitted. 3. Ensure appropriate waste collection and removal from the site and effective disposal	• Physical verification of waste drums • Report of waste disposal	Contractor

Table 10. Heritage Resources

Heritage Resource	Objectives	Proposed Mitigation Measures	Monitoring Indicator	Responsibility
Heritage and Archaeology	The proposed area does not have known Heritage site or archaeological material. Regardless and as standard practise, a chance find is developed	1. Employee must be trained on the possible find of heritage and archaeological material in the area; 2. Implement a chance find and steps to be taken for heritage and archaeological material finding (Heritage (rock painting and drawings), human remains or artefacts) are unearthed by;	Training records and attendance registers	Contractor

Heritage Resource	Objectives	Proposed Mitigation Measures	Monitoring Indicator	Responsibility
	to ensure protection of artefacts, heritage and archaeological materials.	i. Stopping the activity immediately ii. Informing the operational manager or supervisor iii. Cordoned of the area with a danger tape and manager to take appropriated pictures. 1. Manager/supervisor must report the finding to the following competent authorities, National Heritage Council of Namibia (061 244 375) National Museum (+264 61 276800) or the National Forensic Laboratory (+264 61 240461).		

5 DECOMMISSIONING AND REHABILITATION PLAN

5.1 River Water Abstraction

Decommissioning of river water abstraction infrastructure would involve activities such as the removal of pumps, pipelines, storage tanks, solar-powered systems, and associated irrigation infrastructure where such infrastructure is no longer operational, damaged beyond repair, or where abstraction activities are permanently discontinued. In practice, the project is intended to provide a long-term and sustainable water supply system to support irrigation demonstration plots and strengthen food security and climate resilience within participating communities.

As such, decommissioning is not anticipated in the foreseeable future unless required due to major environmental, technical, or socio-economic factors that may render the water abstraction systems unsustainable or non-operational. Where infrastructure reaches the end of its operational lifespan, rehabilitation, upgrading, or replacement of components shall be prioritised to ensure continuity of water supply and irrigation activities.

Any decommissioning activities undertaken shall minimise disturbance to the surrounding environment and riverine ecosystems. Disturbed areas around abstraction points shall be rehabilitated where necessary, and all obsolete infrastructure and waste materials shall be removed and disposed of at approved disposal facilities. Rehabilitation efforts shall aim to restore disturbed areas to a stable and environmentally acceptable condition.

5.2 Borehole Drilling Activities

Decommissioning of borehole infrastructure would involve the removal or closure of pumps, pipelines, storage tanks, solar systems, and associated infrastructure where boreholes are no longer operational or where groundwater abstraction activities are permanently discontinued. However, the proposed boreholes are intended to serve as long-term water supply systems supporting irrigation demonstration plots and community-based agricultural activities for many years into the future.

Where boreholes remain productive and water quality remains suitable, continued operation, maintenance, and rehabilitation of infrastructure shall be prioritized over decommissioning. Aging or damaged equipment requiring replacement shall be repaired or replaced by qualified personnel to ensure the continued functionality and safety of the borehole systems.

Groundwater quality and borehole performance shall be monitored periodically to identify any decline in water quality, corrosion of infrastructure, or reduction in borehole yield. Preventative maintenance and rehabilitation measures shall be implemented where necessary to maintain sustainable groundwater abstraction and long-term operational efficiency.

Should boreholes become unsuitable for continued use due to poor water quality, structural failure, or unsustainable groundwater conditions, boreholes shall be properly sealed and rehabilitated in accordance with applicable Namibian water resource management requirements to prevent groundwater contamination and environmental degradation.

6 CONCLUSION AND RECOMMENDATIONS

6.1.1 River Water Abstraction

6.1.1.1 Conclusions

This Environmental Management Plan (EMP) was developed for the proposed river water abstraction activities intended to support irrigation demonstration plots linked to Producer Organizations (POs) in the Kavango East Region. The project aims to improve agricultural productivity, strengthen food security, enhance climate resilience, and support sustainable livelihoods through reliable irrigation water supply systems.

The environmental assessment concluded that most identified impacts associated with river water abstraction activities are of low to moderate significance and can be effectively managed through the implementation of appropriate mitigation and monitoring measures outlined in this EMP.

The study further concludes that:

i) the project sites are generally located within already disturbed or agricultural landscapes with relatively low environmental sensitivity;
ii) impacts associated with river water abstraction, alteration of river flow dynamics, and disturbance to aquatic systems are expected to remain minimal provided that abstraction activities are undertaken sustainably and in compliance with applicable permit conditions; and
iii) the project is expected to generate positive socio-economic benefits through improved agricultural production, climate-smart farming practices, skills development, and strengthened food security within participating communities.

Overall, the project is considered environmentally acceptable and socially beneficial, provided that all mitigation measures and environmental management commitments contained in this EMP are implemented effectively throughout the project lifecycle.

6.1.1.2 Recommendations

The study recommends the following:

i) the Ministry of Environment, Forestry and Tourism (MEFT) consider the issuance of the Environmental Clearance Certificate (ECC) for the proposed river water

abstraction activities subject to implementation of the mitigation measures contained in this EMP;

ii) DAPP Namibia and participating Producer Organizations should ensure that sustainable water abstraction and environmental management practices are implemented and monitored continuously;

iii) regular maintenance of irrigation infrastructure and abstraction systems should be undertaken to minimize water losses, infrastructure damage, and environmental impacts; and

iv) continuous environmental awareness and capacity-building programmes should be conducted to strengthen community understanding of sustainable water use, environmental protection, and climate-resilient agricultural practices.

6.1.2 Borehole Drilling Activities

6.1.2.1 Conclusions

This Environmental Management Plan (EMP) was developed for the proposed borehole drilling and groundwater abstraction activities intended to support irrigation demonstration plots at Thikanduko, Mukuvi, and Hoha Producer Organisations in the Kavango East Region.

The environmental assessment determined that the proposed borehole drilling activities are unlikely to result in significant long-term environmental impacts provided that the mitigation and monitoring measures outlined in this EMP are implemented effectively.

During site investigations, the proposed borehole locations were generally found to be situated within already disturbed communal or agricultural landscapes with limited ecological sensitivity. The anticipated impacts associated with vegetation clearing, drilling activities, waste generation, groundwater abstraction, and infrastructure installation are considered manageable and capable of being reduced to acceptable levels through proper environmental management practices.

The study further concludes that the proposed borehole water supply systems will contribute positively towards improving irrigation reliability, strengthening food security, reducing dependence on rainfall, and supporting climate-resilient agricultural production within the participating communities.

6.1.2.2 Recommendations

The study recommends the following:

i) the Ministry of Environment, Forestry and Tourism (MEFT) consider the issuance of the Environmental Clearance Certificate (ECC) for the proposed borehole drilling and groundwater abstraction activities subject to implementation of the mitigation measures contained in this EMP;

ii) borehole drilling activities should be undertaken under the supervision of qualified hydrogeological specialists to ensure appropriate siting and sustainable groundwater abstraction;

iii) groundwater quality and borehole performance should be monitored periodically to ensure long-term sustainability and protection of human and environmental health; and

iv) DAPP Namibia and participating Producer organizations should implement regular maintenance, environmental monitoring, and community awareness programmes to ensure sustainable operation of borehole infrastructure and irrigation systems.