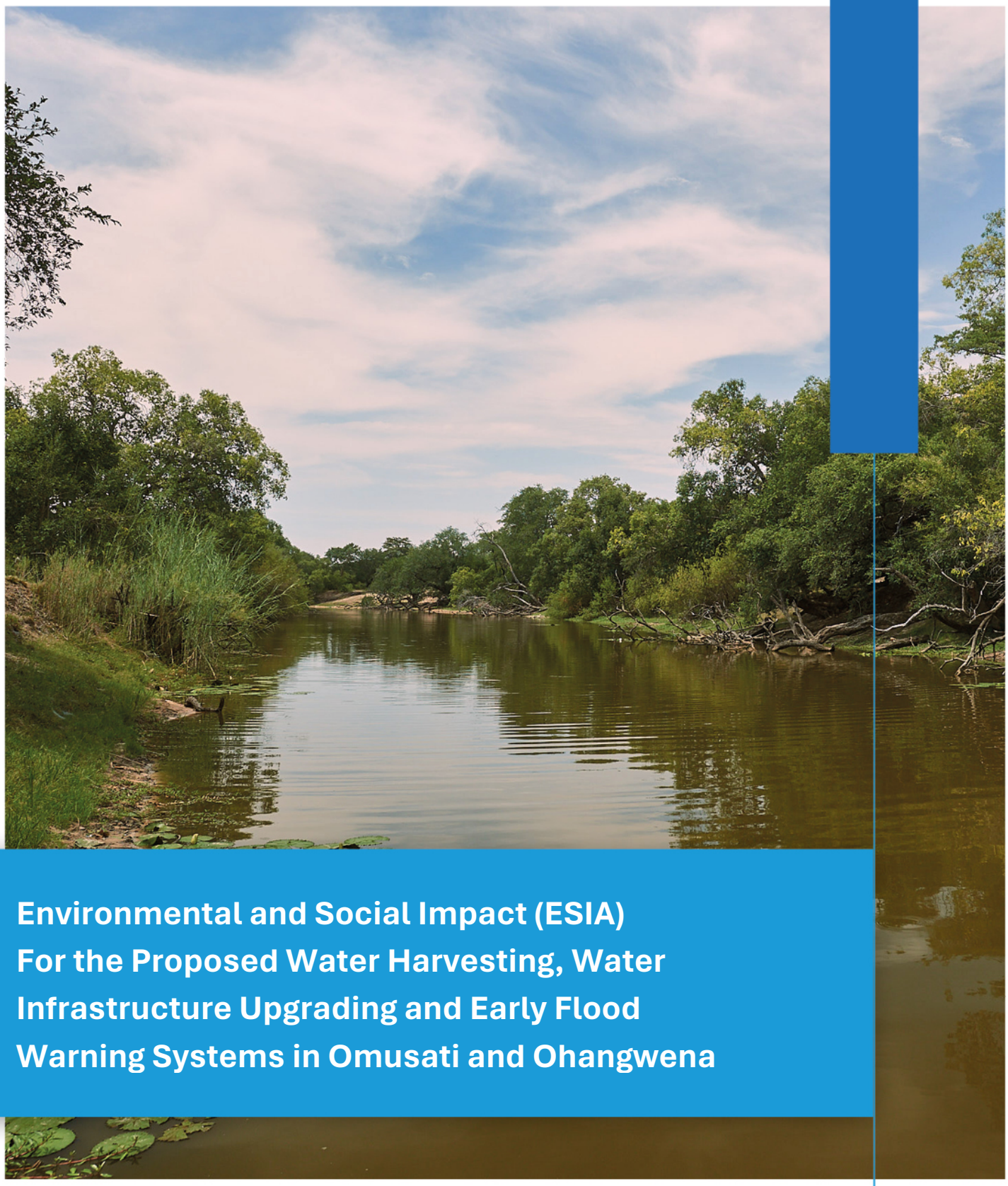
CUVKUN

Enhanced Water Security and Community Resilience in the Adjacent Cuvelai and Kunene Transboundary River Basins Project



Environmental and Social Impact (ESIA) For the Proposed Water Harvesting, Water Infrastructure Upgrading and Early Flood Warning Systems in Omusati and Ohangwena

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Executive summary

This Environmental and Social Impact Assessment (ESIA) for the Cuvelai and Kunene Transboundary River Basins ("CUVKUN Project") pilot interventions was undertaken in March 2025. The CUVKUN project aims to enhance climate resilience, water security, and sustainable livelihoods in the Cuvelai and Kunene basins, in Namibia and Angola. This report is specifically for the Namibian part of the basins. The project introduces three key interventions: (i) the development of early warning systems (EWS) for floods, (ii) the construction and rehabilitation of rainwater harvesting ponds, and (iii) the improvement of water access through solar-powered boreholes and/or mechanised wells. Together, these measures are designed to strengthen disaster preparedness, support food and water security, and promote sustainable resource management across the beneficiary basin communities including vulnerable[1] groups.

The Potential Project Impacts

The ESIA identified potential environmental and social impacts across all phases of the project design/preconstruction, construction, operation, and decommissioning using the UNDP Social and Environmental Standards (SES) and impact assessment matrix. Overall, risks range from low to substantial. Consistent with UNDP SES risk categorisation, and given that the assessment includes individual risks rated as 'Substantial' (Table i), the project is classified overall as a Substantial SES risk project. No high-significance (major) impacts are recorded (Table i).

In the **design and preconstruction phase**, risks are generally low. They relate primarily to unequal access, possible exclusion of vulnerable groups, and technical design flaws that could result in erosion, siltation, or inefficiencies.

The **construction phase** presents the highest concentration of moderate risks, with a limited number of risks rated as Substantial. Key concerns include vegetation loss, habitat disturbance, water contamination, dust and noise emissions, and soil erosion. Safety risks for workers and communities may arise from excavation unlined (earthen) ponds no concrete or geomembrane lining is installed and from ponds that are currently unsecured, which poses a safety risk (e.g., livestock/people could fall in**)**, as well as inadequate occupational safeguards. Social risks include land-use conflicts, livestock contamination, and ownership disputes. During the **operation phase**, most risks remain moderate, with ongoing challenges linked to sustainable water use and social inclusion, Potential impacts include groundwater over-abstraction, mosquito breeding in ponds, vandalism of infrastructure, inequitable access to resources, and risks of sexual exploitation, abuse, or harassment (SEAH).

In the **decommissioning phase**, moderate risks are associated with abandoned ponds becoming mosquito breeding habitats, soil disturbance during site closure, theft or conflict over redistributed equipment, and weakening of governance structures once committees transition out.

[1] **Vulnerable groups** are individuals in a community who are at a higher risk of marginalization, discrimination, or harm due to social, economic, cultural, physical, or environmental factors. They include women and children, elderly people and those living with disability and poverty.

Mitigation Measures

Mitigation measures are consolidated in the Environmental and Social Management Plan (ESMP), which serves as a binding requirement upon project approval. The ESMP is an Annex to this ESIA. Guided by the mitigation hierarchy—avoidance, minimisation, and compensation—the measures are designed to prevent negative impacts while enhancing community and environmental benefits.

Table i. Impact and Mitigation Summary

I. Design / Preconstruction Phase			
Task/Activity	**Anticipated Risk**	**Significance level**	**Mitigation Measures**
Site selection for water points	Unequal access, ownership conflicts	Low	Conduct participatory site selection with community representatives; ensure inclusion of women, youth, and vulnerable groups; establish transparent criteria for site prioritization; formalize agreements with local authorities to prevent disputes.
Planning mechanized wells / solar boreholes	High labour intensity if inappropriate technology selected	Low	Conduct technical feasibility studies to select appropriate technology; evaluate local capacity and maintenance requirements; phase in mechanization gradually; provide preliminary training for local operators.
Rainwater/floodwater ponds design	Siltation if ponds poorly designed	Low	Use hydrological assessments to inform pond design; include sedimentation basins and overflow channels; design for easy maintenance and desilting; consult communities on site placement to minimize erosion.
Early warning system design	Limited coverage or exclusion of vulnerable groups	Low	Map vulnerable groups to ensure equitable coverage; design communication channels accessible to all (SMS, radio, sirens); include community engagement in system planning; provide training and awareness campaigns.
II. Construction Phase			
Task/Activity	**Anticipated Risk**	**Significance level**	**Mitigation Measures**
Clearing of vegetation, soil erosion, and accidental spills	Habitat destruction, water contamination, long-term land degradation	Moderate	Limit vegetation clearance to essential areas; implement erosion control measures (silt fences, sediment traps, vegetative buffers); prepare spill response plans; store fuel and chemicals securely; train staff on handling and emergency response.
Installation of wells / solar boreholes	Temporary disruption of water access; dust/noise	Moderate	Schedule works to minimize disruption; provide alternative water sources during construction; implement dust suppression measures (watering, covering materials); use noise-reducing equipment where possible.

Training and engagement of local labour	Fatigue or minor injuries	Moderate	Provide occupational health and safety training; supply protective equipment; enforce work/rest cycles; have first aid and emergency response readily available.
Pond excavation and construction	Soil erosion, temporary mosquito breeding	Moderate	Stabilize pond embankments and surrounding soil; schedule construction to avoid rainy season if possible; design ponds with drainage and mosquito control features; apply larval control measures.
Installation of early warning infrastructure	Minor disturbance to community; vandalism risk begins	Moderate	Engage community prior to installation; install equipment in secure, tamper-resistant structures; assign local monitoring responsibility; provide awareness on system benefits.
Increased dust and noise levels	Community disturbance, respiratory issues, complaints	Moderate	Implement dust suppression (water spraying); limit noisy activities to daytime hours; provide PPE to workers; communicate schedule to local communities in advance.
Well rehabilitation works (lining, desilting, deepening)	Risk of well collapse, fall hazards, confined space risks, flooding during rains	Moderate	Conduct structural assessment before works; use shoring/bracing for stability; train workers on confined space entry; provide harnesses and safety gear; suspend work during heavy rainfall; establish emergency rescue plans.
Installation of fencing and well covers	Injury risk during manual handling; potential exclusion conflicts if access not managed	Moderate	Provide lifting aids and team handling for heavy materials; train workers on safe manual handling; design fencing with inclusive access points; engage community on access rules prior to completion.
Worker-community interactions	Risk of Sexual Exploitation, Abuse, and Harassment (SEAH); conflicts over access and allocation	Moderate	Implement worker codes of conduct; conduct SEAH awareness training; establish community grievance mechanisms; ensure strict supervision and reporting protocols.
Construction of livestock troughs and hard standing	Soil erosion and ponding if poorly built; safety hazards from livestock near works	Moderate	Compact and stabilize soils; install proper drainage channels; fence construction sites until works are complete; design troughs to reduce overcrowding and trampling.

Construction and rehabilitation activities	Construction waste, such as rubble and the handling of old parts	Low	Segregate waste (metal, rubble, packaging), reuse and recycle materials where possible, dispose of waste at an approved landfill, and keep the site clean and hazard-free.
Installation of drainage, collars, and elevated structures	Floodwater backwash and silt entry if poorly constructed; worker safety risks	Moderate	Follow engineering specifications; supervise works with qualified technician; use quality materials; train workers on safe installation methods; monitor performance after first rains.
III. Operation Phase			
Task/Activity	**Anticipated Risk**	**Significance level**	**Mitigation Measures**
Operation and use of floodwater harvesting ponds (including livestock watering)	Drowning risk for people (especially children) and livestock due to open water and unsecured pond edges; higher risk during peak flood season and at night	Substantial	Install robust fencing around ponds with lockable access gates; provide designated safe access points (ramps/steps) and non-slip edges; place warning signage in local language(s); enforce controlled access through community by-laws and supervised use times; conduct community safety awareness (including child-safety messaging); establish incident reporting and emergency response arrangements; ensure regular inspection and maintenance of fences/gates and pond edges.
Routine maintenance and local operation	Theft/vandalism of solar panels; disputes over cost-sharing	Low	Install anti-theft devices (locks, alarms); engage local watch groups; establish clear cost-sharing agreements; conduct community awareness campaigns on ownership and responsibilities.
Operation of ponds	Malaria risk	Low	Regular pond maintenance and drainage; larval control measures; health education campaigns
Operation of mechanized boreholes	Over-abstraction of groundwater; equipment failure; inequitable access	Moderate	Establish water use quotas; monitor water levels; implement routine equipment maintenance; provide training for operators; inclusive governance through community water committees.
Household and small-scale	Increased water demand; risk of unsustainable usage	Moderate	Promote water-efficient irrigation practices; monitor consumption; encourage crop planning and rotation; include water use rules in community governance frameworks.

farming use of water			
Air quality	Dust and emissions from maintenance vehicles and activities	Low	Control dust during maintenance; minimize vehicle emissions through scheduling and maintenance; monitor air quality; raise community awareness on safe practices.
Solar pumps & pressurized storage	Mechanical failure; reduced water access; risk of exclusion of vulnerable groups	Moderate	Schedule preventive maintenance; keep spare parts available; train local technicians; ensure inclusive water distribution rules.
Hydrometric stations / early warning systems	Vandalism or equipment failure; gaps in coverage	Low	Install protective enclosures; community-based monitoring; backup communication systems; routine calibration and servicing.
Community water governance & committees	Conflicts over access and allocation; inequitable decision-making	Moderate	Develop transparent rules; promote inclusive participation (youth, women, vulnerable groups); provide conflict resolution training; establish grievance redress mechanisms.
Routine maintenance of infrastructure (labour)	Minor hazards such as fatigue or injuries	Low	Provide personal protective equipment (PPE); schedule rest breaks; ensure training on occupational safety; maintain first aid kits at worksites.
Increased water demand during dry periods	Pressure on resources; risk of conflict	Moderate	Monitor seasonal demand; strengthen water use quotas; promote water conservation awareness campaigns; establish contingency water-sharing agreements.
IV. Decommissioning Phase			
Task/Activity	**Anticipated Risk**	**Significance level**	**Mitigation Measures**
Dismantling ponds	Abandoned ponds may cause mosquito habitats or land degradation	Moderate	Drain ponds or fill with soil if no longer used; maintain temporary water circulation if ponds remain; conduct health awareness campaigns on mosquito control; restore vegetation on embankments.

Equipment redistribution / solar panels	Conflicts or theft if not managed	Moderate	Create transparent redistribution plans; involve community representatives; track assets; provide security during relocation.
Loss of employment for caretakers/operators	Reduced income; community dissatisfaction	Low	Provide early notice and alternative livelihood support; involve affected personnel in decommissioning activities; offer training for new roles.
Abandonment of community water committees	Breakdown in governance; potential conflicts	Low	Transition responsibilities gradually; provide training to ensure continuity; formalize handover agreements; maintain advisory support during early post-decommissioning phase.
Removal of pipelines / water infrastructure	Soil disturbance; waste generation; disruption of natural drainage	Low	Plan removal to minimize disturbance; recycle or safely dispose of removed materials; restore drainage channels; re-vegetate disturbed areas.

In the design and preconstruction phase, early planning, technical assessments, and participatory decision-making ensure that water points and ponds are sited at an accessible and best technically viable location and designed to prevent exclusion, erosion, or waterlogging.

During construction and operation, practical safeguards are applied, including erosion and spill control, dust and noise suppression, safe storage of chemicals, and strict occupational health and safety standards, such as fencing to minimise the risk of people or livestock drowning. Governance measures such as water use quotas, regular maintenance, and oversight by community water committees promote equitable access and sustainable resource use. Social risks, including vandalism and SEAH, are managed through grievance mechanisms, community awareness campaigns, codes of conduct, and tamper-proof early warning systems.

In the decommissioning phase, mitigation prioritises sustainability and continuity. Ponds are drained or filled to prevent mosquito breeding, disturbed sites are restored, and assets like solar panels are redistributed transparently to reduce conflict. Support is provided to water committees and caretakers through training, livelihood alternatives, and transition planning to ensure lasting benefits.

Across all phases, effective mitigation depends on inclusive governance, strong community engagement, technical safeguards, and continuous monitoring, ensuring the project remains both environmentally responsible and socially equitable.

The GAP, SEP and GRM

The CUVKUN project is supported by complementary safeguard instruments, namely the Gender Action Plan (GAP), Stakeholder Engagement Plan (SEP), and Grievance Redress Mechanism (GRM). Together, these ensure inclusive participation, transparency, and accountability across project design and implementation.

A broad stakeholder engagement process, aligned with Namibia's Environmental Management Act and UNDP Social and Environmental Standards, secured meaningful input from government agencies, parastatals, development partners, and local communities. Consultations highlighted priorities such as rainwater harvesting, improved wells, solar-powered systems, dam dredging, and tamper-proof early warning systems. Communities consistently emphasized equity, ownership, and the engagement of women and youth.

Although the presence of the San and OvaHimba peoples were considered under Free, Prior, and Informed Consent (FPIC) requirements, consultations confirmed no distinct Indigenous Peoples reside in the project areas. The SEP nonetheless is designed to ensure culturally appropriate engagement and continued inclusivity of all stakeholders through the project life. Gender considerations were central, with the GAP addressing issues such as Gender-Based Violence (GBV), enhancing referral systems, and promoting women's and youth participation in decision-making, training, and benefit-sharing.

To uphold accountability, the GRM provides a transparent, accessible platform for resolving concerns. It follows UNDP and GWPSA guidelines through an eleven-step process, emphasizing fairness, inclusivity, and face-to-face interaction. Ongoing monitoring strengthens grievance handling, supports vulnerable groups, and reinforces community trust, ultimately contributing to long-term project sustainability.

In conclusion, the CUVKUN Project pilot interventions are environmentally and socially feasible, with all risks manageable through proper mitigation and governance, comprehensive stakeholder engagement, gender-responsive interventions, and a transparent grievance mechanism. The project seeks to minimize risks while maximizing equitable benefits. There are no culturally sensitive or protected areas that will be affected by the project, nor will any Indigenous peoples and their resources be impacted. Additionally, no resettlement is required, as the project interventions are taking place in areas already used for similar purposes. By embedding safeguards early on, and ensuring outcomes that are equitable, community-driven, the project is therefore positioned to deliver lasting positive impacts for communities, ecosystems, and the broader Cuvelai and Kunene basins.

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ABBREVIATIONS

CUVKUN	Cuvelai and Kunene Transboundary River Basins
CUVECOM	Cuvelai Watercourse Commission (CUVECOM)
DEA	Department of Environmental Affairs
DRRM	Directorate of Disaster Risk Reduction Management
EA	Environmental Assessment
EAP	Environmental Assessment Practitioner
ECO	Environmental Compliance Officer
EIA	Environmental Impact Assessment
EMA	Environmental Management Act (No. 7 of 2007)
EMP	Environmental Management Plan
ESIA	Environmental and Social Impact Assessment
ESR	Environmental Scoping Report
ESMP	Environmental and Social Management Plan
FPIC	Free Prior and Informed Consent
GRM	Grievances Redress Mechanism
I&APs	Interested and Affected Parties
IP	Indigenous People
MAWLR	Ministry of Agriculture, Water and Land Reform
MEFT	Ministry of Environment, Forestry and Tourism
MoHSS	Ministry of Health and Social Services
SES	Social and Environmental Standards
SM	Site Manager
UNDP	United Nations Development Programme

1. Introduction

This document presents the Environmental and Social Impact Assessment (ESIA) for nine villages in northern Namibia that have been selected as demonstration sites under the Cuvelai and Kunene Transboundary River Basins ("CUVKUN Project") component titled "Enhancing Community Participation in Integrated Water Resources Management (IWRM) to Build Resilience in Livelihoods."

1.1 Terms of Reference

The consultants has been appointed to undertake the requisite Environmental and Social Impact Assessment (ESIA) in the Oshikoto, Omusati and Ohangwena regions, Namibia. The assessment is guided by Namibian environmental legislation and UNDP's Social and Environmental Standards (SES).

Specific Terms of Reference (ToRs) for the ESIA include:

- Describing the proposed project and its associated works, along with the requirements necessary for implementation.
- Documenting the baseline environmental and social conditions, including both natural and human-made aspects likely to be affected by the development.
- Identifying, predicting, and evaluating potential environmental and social impacts of the project, including cumulative effects across all development phases.
- Specifying appropriate methods, measures, and standards to be incorporated into project design, construction, and operation to mitigate impacts to acceptable levels.
- Assessing the institutional capacity required for implementing and monitoring the proposed management measures and preparing a capacity-building plan.
- Developing an Environmental and Social Management Plan (ESMP) together with subsidiary plans, such as the Stakeholder Engagement Plan, Gender Action Plan, and Grievance Redress Mechanism (GRM), to address adverse impacts and ensure accountability.
- Outlining environmental and social monitoring requirements to evaluate the effectiveness of the management measures implemented.

1.2 ESIA Objectives

The Environmental and Social Impact Assessment (ESIA) will primarily focus on identifying the potential social and environmental impacts, both positive and negative, associated with the pilot projects implemented under Component 6, Enhancing the community participation in Integrated Water Resources Management (IWRM) to build resilience in their livelihoods.

The assessment will also design and propose measures to enhance the positive impacts and prevent, reduce, mitigate, and/or offset/compensate the potential negative impacts. By specifically targeting the pilot sites under this component, the ESIA aims to ensure that all potential risks and opportunities are appropriately addressed within the context of strengthening community-led water resource management and climate resilience.

1.3 Project Background and Description

The Cuvelai and Kunene Transboundary River Basins (CUVKUN) Project is an initiative supported by the Cuvelai Watercourse Commission (CUVECOM), which represents a strategic collaboration between the Governments of Angola and Namibia aimed at improving transboundary water governance and building resilience in the Cuvelai and Kunene River Basins. CUVECOM, established by both governments, seeks to promote integrated and cooperative management of the shared Cuvelai River Basin, which is increasingly vulnerable to climate change, recurring floods, droughts, and weak water governance systems (CUVECOM, 2019).

The Cuvelai Basin, a transboundary wetland area shared by Angola and Namibia, is made up of hundreds of ephemeral drainage channels known as *iishana* (as shown in Figure 1-1), many of which are dry most of the year but can flood heavily during the rainy season (CUVECOM, 2019). The channels flow from north to south, from the southern Angolan highlands to Namibia. The Cuvelai is an endorheic basin, meaning that all its water either flows into the Omadhiya Lakes and Etosha Pan or evaporates along the way (CUVECOM, 2019).

The Cuvelai Basin covers approximately 160,000 km^2 and supports a population of around 1.2 million people. Despite its significance for human settlements, livestock, agriculture, and biodiversity, the basin faces considerable challenges related to water scarcity, hydrological variability, and climate change. Approximately 33% of the Cuvelai River Basin is located in Angola, while 66% is in Namibia. In contrast, the Kunene River Basin is located 87% in Angola and 13% in Namibia. Although they share a geographic area, the two basins encounter different issues concerning water availability, infrastructure, and climate resilience.

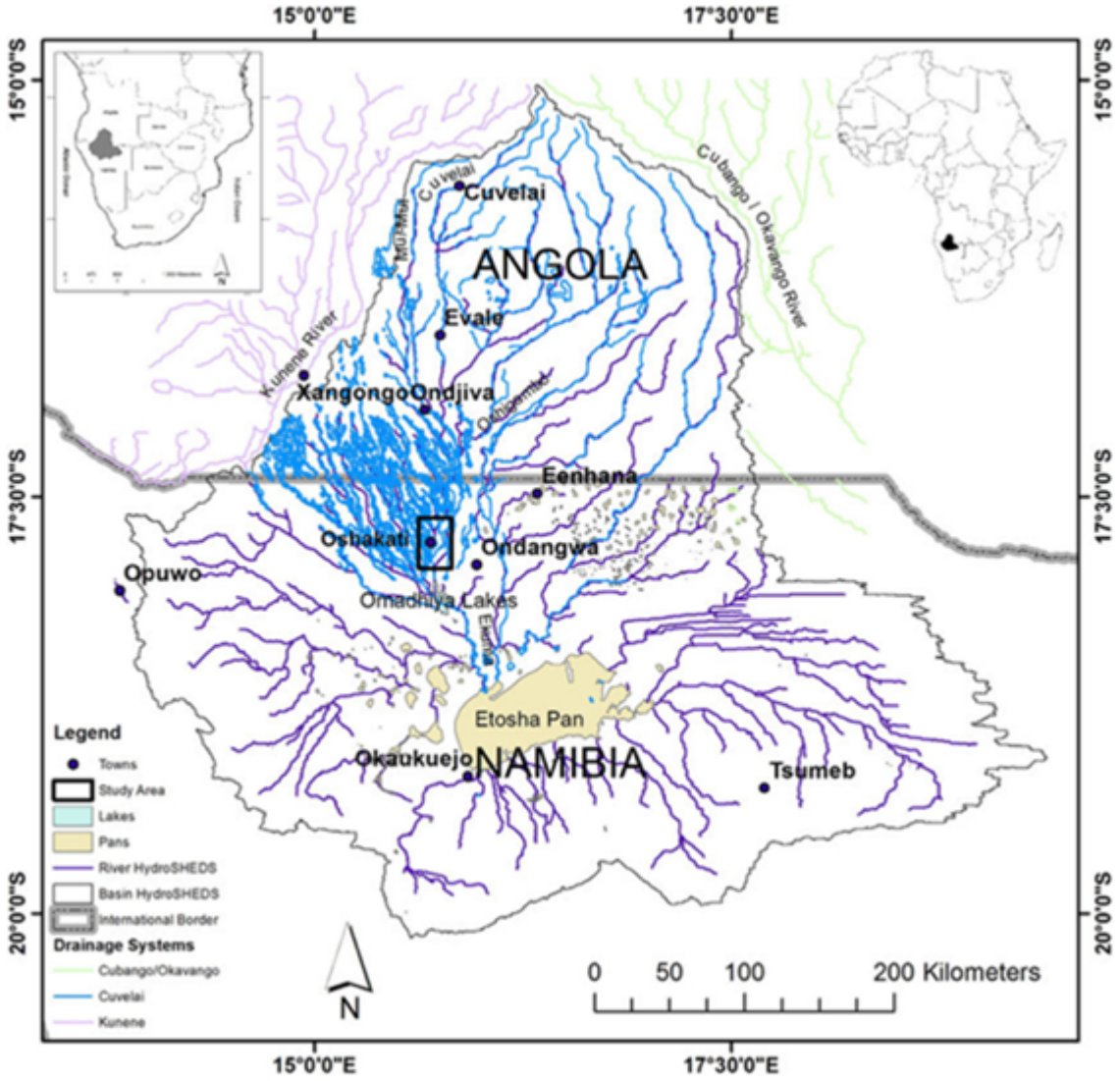


Figure 1-1*: Illustrates the complexity and scale of drainage systems*

This project targets both rural and peri-urban communities that heavily rely on water resources from these basins for their livelihoods, especially for agriculture, livestock farming, and domestic use. These communities are particularly vulnerable to the impacts of climate change, including prolonged droughts, floods, and the degradation of water sources. Many residents in the project area depend on natural waterways for their livestock and personal water needs, but they are increasingly experiencing water scarcity due to shifting climatic conditions and rising demand from growing populations.

In response to these various challenges, the CUVKUN project aims to improve community resilience and enhance integrated water resource management (IWRM) through community-driven interventions. These interventions will focus on water harvesting, livelihood-based watershed management, aquaculture, and early warning systems for floods and droughts.

During the ESIA assessment, the feasibility of aquaculture activities in the project areas was thoroughly evaluated. While small-scale aquaculture was initially considered as a complementary livelihood opportunity during the inception stakeholders suggested that the site selection criteria need to be revised based on the specific purposes of the sites to harvest water

for horticulture or livestock. Field assessments revealed that water scarcity remains the prevailing challenge in the Cuvelai basin especially for livestock. Field assessment further revealed that the priority for community interventions is water security and availability for domestic use and livestock rather than food security through aquaculture. Given the unreliable water availability, particularly during extended dry seasons, the ESIA concludes that fish farming is not feasible in these areas at this time. Consequently, the risk of introducing invasive alien fish species identified in the Social and Environmental Screening Procedure (SESP) is not applicable to the current project interventions. Should water availability conditions improve in the future and aquaculture become viable, any such activities would require separate environmental screening and assessment, including specific measures to prevent the introduction of invasive species through the use of indigenous and/or non-invasive fish species only

To achieve this, nine pilot demonstration sites (Table 1-1) have been selected in Namibia to implement a series of activities (see Table 1-2) aimed at enhancing joint management and planning capacities at the transboundary basin level. These activities will be organized into six components (Figure 1-2), each addressing a critical aspect of transboundary water resource management.

Table ii*:* List of CUVKUN villages and Coordinates– Namibia

N0.	Village	Regional and Constituency	Coordinates
1.	Okanyanona	Okongo Constituency, Ohangwena Region	-17.5559444S,17.2227223E
2.	Oluwaya	Oshikunde Constituency, Ohangwena Region	-17.5373436S, 17.0582716E
4.	Oshanalumono	Engela Constituency, Ohangwena Region	-17.4485077S, 15.7624978E
5.	Shapoko	Anamulenge Constituency, Omusati Region	-17.456672S, 15.174479E
6.	Oshuudhi / Ombundanti	Anamulenge Constituency, Omusati Region	-17.5545631S, 15.2242317E
7.	Olupumbu	Oshikuku Constituency, Omusati Region	-17.7504598S, 15.4192767E
8.	Omboloka	Okongo Constituency, Ohangwena Region	-17.4066234S, 17.134171E
9.	Onamatende	Okankolo constituency, Oshikoto region	-17.974383S, 16.813371E

The proposed interventions across the nine target villages aim to improve water access, enhance community resilience, and strengthen early warning mechanisms against flooding. Activities will be implemented with direct community engagement and ownership. The table below provides a summary of activities that will be carried out by the project:

Table iii: Summary of Proposed Interventions Across Villages

Village	Intervention Type	Number / Size (approx.)
Onamatende	Construction of rainwater harvesting earth pond	1 pond, 500–1,000 m^3
Oshuudhi/Ombundanti	Construction of rainwater harvesting earth pond	1 pond, 500–1,000 m^3
Olupumbu	Construction of rainwater harvesting earth pond	1 pond, 500–1,000 m^3
Omboloka	Deepening of existing wells and upgrading of community water infrastructure	1 Borehole,
Okanyanona	Deepening of existing wells and upgrading of community water infrastructure	1 Borehole
Oluwaya	- Deepening of existing wells and upgrading of community water infrastructure - The Saline Borehole requires basic water purification	1 borehole + deepening of existing wells
Oshanalumono	Early warning system	1 Upgrading of the infrastructure
Shapoko	Early warning system	1 Upgrading of the infrastructure

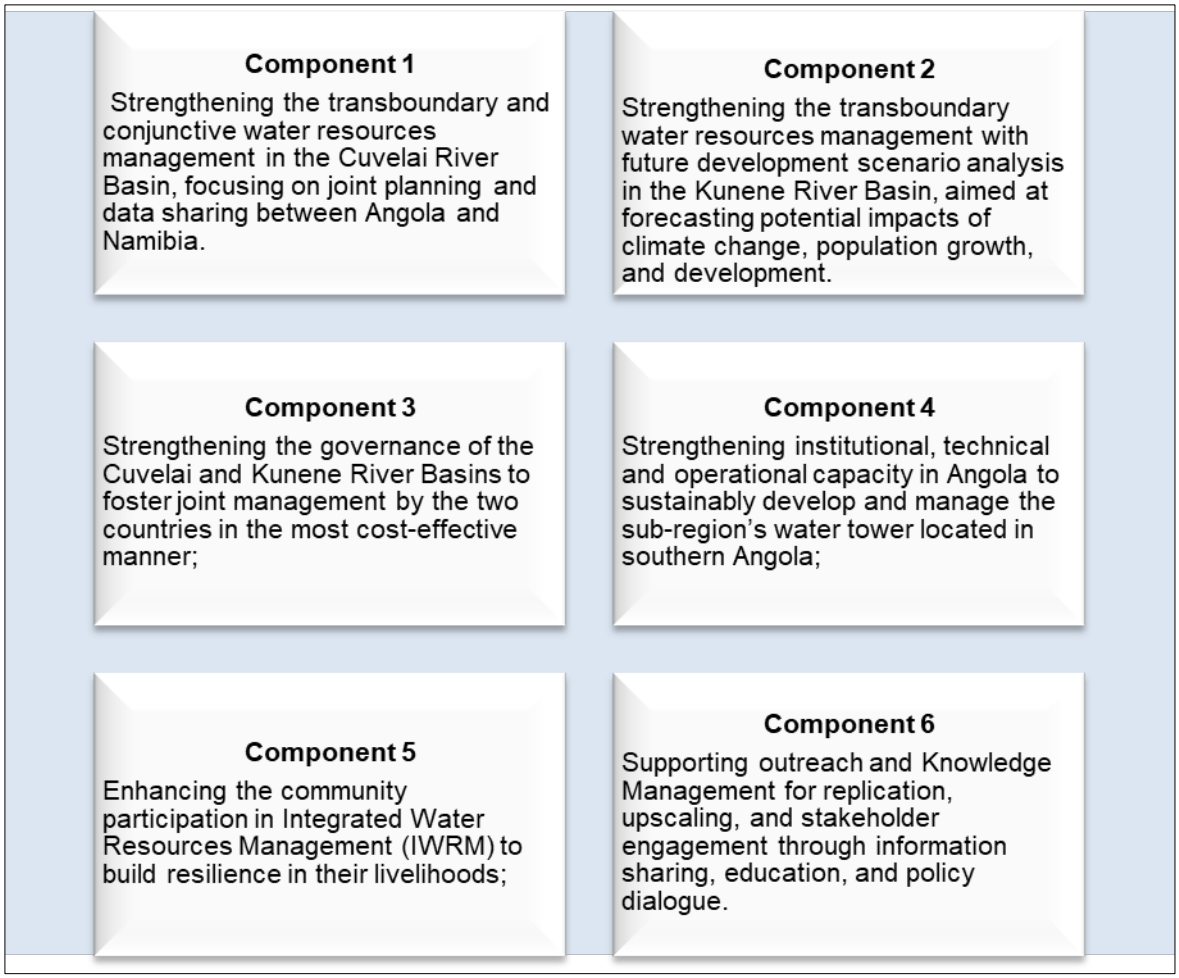


Figure 1-2: Project components

The project intervention sites in Namibia are strategically located within the Ohangwena, Omusati, and Oshikoto regions. These areas were selected based on their distinct socio-economic conditions and the potential for substantial improvements through the project's initiatives. Figure 1–3 illustrates the specific locations of the project sites, as well as the surrounding areas that may be affected by the project activities.

Small-scale aquaculture was initially considered as a complementary livelihood opportunity in villages with rainwater harvesting ponds. However, comprehensive field assessments revealed that water scarcity remains the prevailing challenge in the Cuvelai basin. The priority for project interventions is water security and availability for domestic use and livestock rather than food security through aquaculture. Given the unreliable water availability, particularly during extended dry seasons, the ESIA concludes that fish farming is not feasible in these areas at this time. Consequently, the risk of introducing invasive alien fish species identified in the Social and Environmental Screening Procedure (SESP) is not applicable to the current project interventions. Should water availability conditions improve in the future and aquaculture become viable, any such activities would require separate environmental screening and assessment, including specific measures to prevent the introduction of invasive species through the use of indigenous and/or non-invasive fish species only. .

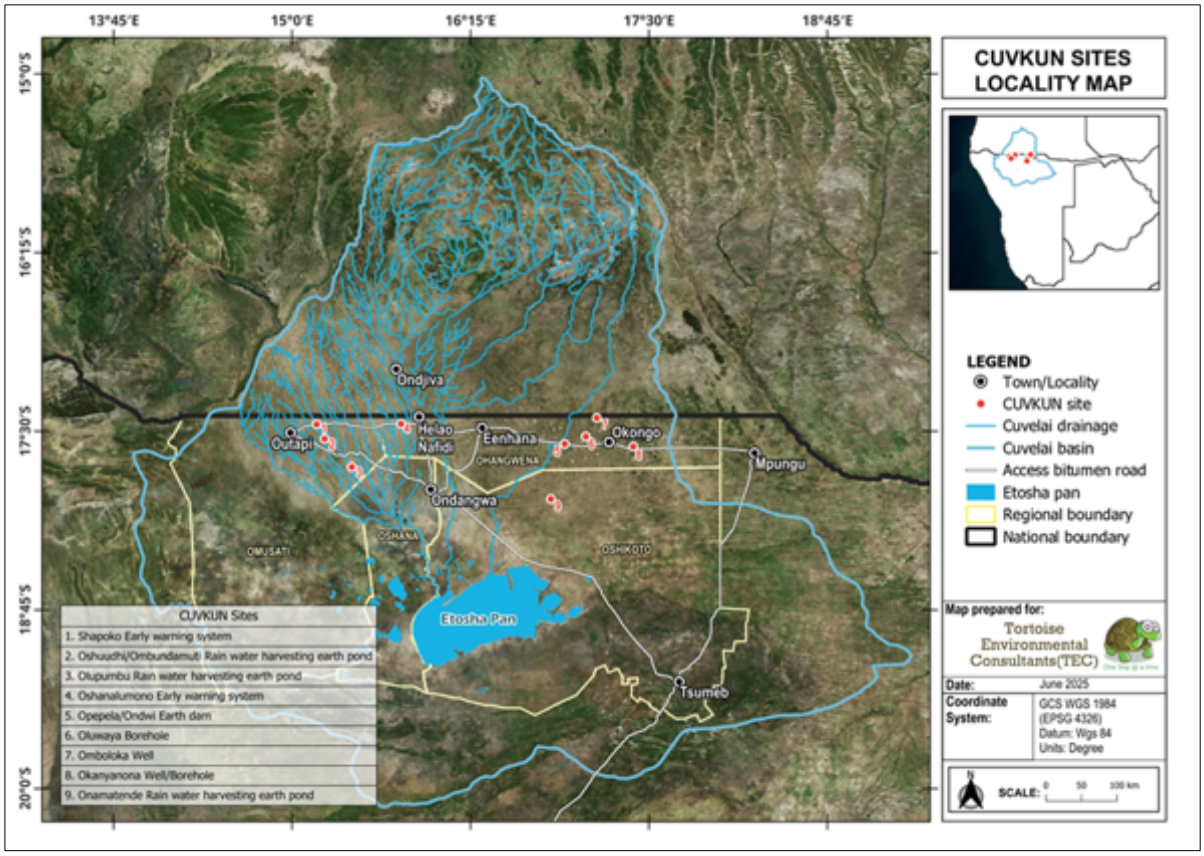


Figure 1-3*: Project intervention sites in Namibia*

1.4 Project Rationale

The CUVKUN project focuses on enhancing the management of water resources in the transboundary Kunene and Cuvelai basins, which Angola and Namibia share. Despite the contrasting characteristics of the two basins, the region faces growing water scarcity and hydrological variability, intensified by climate change. This highlights the urgent need for comprehensive monitoring of climate and water resources (flood water monitoring and harvesting), enhanced information sharing, and the development of systems capable of providing warnings for climate-related disasters.

2. Legal and institutional framework

This chapter provides an overview of the policies and legal and administrative framework within which the ESIA is carried out. Moreover, it presents the relevant national and international environmental and social policies and related practices relevant to the project, as indicated in the following tables.

2.1 The Constitution of the Republic of Namibia, 1990

The Constitution is the supreme law in Namibia, making provision for the establishment of the three organs of State (the Executive, the Legislative and the Judiciary).

The Namibian constitution under Article 95/1 mandates the "*maintenance of ecosystems, essential ecological processes and biological diversity of Namibia and utilisation of living natural resources on a sustainable basis for the benefit of the Namibians, both present and future*".

2.2 Namibia's Environmental Management Act (EMA) (Act No 7 of 2007)

The EIA/ESIA is regulated by the Environmental Management Act, 2007 and the EIA Regulations No. 30 of 2012, which is administered by the Ministry of Environment, Forestry and Tourism (MEFT), through the Department of Environmental Affairs (DEA), which is headed by the Environmental Commissioner (EC). The ESIA entails the development of the ESIA Scoping Report and Environmental and Social Management Plan (ESMP) which should be submitted to MEFT and the competent authority as part of the application for an ECC.

Table iv*:* Policies, Plans and Strategies

Policy / Plan	Relevance	Applicability to the Proposed Project
5th National Development Plan (NDP) and Vision 2030	Outlines the country's National Development Plans (NDPs), in line with the Harambee Prosperity Plan (HPP) and vision 2030	The proposed interventions are a development that forms part of the bigger picture of achieving economic progression, social transformation and environmental sustainability.

Table v*:* Relevant legislation and the applicability thereof

National Statutes	Relevance	Applicability to the Proposed Project
Environmental Assessment Policy (1995)	Promotes Sustainable development and Environmental Conservation emphasize the importance of environmental assessments as a key tool towards environmental sustainability	Environmental Protection

National Statutes	Relevance	Applicability to the Proposed Project
Water Act, 1956	Provides for the control, conservation and use of water for domestic, agricultural, urban and	Prohibits water pollution and the discharge of wastewater, effluent
Water Resources Management Act, 2013 (No. 11 of 2013) *(Promulgated, but not yet gazetted)*	Provides a framework for managing water resources based on the principles of integrated water resource management. It provides for the management, protection, development, use and conservation of water resource	Section 44 stipulates the requirements for a licence to be held for water abstraction. Section 68 makes provisions for prevention of water pollution.
Public Health Act (Act No. 36 of 1919)	Advocates for Public Health and safety	Protective clothing
The Occupational Safety and Health Act No. 11 of 2007	Advocates for employee and public safety, health	In the working context "SAFETY" implies "free from danger"
National Heritage Act, No. 27 of 2004.	The Act provides provision of the protection and conservation of places and objects with heritage significance.	Refer to handling procedures presented in the Scoping Report
Traditional Authorities Act, No. 25 of 2000	Recognizes customary governance and traditional leaders.	Facilitates culturally appropriate consultations and supports Free, Prior and Informed Consent (FPIC) processes in community engagement.
Communal Land Reform Act, No. 5 of 2002	Provides tenure security and regulates communal land access through traditional authorities.	Key in securing land rights for community-based project infrastructure (e.g., boreholes, water systems). Requires engagement with traditional authorities.
National Gender Policy (2010–2020)	Promotes gender equality and integration in water, land, and natural resource sectors.	Supports gender-responsive planning and budgeting in project activities, including IWRM and stakeholder engagement.

Table vi: International and Regional Frameworks and the Applicability Thereof

Framework	Relevance	Applicability to the Proposed Project
SADC Revised Protocol on Shared Watercourses (2000)	Promotes cooperation in transboundary water management.	Supports joint planning, data sharing
UN Declaration on the Rights of Indigenous Peoples (UNDRIP)	Sets FPIC and participation standards for indigenous peoples.	Guides consultations and safeguards when projects affect traditional or indigenous communities.
Convention on the Elimination of All Forms of Discrimination Against Women (CEDAW)	Promotes gender equality and women's rights.	Requires gender-inclusive planning, participation, and benefit-sharing.
UNDP Social and Environmental Standards (SES)	Mandates inclusive stakeholder engagement, FPIC, and grievance redress mechanisms.	Directly governs the ESIA process; ensures alignment with UNDP safeguards.
UN Framework Convention on Climate Change (UNFCCC) & Paris Agreement	Mandates climate change adaptation and resilience.	Guides the integration of climate risks and adaptive responses in water and community systems.
Sendai Framework for Disaster Risk Reduction (2015–2030)	Promotes disaster risk reduction and early warning systems.	Supports flood monitoring, early warning, and climate-resilient infrastructure in the project.
African Water Vision 2025 / AU Agenda 2063	Promotes sustainable water management for growth and resilience.	Aligns with regional aspirations for IWRM and inclusive development.

2.3 UNDP's SES Principles and Standards

The proposed project requires adherence to UNDP's Social and Environmental Standards (SES) to ensure that activities align with set standards, as illustrated in Table 2-4 below.

Table vii: SES Standards triggered by the Project

SES Standard	Relevance to the project
Standard 1: Biodiversity Conservation and Natural Resource Management	Protection of nearby ecosystems, ensuring minimal disruption to natural habitats and sustainable management of water resources
Standard 2: Climate Change and Disaster Risks	Addresses the role of the construction of rainwater harvesting earth ponds in managing flood risks and ensuring resilience to climate-induced variability in water resources.

	Incorporates climate-resilient measures to address seasonal water shortages and disaster risks like droughts or floods.
Standard 3: Community health, safety and security	Prevents adverse health impacts from construction activities, ensures structural safety of the dam, and minimizes flooding risks. It further addresses risks associated with waterborne diseases and ensures infrastructure safety, particularly to prevent hazards for children using the wells.
Standard 5: Displacement and Resettlement	Activities that involve physical and economic displacement, including through land acquisition or restrictions on land use or access to resources, pose impoverishment risks.
Standard 7: Labour and Working Conditions	Ensures safe working conditions for construction workers and compliance with labour laws, preventing exploitation and workplace hazards.
Standard 8: Pollution Prevention and Resource Efficiency	Minimizes construction waste, manages soil erosion, and prevents water contamination during construction and operation.

The Project does not trigger Standard 4 (Cultural Heritage), as project activities are not located near or likely to impact any sites of cultural, historical, or archaeological significance. Standard 5 (Displacement and Resettlement) is not applicable since the project does not involve land acquisition, physical relocation, or restriction of access to resources. Similarly, Standard 6 (Indigenous Peoples) is not triggered, as the project area does not overlap with Indigenous Peoples' lands or territories, nor does it affect their cultural rights or traditional livelihoods.

2.4 Legal Requirements of EMPs / ESMPs

The EIA Regulations GN 28, 29, and 30 of 2012 define a 'management plan' as:
"*...a plan that describes how activities that may have significant environmental effects on the environment are to be mitigated, controlled and monitored.*"

Section 8 (j) of the 2012 EIA Regulations requires that a draft EMP be submitted as part of the Scoping and or Baseline Report. The draft EMP/ESMP should include –

(aa) information on any proposed management, mitigation, protection or remedial measures to be undertaken to address the effects on the environment that have been identified, including objectives in respect of the rehabilitation of the environment and closure.

(bb) as far as is reasonably practicable, measures to rehabilitate the environment affected by the undertaking of the activity or specified activity to its natural or predetermined state or to a land use which conforms to the generally accepted principle of sustainable development; and

(cc) a description of the manner in which the applicant intends to modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation remedy the cause of pollution or degradation and migration of pollutants.

2.5 Gaps Between UNDP SES and Namibian National Legislation

The following Table viii illustrates a brief analysis of the key differences and gaps identified between UNDP's Social and Environmental Standards (SES) and Namibia's national legislative requirements, as indicated below:

Table viii: Identified gaps between UNDP SES and Namibian National Legislation

Area	UNDP Requirements	Namibian Legislation	Gaps
FPIC (Free, Prior and Informed Consent)	UNDP SES (Standard 6) and overarching Human Rights Principle requires FPIC for activities affecting Indigenous Peoples or traditional communities, with emphasis on meaningful participation and the right to say "no".	Namibia has no law that specifically recognizes Indigenous Peoples or mandates FPIC. Traditional Authorities Act provides for consultation but lacks binding FPIC standards.	- No formal legal requirement for FPIC in Namibia. - Consultations may occur, but not always in line with the principles of "free," "prior," and "informed". - FPIC is often interpreted as one-time consent, rather than ongoing dialogue.
Gender Equality	Requires gender-responsive design (Principle of Gender Equality and Women's empowerment; also reinforces SES Standard 10), implementation, and monitoring of all projects; mandates disaggregated data and inclusive stakeholder engagement.	National Gender Policy (2010–2020) promotes equality, but enforcement is weak and the policy has expired. Constitution protects equality but doesn't mandate operational frameworks.	- No binding gender mainstreaming requirements in sector-specific laws. - Implementation of gender-responsive planning is often inconsistent, especially in rural areas.
Indigenous Peoples and Marginalized Groups	SES (Standard 6 and Standard 10) explicitly requires safeguards and development benefits for Indigenous Peoples and other	Namibia has no formal recognition of Indigenous Peoples under the law. Rights are implied under constitutional protections and the Traditional Authorities Act.	- Absence of formal definition of "Indigenous Peoples" creates protection gaps. - Legal instruments do not address cultural-specific vulnerabilities or require benefit-sharing mechanisms.

Area	UNDP Requirements	Namibian Legislation	Gaps
	vulnerable groups, including respect for cultural rights and livelihoods.		
Stakeholder Engagement	Covered under the principle of meaningful, Effective and Inclusive Participation-and cross cutting all standards- Requires inclusive, iterative, and documented stakeholder engagement throughout the project lifecycle, with particular focus on marginalized voices.	The Environmental Management Act (No. 7 of 2007) requires public participation but often only mandates it during the Scoping/ESIA phase.	- Stakeholder engagement is often project-phase limited and may not involve ongoing dialogue. - National law lacks provisions for tracking grievances or feedback loops.
Climate Change	SES Standard 2 emphasizes climate risk screening, vulnerability assessments, and resilience-building.	Namibia is party to the UNFCCC and has a national climate policy, but climate considerations are not yet integrated into all sectoral laws.	- Climate risks are not systematically considered in national EIA processes. - No requirement for climate adaptation planning in communal water or land development.
Community Health & Safety	SES Standard 3, requires protection of communities from health and safety risks, including infrastructure design standards, disaster preparedness, and emergency response.	Public Health Act (2015) provides for public health safeguards; EMA (2007) addresses pollution and hazards indirectly.	- Enforcement capacity is weak in rural areas. - No clear framework linking infrastructure projects to emergency preparedness.
Labour & Working Conditions	SES Standard 7- requires fair treatment, non-discrimination, occupational health and safety (OHS), and prohibition of child/forced labour.	Labour Act (No. 11 of 2007) provides comprehensive labour protections, including OHS.	- Enforcement limited in remote communal areas. - Informal/temporary workers often outside formal protections.

Area	UNDP Requirements	Namibian Legislation	Gaps
Pollution Prevention & Resource Efficiency	SES Standard 8 - requires pollution avoidance, resource efficiency, and waste minimisation.	EMA (2007), Water Act (1956, under revision), and Pollution Control and Waste Management Bill (draft) cover pollution prevention.	- Pollution control legislation is outdated; draft law not yet enacted. - Limited monitoring capacity at basin/community level.
Water Resources Management	Falls under- SES Standard 1 and Standard 9 requires sustainable management of water resources, equitable access, and maintenance of ecosystem services.	Water Resources Management Act (2013) provides for sustainable use and permits for abstraction.	- Implementation slow; many provisions not yet fully operationalised. - Weak enforcement in communal areas.
Biodiversity, Land & Natural Resources	Falls under SES Standard 1 and Standard 9 - Conserve biodiversity; avoid critical habitat loss; sustainable land use; apply mitigation hierarchy.	Nature Conservation Ordinance (1975); Forest Act (2001); Communal Land Reform Act (2002); EMA (2007).	- Some instruments are outdated; weak enforcement in communal areas. - Limited basin-level integration of biodiversity safeguards. - No explicit requirements for offsets or ecosystem-services valuation.

2.6 Permits and licences

This section outlines how the project intends to comply with the identified policies, regulations, and legislation. This includes obtaining specific permits and licenses. Table 2-6 below summarises the anticipated permits and authorisations that might be required.

Table ix: Permits and licenses might be required for this project

Project Stage	Permit/License/Approval	Regulatory Authority	Purpose / Justification

Planning & Design	Environmental Clearance Certificate (ECC)	Ministry of Environment, Forestry and Tourism (MEFT), Department of Environmental Affairs (DEA)	Required under EMA (2007) before commencement of listed activities (e.g. borehole drilling, water infrastructure, construction in sensitive ecosystems).
	Land/Access Authorization	Traditional Authority & Communal Land Board or Land owners	To secure land-use rights for borehole sites, ponds, or early warning system installations on communal land.
	Early warning system (EWS)	Obtained from either the National Disaster Risk Management Committee (NDRMC) or the Namibia Meteorological Service (NMS)	To ensure the Early Warning System is legally recognized, integrated with national infrastructure, and delivers credible, coordinated, and sustainable alerts
Construction & Development	Borehole Drilling Permit	Ministry of Agriculture, Water and Land Reform (MAWLR), Department of Water Affairs	Required for drilling of new boreholes.
	Water Abstraction Permit	MAWLR (Water Resources Management Act, 2013)	To abstract and use groundwater from boreholes.
	Waste Disposal Permit	Local Authority / MAWLR (pending Pollution Control & Waste Management Bill)	For safe disposal of construction and drilling waste, sludge, and hazardous materials.
	Labour Registration / OHS Compliance	Ministry of Labour, Industrial Relations and Employment Creation	Ensures worker safety, fair labour practices, and compliance with Labour Act.
Operation & Maintenance	Public Health Clearance	Ministry of Health & Social Services	To ensure boreholes/ponds do not pose health risks (contamination, vector breeding).
	Decommissioning Plan Approval	MEFT (DEA)	Required under EMA for closure of project facilities, restoration of sites.

Closure / Decommissioning	Groundwater Well Sealing/Decommissioning Permit	MAWLR	Ensures boreholes no longer in use are properly sealed to prevent contamination.

3 Project alternatives

Alternatives are defined as the “different means of meeting the general purpose and requirements of the activity” (EMA, 2007). This section highlights the different ways in which the project can be undertaken, and identifies alternatives that may be the most practical, but least damaging to the environment. Once the alternatives have been established, these are examined by asking the following three questions: What alternatives are technically and economically feasible? What are the environmental effects associated with the feasible alternatives? And what is the rationale for selecting the preferred alternative?

Table 3-1 below presents a systematic comparison of feasible project alternatives, including the “without project” scenario, for the CUVECOM interventions. Each alternative is assessed across six dimensions: description, key environmental impacts, key social impacts, feasibility/advantages, and disadvantages/risks. The table is designed to highlight differences in potential outcomes related to site selection, technology choices, design options, and operational approaches. This comparative analysis helps identify the preferred course of action by illustrating the trade-offs between environmental sustainability, social benefits, technical feasibility, and potential risks. It supports informed decision-making and demonstrates why the proposed interventions are the most suitable option for enhancing climate resilience, water security, and livelihoods in the Cuvelai and Kunene basins.

Table x: Comparative Analysis of Project Alternatives, Including "Without Project" Scenario

Alternative	Description	Key Environmental Impacts	Key Social Impacts	Feasibility / Advantages	Disadvantages / Risk
Proposed Project	Implementation of EWS, rainwater harvesting ponds, and solar-powered boreholes	Moderate construction impacts (soil erosion, vegetation clearance), low operational impacts (water pollution, air quality)	Improved water access, livelihood support, enhanced disaster preparedness	Technically feasible, aligns with community needs, enhances resilience	Requires careful mitigation of moderate risks, community engagement, maintenance
Alternative Sites	Implement same interventions at different locations within the basin	Similar construction and operational impacts, may affect different habitats	Impacts on other communities; potential access inequities	May optimize resource distribution or reduce environmental sensitivity	May increase costs or reduce accessibility for some beneficiaries
Alternative Technologies	Use manual wells, rainwater tanks, or different EWS technology	Lower construction impacts, possibly higher maintenance requirements	Less equitable access if capacity is limited; slower disaster response	Lower upfront cost; simpler technology	Reduced efficiency and resilience; higher long-term maintenance
Alternative Designs	Vary pond size, borehole depth, or EWS coverage	Larger ponds may increase siltation; deeper boreholes may affect groundwater	Potentially better water security for more households	Can optimize water storage or access	Higher cost; increased environmental footprint
Without Project	No interventions implemented	Status quo; natural resource stress continues	Continued water scarcity, vulnerability to floods, limited livelihood improvement	No cost, no new impacts	Communities remain vulnerable; no resilience or development benefits

4 Environmental and social baseline conditions

a. Community Demographics

Based on the Namibia 2023 population and housing report, Appendix 1 presents the demographics of the Ohangwena, Omusati, and Oshikoto regions.

i. Ohangwena Region

Between 2011 and 2023, the Ohangwena Region (location for Okanyanona, Oluwaya, Opepela, Shanalumono, and Omboloka villages) experienced significant population growth from 245,446 to 337,729, with an increased annual growth rate from 0.7% to 2.7% (Appendix 1A). Although still predominantly rural, urbanisation slightly increased, with the urban population growing from 10.1% to 14.5%. Educational attainment improved, particularly at secondary and tertiary levels, with secondary education rising from 8.5% to 19.3% and tertiary from 2.7% to 7.3%. The literacy rate, however, showed a slight decline from 86.3% to 84.6%. Access to essential services improved markedly: households with safe drinking water rose from 56.4% to 84.3%, and access to electricity increased from 11.0% to 20.7%. However, the proportion of households without toilet facilities, though reduced, remained high at 61.7%. Notably, birth registration coverage reached 69.0%, and internet access rose sharply from 2.6% to 14.0%, signalling digital progress.

ii. Omusati Region

Omusati Region's (region for Omusati, Shapoko, and Ombundamuti villages) population rose from 243,166 in 2011 to 316,671 in 2023, with the annual growth rate increasing from 0.6% to 2.2% (Appendix 1B). Urbanisation also improved, from 5.7% urban residents in 2011 to 11.1% in 2023. Education indicators showed substantial gains: secondary education attainment grew from 14.0% to 19.6% and tertiary from 3.5% to 8.0%. While the literacy rate slightly declined (from 87.6% to 84.1%), early childhood education attendance increased from 14.9% to 22.0%. Access to drinking water improved significantly (from 51.6% to 89.9%), and households using electricity for lighting rose from 9.0% to 20.2%. Though sanitation improved, 57.8% of households still lacked toilet facilities in 2023. Economic reliance on farming slightly declined, while wage and salary employment increased to 27.0%. Meanwhile, the average household size shrank from 5.2 to 4.2, and the number of female-headed households rose to 58.3%.

iii. Oshikoto Region

The population of the Oshikoto region (which constitutes Onamahene Village) grew from 181,973 in 2011 to 257,302 in 2023, accompanied by a rise in urbanisation from 13.0% to 18.3% and an increase in the growth rate from 1.2% to 2.9% (Appendix 1C). The region saw notable improvements in education, particularly in secondary and tertiary attainment (from 14.6% to 20.8% and 3.0% to 8.5%, respectively). Access to safe drinking

water surged from 69.7% to 90.2%, and electricity access improved from 20.0% to 28.6%. However, the number of households without toilet facilities remained high at 54.6%. A sharp increase in informal housing (from 4.8% to 15.6%) suggests rising housing challenges despite development. Literacy slightly dropped to 85.2%, while internet access increased significantly from 3.9% to 18.1%. The economic profile shifted, with farming declining from 33.3% to 23.6% as the region leaned more on wage employment (33.3%). Like other regions, Oshikoto's average household size decreased and female-headed households slightly increased, reflecting broader demographic and socio-economic changes.

b. Socio-economic

i. Land tenure system

The target villages in Oshikoto, Ohangwena, Omusati, and surrounding regions largely operate under communal land tenure systems. For example, in Onamatende Village, a community member voluntarily donated land for a proposed rainwater harvesting pond, which is also used for livestock grazing. In Opapela and Olupumbu, earth ponds are located on communal land historically shared among the villages. Land tenure details in other villages are not specified but are assumed to follow similar customary practices.

ii. Current land use

The communities in project sites predominantly depend on subsistence crops and livestock farming. The main crops grown in the area include pearl millet, maize, sorghum, watermelons, groundnuts, and beans. Most households raise livestock such as cattle, goats, donkeys, chickens, pigs, and a few sheep and ducks. Donkeys are primarily used for ploughing pearl millet fields and transporting water (see Figure 4-1 and Figure 4-2 below).

iii. Livelihood/income sources

The livelihoods of these households are largely based on subsistence agriculture and livestock rearing. Many families keep cattle, goats, and poultry, with some owning as many as 40 to over 100 head of cattle, especially in regions with access to communal grazing land. Livestock not only provides a source of income and food but also plays a significant role in cultural and social practices.

Small-scale trade and the collection of local resources, such as construction poles from nearby forests, provide additional income.

Figure 4-1: Donkeys are used for ploughing

Figure 4-2: Donkeys are also used to carry / transport water

iv. Social and health services

Access to social and health services is limited across the villages. Clinics are often distant, with mobile clinics providing supplementary services in villages such as Oshuudhi and Ombundanti. Health concerns include diarrhoea, tuberculosis, malaria, and other water-related diseases, particularly affecting infants, the elderly, and other vulnerable populations. The government provides essential services such as drought relief and veterinary care.

v. Transport and communication

Transport and communication challenges are evident, with households frequently travelling 2–5 km to access water. Water collection often relies on donkeys, vehicles, or youth carrying water manually.

vi. Gender-Based Violence (GBV)

GBV cases have been reported in some villages, notably Oluwaya, although many cases remain unaddressed due to social and cultural factors. Limited access to formal support or GBV service providers underscores the need for strengthened community awareness, prevention strategies, and accessible reporting mechanisms.

vii. Education

Educational access is occasionally disrupted, especially during flooding events. For example, Shapoko Village experiences school closures during heavy rains. Detailed data on education infrastructure across other villages is limited, highlighting a need for further assessment.

c. Climate

The climate of Omusati region is categorised as semi-arid with high temperatures ranging between 25-37 degrees Celsius. Annual average rainfall is approximately 350-500 mm between November and April (Omusati Regional Council, n.d). While the potential evapotranspiration ranges from 2800 to 3200 mm/a (Mendelsohn, et al., 2013).

Ohangwena Region has a sub-tropical climate with hot summers and cool to warm winters. The region is semi-arid, and annual rainfall varies from 480mm in the western part to 600mm in the east. The regional hottest months are November to February with an average temperature of 20 - 36 Degrees Celsius. (Ohangwena Regional Council , n.d)

Oshikoto region has a hot, semi-arid climate with average annual rainfall ranging from 400mm to 550mm. Temperatures typically range from 22.6 to 30°C during the cooler months and 30 to 37°C during the hot months. Rainfall decreases from the northeast to the southwest, with the Tsumeb area receiving the highest amount.

The relatively reliable rainfall makes provision for crop and livestock farming. However, the marginal and unpredictable nature of rainfall, crop failures are common in both regions. Below, *Figure 4-3* illustrates the rainfall patterns across all three regions.

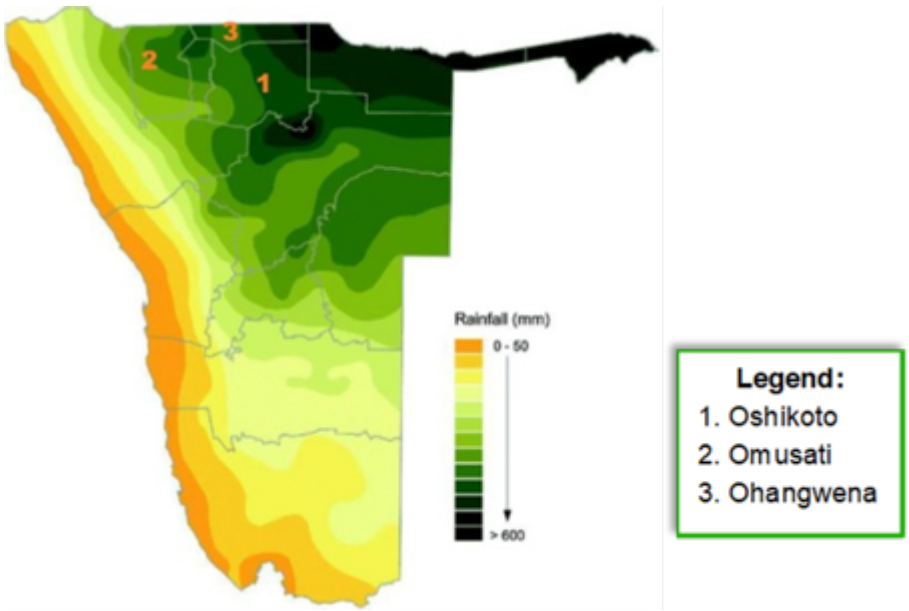


***Figure 4-3**: Namibia Rainfall Pattern (Source: First Capital Namibia, 2022)*

i. Topography, Landscape and Soils

The Omusati, Oshikoto and Ohangwena Regions feature a predominantly flat topography, with elevations ranging between 800 and 1,200 meters above sea level (Mendelson et al., 2002). The project area falls within the Cuvelai landscape. The land gradually slopes from approximately 1,150 meters above sea level in the northeast to about 1,080 meters at the Etosha Pan in the south.

As noted by Environam Consultants (2019), the northern regions of Namibia fall within the Cuvelai landscape, comprising sediment layers of silt, clay, limestone, and sandstone.

A defining feature of this area is the network of drainage channels known locally as *Iishana* (see *Figure 4-4*), which fill with water during heavy rains and erode the underlying sediments.

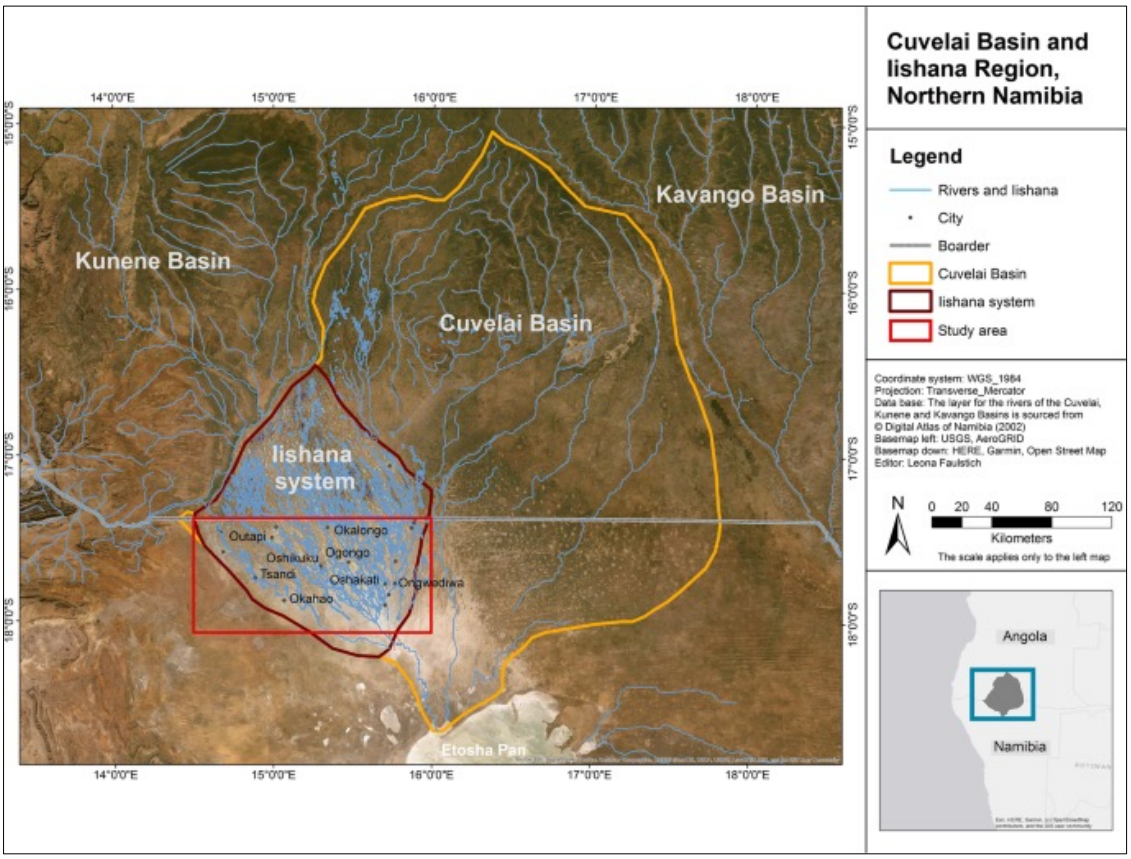


Figure 4-4. Map of Cuvelai Basin and Iishana Region, Namibia (Source: Faulstich, 2023)

The soils in the three regions primarily include *Cambic Arenosols,* with some areas containing *Eutric Cambisols*, (Mendelson et al., 2002). Soil composition varies across the region; much of it is sandy with traces of silt and clay (*Arenosols*), while the northeast contains soils influenced by *oshana* deposits, and the south has clay-rich soils (*Luvisols*) or rocky *Cambisols*. These soils are often classified as sands and loams that have been reshaped by wind and water, resulting in saline conditions. This salinity supports mopane vegetation, which thrives in such environments. However, areas with less saline sands and loams offer fertile ground suitable for agriculture (Environam Consultants, 2019).

ii. Surface and groundwater

The three regions lie within the Cuvelai Basin (see *Figure **4-5***), a landscape dominated by seasonal watercourses known as *Iishana*. These *Iishana* serve as the primary sources of surface water, particularly during the rainy season, when they collect runoff from localized rainfall. Surface water availability is highly seasonal, with many of the *Iishana* drying up during extended dry periods. This seasonal nature of surface water is critical for livestock, small-scale irrigation, and domestic use in rural areas. However, due to high evaporation rates and low rainfall, reliance on surface water is often limited.

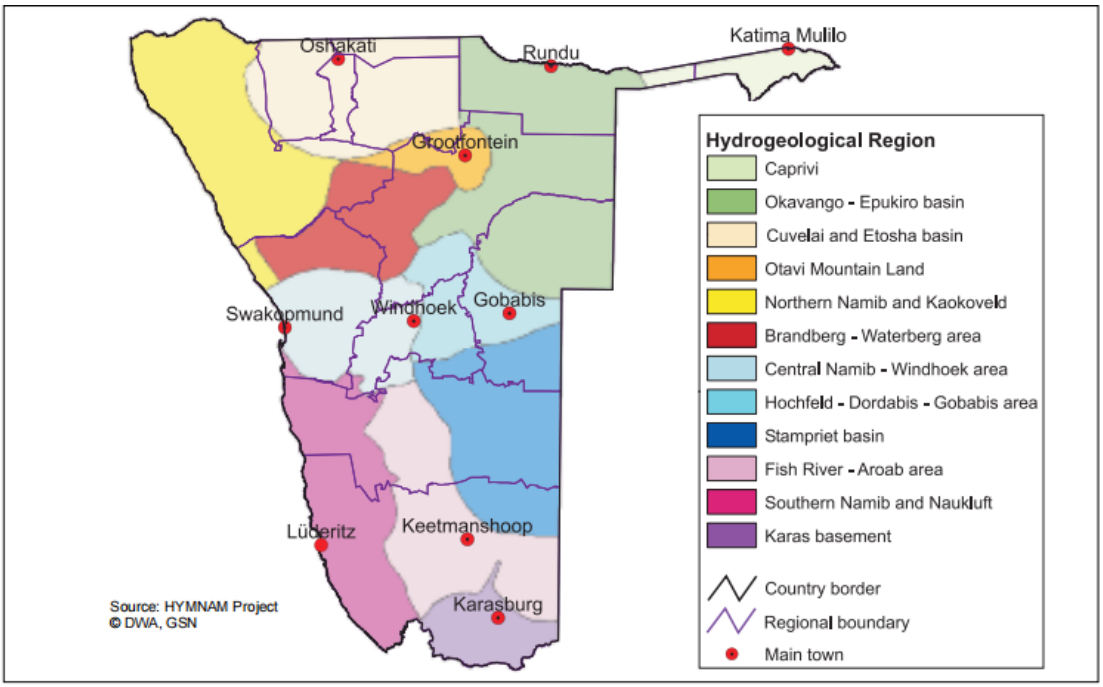


Figure 4-5.Hydrogeology of the Study area (Source: Christelis et al, 2001)

Groundwater is a vital resource for the respective regions, especially due to the limited and unreliable surface water availability. The regions tap into various aquifers, but the groundwater quality and accessibility differ across different areas (as indicated in *Figure **4-5***). The main aquifers are typically found in alluvial deposits and fractured rock formations. However, some of the groundwater in the regions is brackish or saline, which limits its use for human consumption without treatment.

iii. Biodiversity

Flora

The Omusati, Oshikoto, and Ohangwena regions fall within Namibia's north-central "Cuvelai-Etosha Basin," characterized by semi-arid savannah with scattered woodlands and seasonal oshanas (floodplains). Vegetation is dominated by broad-leafed tree and shrub species, notably *Terminalia prunioides* (purple-pod terminalia), *Acacia erioloba* (camel thorn), *Colophospermum mopane* (mopane), and *Combretum imberbe* (leadwood). Mopane woodlands are particularly widespread in Oshikoto and parts of Omusati. Along seasonal pans and depressions, species such as *Phragmites australis* (reeds) and *Cyperus* spp. occur, providing important ecological services. Domesticated crops such as mahangu (pearl millet), sorghum, and beans dominate agricultural areas, while fruit-bearing trees like marula (*Sclerocarya birrea*) and bird plum (*Berchemia discolor*) play an important role in household nutrition and livelihoods.

Fauna

The regions support a mix of wildlife adapted to human-dominated landscapes and species associated with the nearby Etosha ecosystem. Common large mammals include elephants (*Loxodonta africana*), which occasionally move through northern Oshikoto and Omusati, often contributing to human-wildlife conflict. Other species present include

kudu (*Tragelaphus strepsiceros*), steenbok (*Raphicerus campestris*), duiker (*Sylvicapra grimmia*), and warthog (*Phacochoerus africanus*). Smaller mammals include hares, jackals, and various rodents. Birdlife is diverse, particularly around oshanas and pans, with species such as the African openbill, cattle egret, and blacksmith lapwing, alongside raptors like bateleurs and martial eagles. Amphibians such as *Pyxicephalus edulis* (African bullfrog) breed opportunistically during seasonal floods, providing both ecological and food value for communities.

Cultural Heritage

A cultural assessment study conducted indicated that there are no cultural heritage sites in the project area.

Protected areas

The site assessment did not identify any protected or sensitive areas within the project site.

d. How the proposed intervention would interact with the baseline conditions

Overall, the planned project activities, including the mechanisation of wells and boreholes, the construction of rainwater harvesting ponds, and the installation of early warning systems, are largely small-scale and community focused. As such, they are not expected to cause major alterations to the natural topography or biodiversity of the area.

Minor localized changes may occur, such as vegetation clearance at construction sites, disturbance of soils, or increased human activity around water points, but these impacts are manageable with appropriate mitigation measures.

The construction of water ponds will involve varying degrees of excavation, potentially altering the topography at specific points. Modifications on some portions of land due to trenching may deepen or change the land's contours, disrupting natural drainage patterns and increasing the risk of soil erosion. Additionally, construction activities may loosen the topsoil, leading to soil loss and accelerated erosion, particularly during the rainy season.

While these activities will not significantly alter the natural hydrological systems, localized impacts such as changes in groundwater abstraction rates. With proper abstraction permits, monitoring, and sustainable management practices, these interventions are expected to strengthen rather than degrade the regional water balance.

5 Description of project intervention sites

a. Livelihood-based watershed management

CUVKUN Well Intervention Model

The traditional community wells in the Ohangwena region face a range of challenges, including structural collapse due to unlined shafts, contamination from livestock, erosion from trampling, fatigue caused by manual lifting, and floodwater siltation (see Appendix 2). These issues undermine the safety, equity, and sustainability of the water supply.

To address these problems, the proposed intervention includes several enhancements: reinforced well lining, sanitary seals, solar-powered pumps with storage tanks, and separate fenced-off access points for domestic use and livestock, ensuring these are located at safe distances from one another.

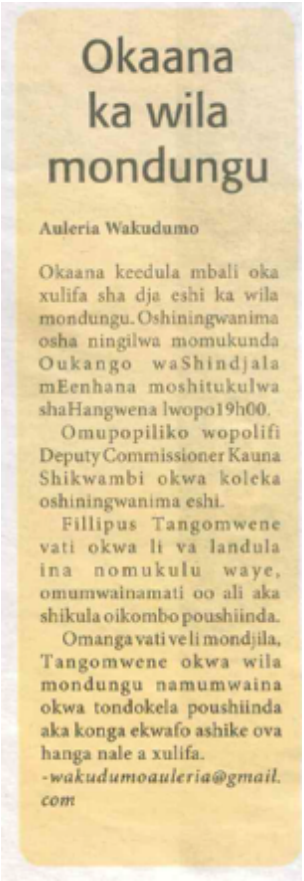
Additional safeguards will involve the installation of elevated collars, drainage systems, and inspection points for ongoing monitoring, alongside continuing manual windlass operation as a backup. Rehabilitation efforts will be labour-based, adhering to safety protocols such as the use of personal protective equipment (PPE), trained overseers, and excavation safety measures. Furthermore, establishing community ownership and governance arrangements, including free, prior, and informed consent (FPIC) and clear rules and constitutions, will promote equitable access and long-term sustainability.

Overall, this intervention seeks not only to upgrade the existing hand-dug wells in four villages but also to improve water access and quality for the local community. By implementing more reliable and sustainable water solutions, such as the installation of boreholes with solar pumping systems or other pumping technologies, we aim to resolve the current challenges effectively.

The anticipated benefits of the intervention are as follows:

- Improved water quality
- Reduced potential risk of drowning
- Efficiency and Increased productiveness
- Reduced spending on diesel

Figure 5-1 below indicates some of the documented dangers of hand-dug wells; such incidents (loss of lives) highlight the need and urgency for upgrading such water infrastructure.



Okaana ka wila mondungu

Auleria Wakudumo

Okaana keedula mbali oka xulifa sha dja eshi ka wila mondungu. Oshiningwanima osha ningilwa momukunda Oukango waShindjala mEenhana moshitukulwa shaHangwena lwopo19h00.

Omupopiliko wopolifi Deputy Commissioner Kauna Shikwambi okwa koleka oshiningwanima eshi.

Fillipus Tangomwene vati okwa li va landula ina nomukulu waye, omumwainamati oo ali aka shikula oikombo poushiinda.

Omanga vati veli mondjila, Tangomwene okwa wila mondungu namumwaina okwa tondokela poushiinda aka konga ekwafo ashike ova hanga nale a xulifa.

-wakudumoauleria@gmail.com

A Child fell and died in a community Hand dung well

Auleria Wakudumo – New Era Newspaper

A 2-year-old child (Fillipus Tangomwene) died after he fell into a hand-dug well. The incident occurred around 19h00 in a village called Oukango waShindjala, in Eenhana district, Ohangwena region.

The police spokesperson, Deputy Commissioner Kauna Shikwambi, confirmed the incident.

Allegedly, the child was following his older brother, who was looking after goats.

His brother ran to the neighbours to seek assistance, but when the child was removed from the well, he was already deceased.

wakudumoauleria@gmail.com

Figure 5-1. Dangers of Hand Dug Wells. (New Era Newspaper, 7 January 2025)

i. Okanyanona village

The village of Okanyanona (Figure 5-3) is home to approximately 114 households, with family sizes ranging from 8 to 20 individuals (Table 5-1). On average, each household consists of about 10 people, bringing the total estimated population to around 1,140 residents. The community includes about seven child-headed households and approximately 60 that are led by women.

Only one individual originates from the San, historically classified as indigenous. However, she has become culturally and socially integrated into the village. In practice, she participates in all aspects of community life and is indistinguishable from other members in terms of work, schooling and shared customs.

Table xi. Socio demographic information for Okanyanona Village – 2024

Aspect	Data
Number of households	114 homesteads / households
Household size - range	8 to 20 people (est.)
Average household size	10 people
Estimated community size	1,140 people
Child-headed households	7 (est.)
Women headed households	60 (est.)
Persons of Indigenous Descent	1 person[2]

Livestock rearing forms a crucial part of the local economy. Out of the 114 households, 100 own cattle, with herd sizes ranging from 15 to as many as 150 animals (Table xii). The average number of cattle per household is around 30, resulting in an estimated total of 3,000 cattle in the village. Goats are even more widespread, with 110 households keeping between 40 and 200 goats each, averaging 60 per household-amounting to approximately 6,600 goats.

Donkeys, though less common, are kept by about 15 households with an average of four donkeys each, giving a total of around 60. Sheep are notably absent from the community's livestock holdings. Both humans and livestock use the existing dug out well for drinking.

Table xii. Livestock Numbers for Okanyanona Village, 2024

Type	No. of households (114)	Lowest	Highest	Average	Estimate
Cattle	100	15	150	30	3,000
Goats	110	40	200	60	6,600
Donkeys	15	2	6	4	60

[2] *"Persons of Indigenous Descent" refers to specific individuals, such as those from the San heritage, who have historically been integrated into local households and community life.*

Figure 5-2. Water Scarcity - Okanyanona Waterpoint

In terms of access to basic services, the nearest school—Enyana Primary—is located 2 kilometres from the village, offering a relatively short walking distance for children. The nearest health facility, however, is much farther away; residents must travel 20 kilometres to reach the clinic in Okongo. Health issues continue to affect the community, with malaria being a persistent concern despite an annual indoor residual spraying program. Skin-related ailments, particularly scabies, also remain common and contribute to the health burden.

The village of Okanyanona currently relies on a single hand-dug well that reaches a depth of 12 meters for its water supply. Approximately 115 households depend on this hand dug-well, along with residents from neighbouring villages like Okaka, Odenda, and Oshiniwa.

During dry seasons, the water level in the well often drops significantly. In such cases, community members take the risky step of manually going down into the well to deepen it. If the water becomes too low and muddy, residents are forced to travel 4 to 5 kilometres (about 2 hours) to fetch clean water from alternative sources.

To address these issues, the well needs to be deepened and modernized, which could involve installing a water pump and potentially adding a borehole to enhance the village's water supply.

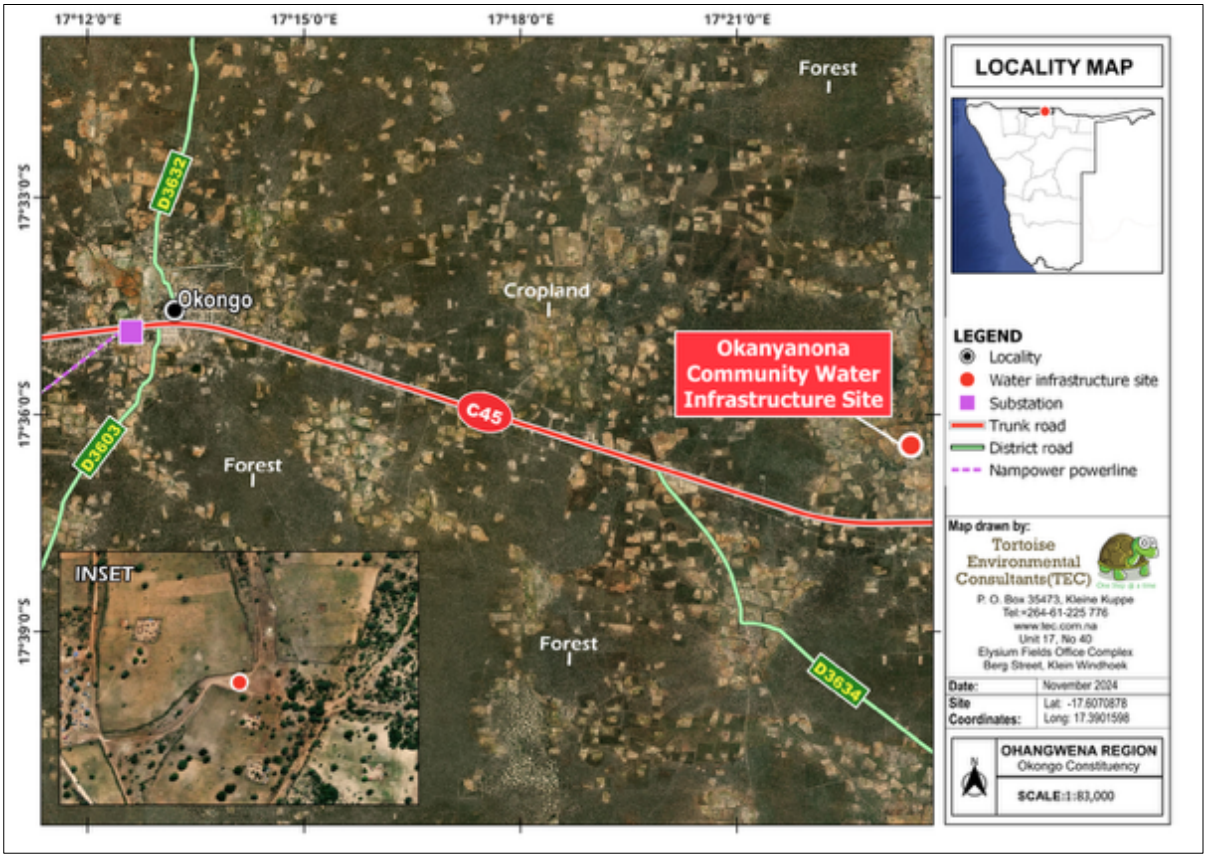


Figure 5-3: Locality map of the Okanyanona Water Point

ii. Omboloka village

Omboloka village, is situated in the Okongo Constituency of Namibia's Ohangwena Region, has been identified as the site for the proposed upgrading of community water infrastructure. It is located at coordinates -17.4066234 latitude and 17.134171 longitude (Figure 5-6) and has approximately 3,180 people from 318 households (Table xiii). These homesteads typically accommodate between 8 to 20 individuals, with an average household size of 10. Among the residents are 14 estimated child-headed households and 105 women-headed households. There were no confirmed indigenous people in the village.

Table xiii. Demographic Data for Omboloka village

Aspect	Information
Number of households	318 homesteads / households
Household size - range	8 to 20 people (est.)
Average household size	10 people
Estimated community size	3180 people
Child-headed households	14 (est.)
Women headed households	105 (est.)
Persons of Indigenous Descent	None confirmed

Currently, the village depends on a single hand-dug well for its water needs, which is shared by both people and livestock (Figure 5-5). However, this source is unsafe and unreliable.

The well, measuring about 150 cm in radius and 8 meters deep (Figure 5-4), is exposed and lacks any form of protective covering, posing a serious risk of accidental falls, especially for children and animals. In addition to these safety concerns, the water is susceptible to contamination from surface runoff, which significantly compromises its quality and contributes to health risks. The water source clearly requires deepening, structural upgrades, and protective measures to ensure it can safely and sustainably serve the community.

Figure 5-4: Safety risk – uncovered community well

Livestock farming is a central aspect of life in Omboloka, with an estimated 13,250 cattle, 10,800 goats, and around 720 donkeys owned collectively by the villagers (Table xiv). Sheep are not present in the area. Access to essential services is relatively good, with the local school situated just 1 kilometre away and the nearest clinic 800 meters from the village centre.

Despite this proximity to health services, the community continues to face a high incidence of diseases such as malaria—despite an annual spraying programme—and scabies, a recurring skin condition. Overall, while Omboloka is a closely-knit and resourceful community, the dire condition of its current water infrastructure underscores an urgent need for investment in safer and more reliable water systems.

Table xiv. Number of Livestock in Omboloka Village

Type	No. of households (318)	Lowest	Highest	Average	Estimate
Cattle	250	25	80	53	13,250
Goats	180	40	200	60	10,800
Sheep	0	0	0	0	0
Donkeys	80	2	15	9	720

Figure 5-5: Water Poverty – Omboloka water point

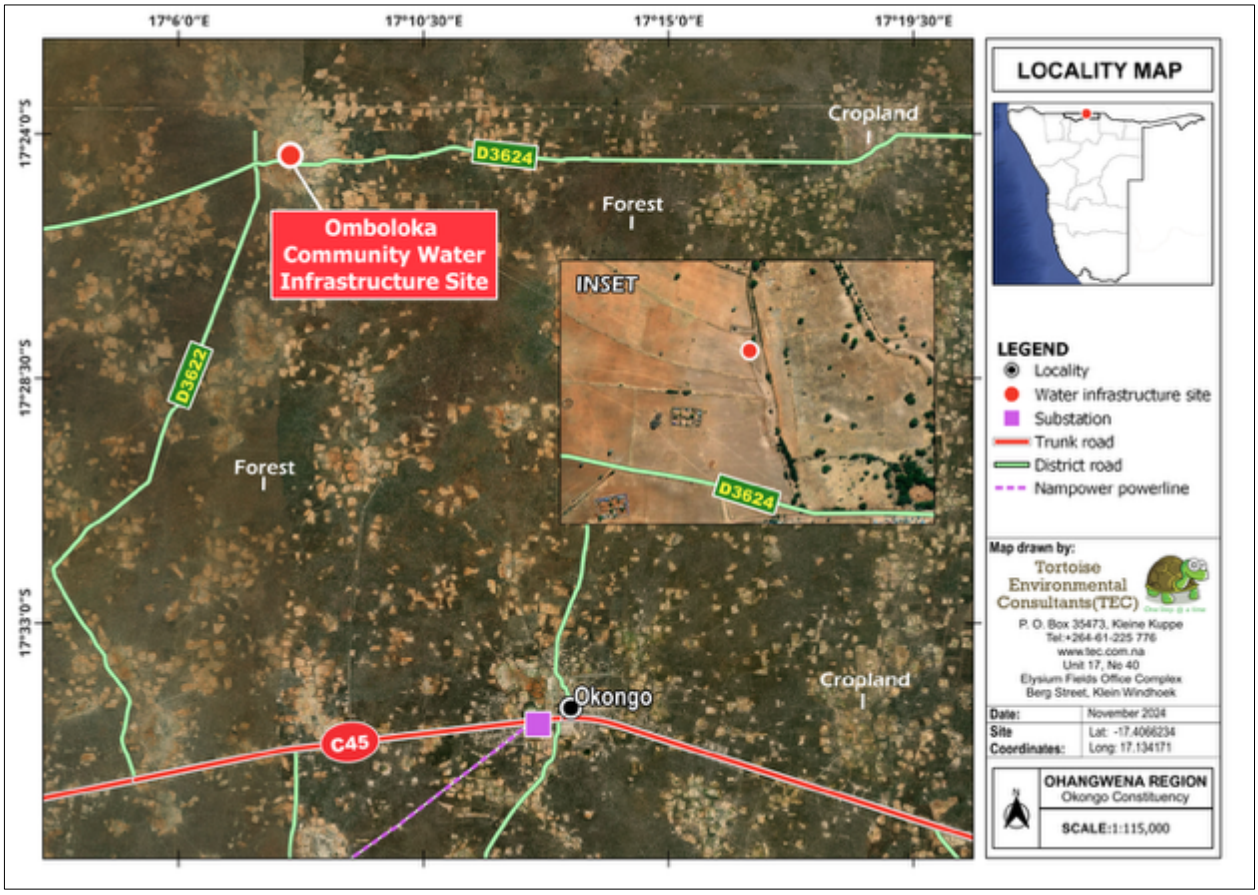


Figure 5-6: Locality map of the Omboloka waterpoint

iii. Oluwaya Community Water Infrastructure

Location and Community Demographics

Oluwaya village, located in the Oshikunde Constituency of the Ohangwena Region (see Figure 5-11). This remote community, situated at latitude -17.5373436 and longitude 17.0582716, is home to approximately 45 homesteads making up an estimated 810 people (Table xv). Households range in size from 7 to 20 individuals, with an average of about 15 people per home. Notably, three households are believed to be child-headed, while approximately 30 are headed by women. The community also includes six individuals from the San indigenous tribe who now live within extended households and are considered adopted members of the village. They do not practice any customs or way of living associated with the typical indigenous community.

Table xv. Community Demographics-Oluwaya

Aspect	Information
Number of households	45 homesteads / households
Household size - range	7 to 20 people (est.)
Average household size	15 people
Estimated community size	810 people
Child-headed households	3 (est.)
Women headed households	30 (est.)
Persons of Indigenous Descent	Six and 3 of these live in main community households, identifying as adopted

Water Sources and Water Quality

Oluwaya village relies on two primary water sources: a hand-dug well used for potable water and a diesel-powered borehole used for livestock due to the salinity of the water (Figures 5-7 and 5-8).

Hand-dug Well

The hand-dug well is about 20 meters deep, often dries up during the dry season, leaving the village vulnerable to severe water shortages.

Borehole

As a coping mechanism, residents either turn to the borehole, although the water is saline and primarily suitable for livestock or travel long distances to the nearest village to get water.

Community members contribute financially to purchase diesel from the nearest town to keep the pump running.

Oluwaya School

While the nearby school operates its own clean water boreholes, these are not accessible to the wider community. This is because some of the households that depend on this water source are located up to 2 kilometers away.

Safety Risk

At times the community have to go into the deep wells to deepen them – a risky activity due to depth and the sandy soils. The borehole infrastructure includes a diesel pump, reservoir, tanks, communal tap, and livestock drinking troughs (Figures 5-7, 5-8, and 5-9, respectively).

Figure 5-7: Properly constructed and covered community well, with a hand-pump – easy and safe to operate) – Oluwaya

Figure 5-8: Oluwaya water point has good infrastructure, however – the borehole has saline water and it is not fit for human consumption – basic water purification is required)

Figure 5-9: Properly constructed Livestock trough with a concrete platform – Oluwaya water point

Livestock ownership plays a critical role in the livelihoods of Oluwaya residents. Among the 45 households, 40 keep cattle with an estimated total of 4,200 head, while 35 households rear approximately 5,425 goats (Table xvi). Donkeys are also common, with around 210 distributed among 30 households (Table xvi). Despite these agricultural activities, access to basic services remains limited.

The community is served by Oluwaya School, located about 500 meters away, but there is no permanent healthcare facility—only a mobile clinic that visits once a month.

Table xvi. Livestock Numbers in Oluwaya Village

Type	No. of households (45)	Lowest	Highest	Average	Estimate
Cattle	40	10	200	105	4,200
Goats	35	60	250	155	5,425
Donkeys	30	2	12	7	210

Regarding disease prevalence, the community reported malaria as the most common illness despite an annual spraying program by the government's Ministry of Health. Scabies, a contagious skin condition, and diarrhoeal diseases—particularly among children and the elderly—were also reported to occur frequently. These illnesses, particularly scabies and diarrhoea are highly linked to poor water quality, water sources and sanitation services.

The proposed upgrades aim to provide a reliable source of water and alleviate the challenges posed by limited freshwater resources.

Figure 5-10: Detailed Well infrastructure- Oluwaya village

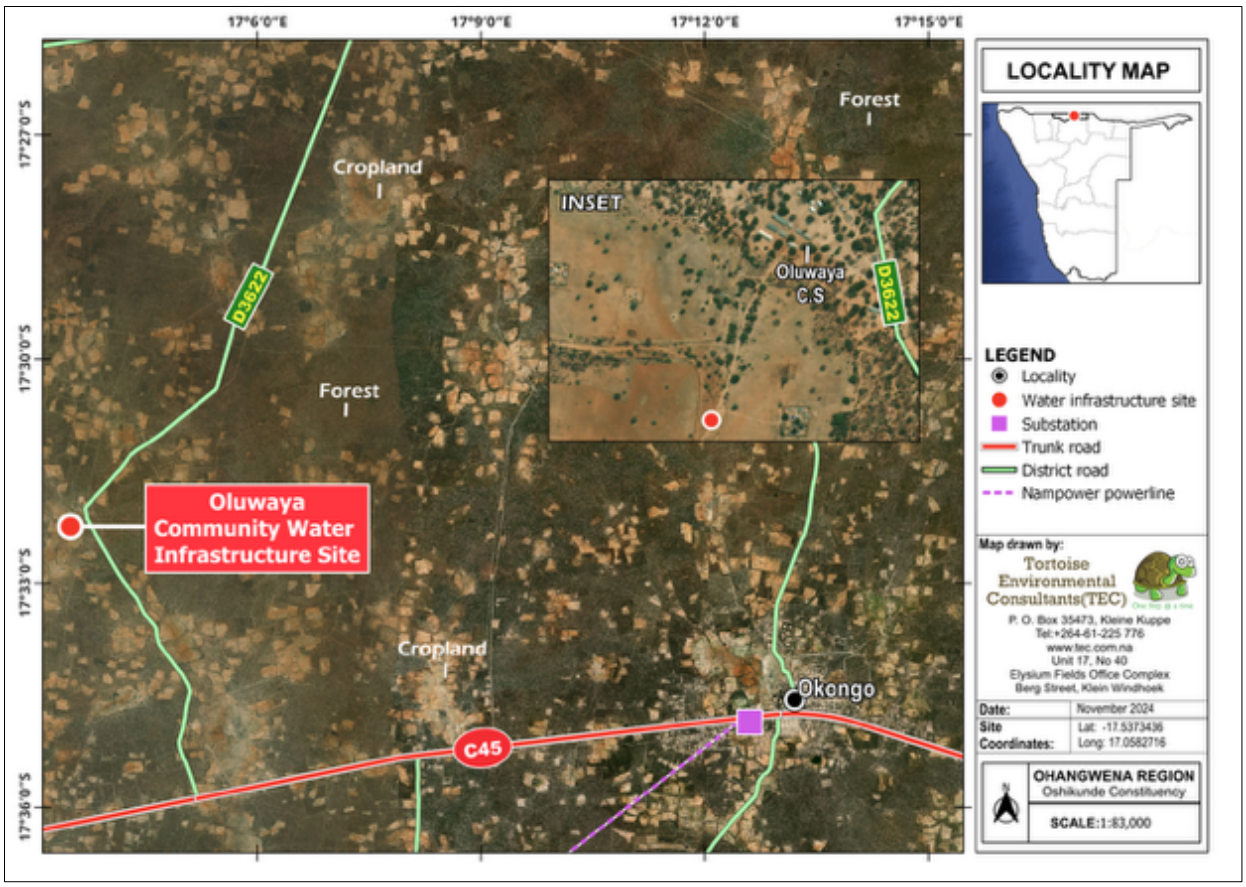


Figure 5-11: Locality map of Oluwaya waterpoint

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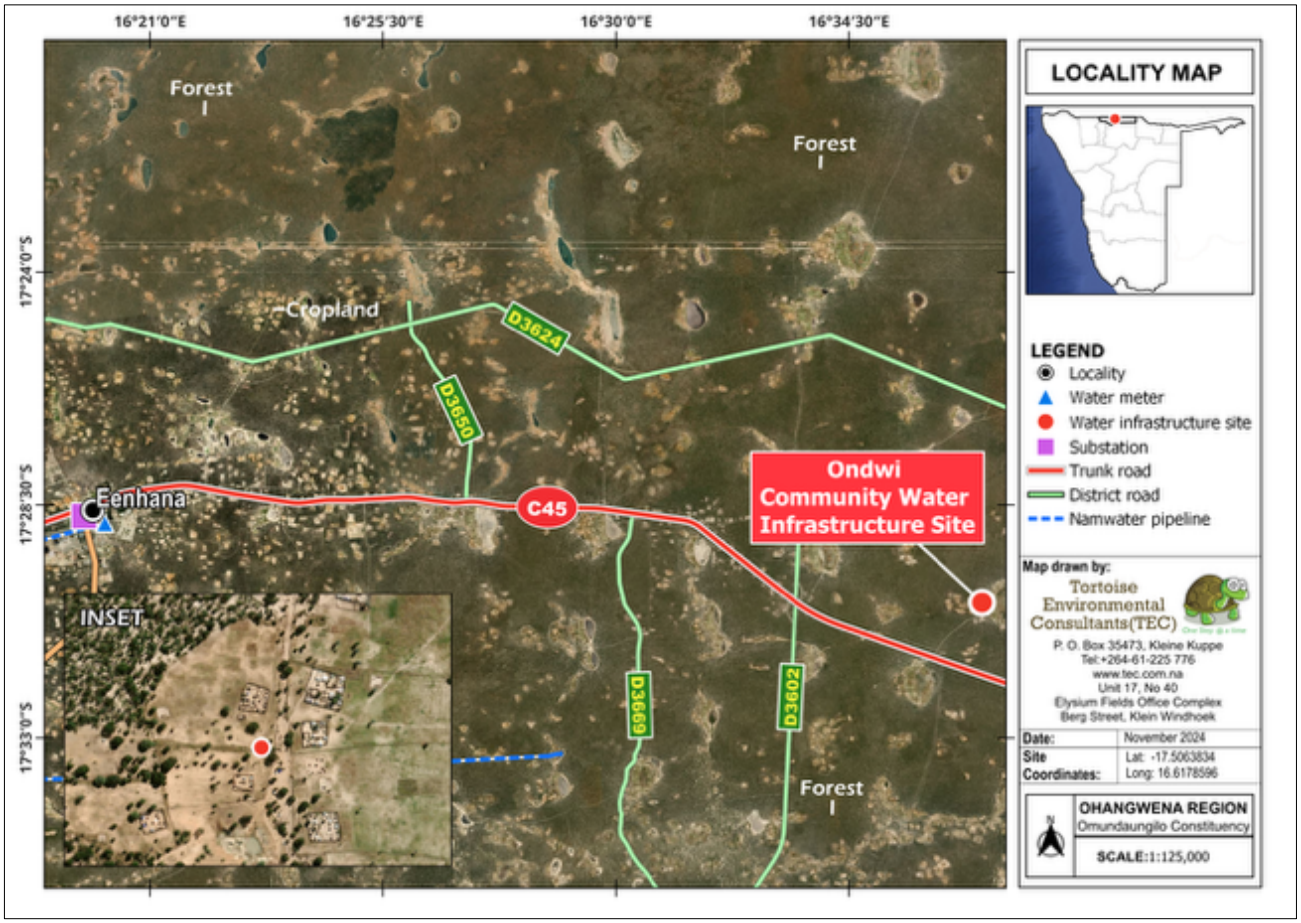

Figure 5-12: Locality map of Opepela / Ondwi waterpoint

b. Water (rainwater and/or flood water) harvesting

This intervention aims to construct rainwater harvesting earth ponds in three villages within the Omusati and Oshikoto regions. These ponds will capture and store rainwater during the rainy season, providing a reliable water source during the dry months. By doing so, the intervention seeks to reduce reliance on inconsistent water supplies, thereby enhancing water security for both household consumption and livestock.

In addition to constructing new ponds, the project will rehabilitate existing floodwater harvesting ponds to address issues such as siltation, contamination, and safety risks while improving overall water reliability (see Appendix 2). Rehabilitation efforts will include mechanical desilting, secure fencing, relocation of water access points, installation of off-pond livestock troughs, and the integration of Nature-Based Solutions like vegetative buffers.

At Ombundamuti, where many individual shallow wells currently exist, the project will convert these into a shared communal water system. This will require the establishment of governance models to manage ownership and access effectively. However, the project also faces several social, environmental, and safety risks, including potential environmental

disturbance during excavation, drowning hazards, labour safety issues, and community tensions over ownership of water resources.

To mitigate these risks, the intervention will implement various measures such as fencing, creating safe access points, installing signage, forming voluntary labour agreements, providing personal protective equipment (PPE), conducting sensitization campaigns, and developing cooperative management frameworks to promote equity and sustainability.

Agriculture, particularly subsistence farming involving livestock and crops, serves as the backbone of rural livelihoods in Northern Namibia. The water stored in the rainwater harvesting ponds will allow for improved farming techniques, such as irrigation during dry seasons, thereby enhancing crop yields and promoting food security. Additionally, increased access to water will support various economic activities, including brickmaking and gardening, ultimately creating income-generating opportunities, especially for the youth in the villages.

c. Aquaculture Feasibility Assessment

Small-scale aquaculture was initially considered during project design as a potential complementary opportunity in villages, where rainwater harvesting ponds could theoretically retain sufficient water to support fish production. However, comprehensive field assessments conducted during the ESIA revealed that water scarcity is the prevailing and most critical challenge across the project landscape. The existing and planned rainwater harvesting infrastructure is essential for meeting basic water needs; domestic consumption and livestock watering particularly during the extended dry season when water sources are severely constrained.

Key findings from the feasibility assessment include:

- Current water availability in existing and planned ponds is insufficient to reliably support aquaculture operations throughout the year
- Prolonged dry seasons result in water levels that are inadequate for maintaining viable fish populations
- Priority community needs centre on securing dependable water supplies for drinking and livestock rather than diversifying into aquaculture
- The opportunity cost of dedicating limited water resources to fish farming outweighs potential food security benefits given current water scarcity conditions

Given these findings, aquaculture activities are not feasible under current conditions and are therefore not included in the project interventions at this time. This determination also eliminates the risk of introducing invasive alien fish species (Risk 16 from the SESP) as originally identified during project screening. Should water availability conditions significantly improve in the future through climate change adaptation, improved water management, or other interventions, any consideration of aquaculture would require:

- A separate environmental and social screening process - Updated feasibility and impact assessments
- Specific management protocols to prevent introduction of invasive alien species
- Exclusive use of indigenous and/or scientifically verified non-invasive fish species

- Community consultation and Free, Prior and Informed Consent (FPIC) where applicable

i. Onamatende

The proposed rainwater harvesting earth pond (Figure 5-13) is set to be constructed at Onamatende village, located in the Okankolo Constituency of the Oshikoto Region. The site lies at the geographic coordinates of latitude -17.974383 and longitude 16.813371 (Figure 5-14).

Onamatende village sustains itself primarily through a mix of livestock and crop farming, with millet, sorghum, and beans being the main food staples. The community also depends on forest-based livelihoods. Women engage in traditional pottery and berry harvesting, while the youth often take up woodworking. Construction poles sourced from the nearby Hapi forest further support household construction needs. Despite this rich livelihood base, the village faces persistent water challenges. Current sources include a slightly saline deep well and a seasonal depression, both of which prove unreliable, particularly during the prolonged dry season.

Figure 5-13: Proposed site for rainwater Harvesting Pond in Onamatende village

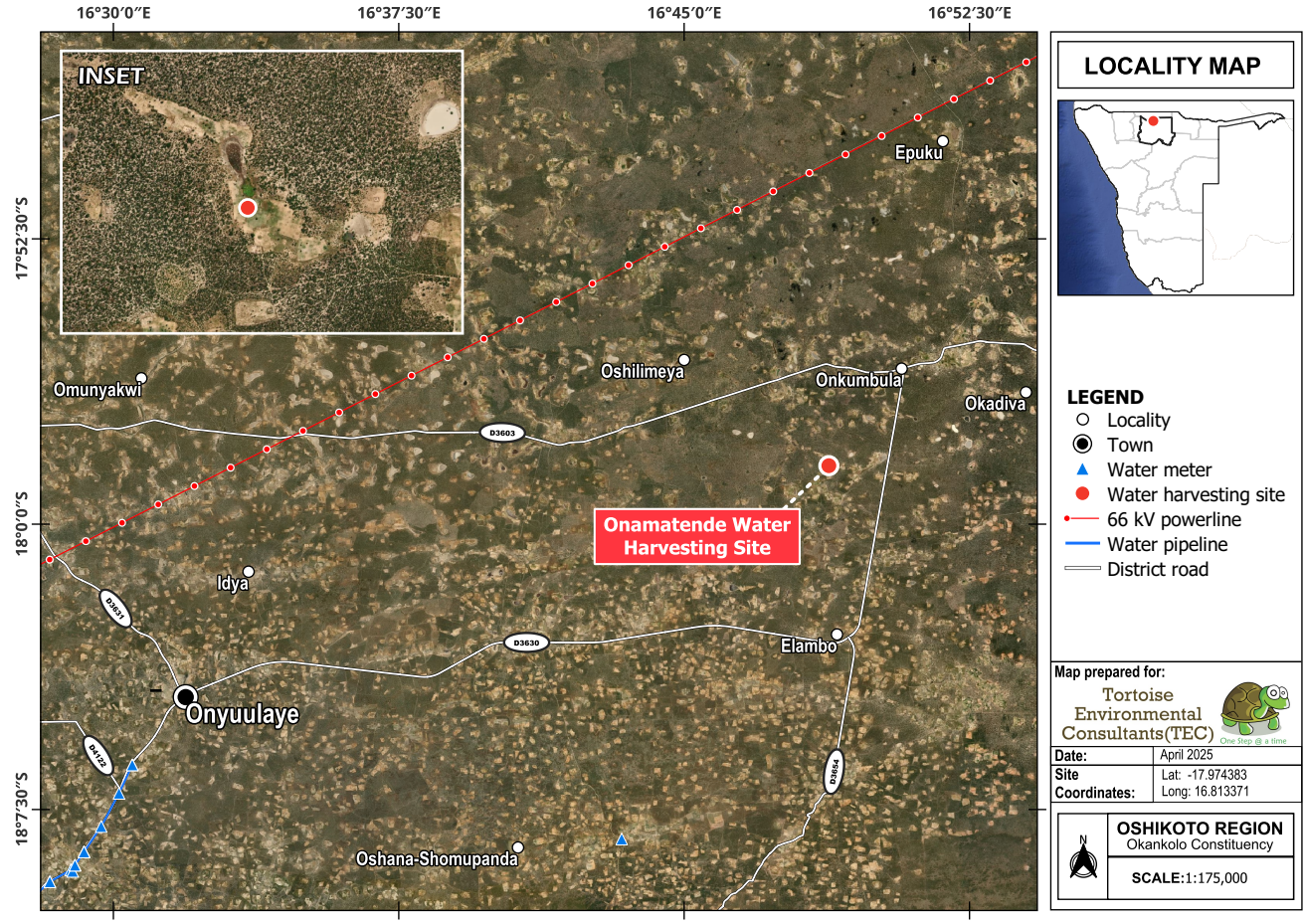

Figure 5-14: Locality map of proposed rainwater harvesting earth ponds in Onamatende

ii. Oshuudhi / Ombundanti

For the village of Ombundanti the project proposes to construct a rainwater harvesting earth pond (Figure 5-15). Oshuudhi/Ombundanti village is located at -17.5545631 latitude and 15.2242317 Longitude in Anamulenge constituency in Omusati region (see Figure 5-16).

In the communities, potable water is supplied by NamWater; however, during the dry season, this water is often used for livestock, which can be costly. To cope with this challenge, many households relocate their livestock to remote cattle posts during the peak dry periods. This arrangement necessitates that some men stay away from their families for extended periods, leading to family separation and increased financial burdens. Households must provide food and supplies for both their homes and the cattle posts.

In response to these challenges, the villages have requested the construction of a rainwater harvesting pond. This initiative aims to help manage seasonal flooding (Figure 5-15) and provide an additional water source for the community.

Figure 5-15: Proposed rainwater harvesting earth ponds Site – Oshuudhi / Ombundanti

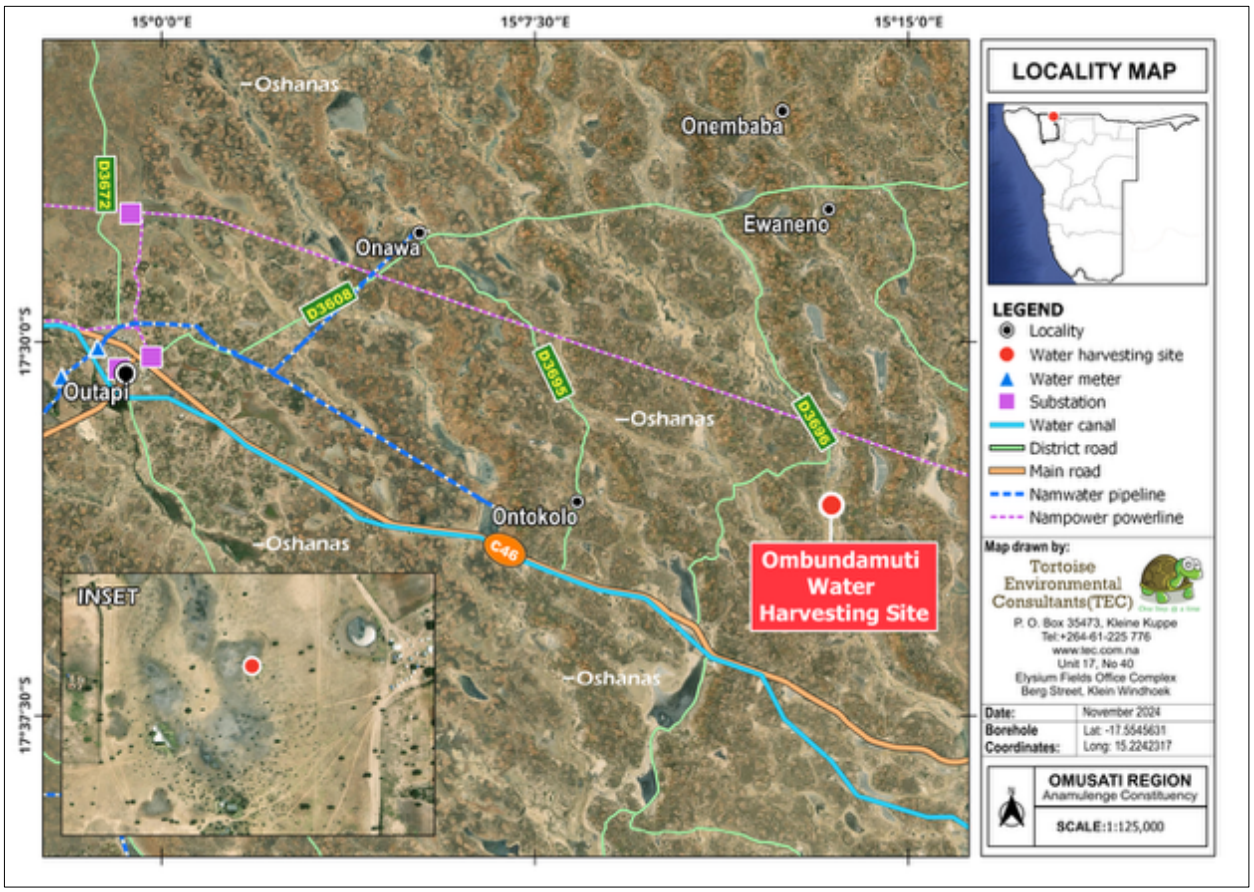

Figure 5-16: Locality map of proposed rainwater harvesting earth ponds in Ombundanti

iii. Olupumbu

Olupumbu is a rural village situated in the Oshikuku Constituency of Omusati Region, where a new rainwater harvesting earth pond is proposed for construction. The village,

located at latitude -17.7504598 and longitude 15.4192767 (Figure 5-17), comprises approximately 60 households with an estimated population of around 6,000 people. Household sizes range between 7 and 20 individuals, averaging about 15 per household (Table xvii). The community includes an estimated 40 women-headed households and seven child-headed households, with no marginalized groups reported.

Table xvii. Olupumbu Village Demographics, 2024

Aspect	Information
Number of households	60 homesteads / households
Household size - range	7 to 20 people (est.)
Average household size	15 people
Estimated community size	6000 people
Child-headed households	7 (est.)
Women headed households	40 (est.)
Persons of indigenous [3]Descent	None

Livestock farming is a central part of livelihoods in Olupumbu. Of the 60 households, 45 keep cattle, with herd sizes ranging from 20 to 50 head per household, averaging 35 cattle, giving an overall estimated cattle population of 1,575. Goat rearing is even more common, with 55 households owning between 60 and 120 goats each, averaging 90, resulting in approximately 4,950 goats in the village. Sheep are not kept in this area, but donkeys are widely used for transport and farming, with 55 households keeping between 2 and 8 animals each, averaging 5 per household, which totals around 275 donkeys (Table xviii).

Table xviii. Livestock Numbers in Olupumbu Village, 2024

Type	No. of households (60)	Lowest	Highest	Average	Estimate
Cattle	45	20	50	35	1,575
Goats	55	60	120	90	4,950
Sheep	0	0	0	0	0
Donkeys	55	2	8	5	275

Residents have access to a nearby school just 300 meters from the village, while healthcare is provided via a mobile clinic. However, access to the clinic becomes difficult during the rainy season, particularly when water channels are full. Health challenges in the area include persistent malaria, despite annual indoor residual spraying campaigns. Scabies is also commonly reported. To support animal health, the government provides annual vaccinations and emergency veterinary responses when disease outbreaks occur.

[3] **Indigenous peoples** are distinct cultural groups who self-identify as indigenous, maintain collective attachment to ancestral lands and natural resources, and preserve unique social, cultural, economic, and political traditions that differ from dominant societies.

The community currently relies on an old rainwater harvesting pond built in 1970. However, the pond has become heavily silted and now holds minimal water, making its rehabilitation essential. Although a potable water supply exists in the village, the cost of this water deters residents from using it for their livestock. As a result, during the dry season, many villagers either drive their cattle to NamWater canals, which are fed by the Kunene River and lie up to 10 km away, or relocate their animals to distant cattle posts until conditions improve.

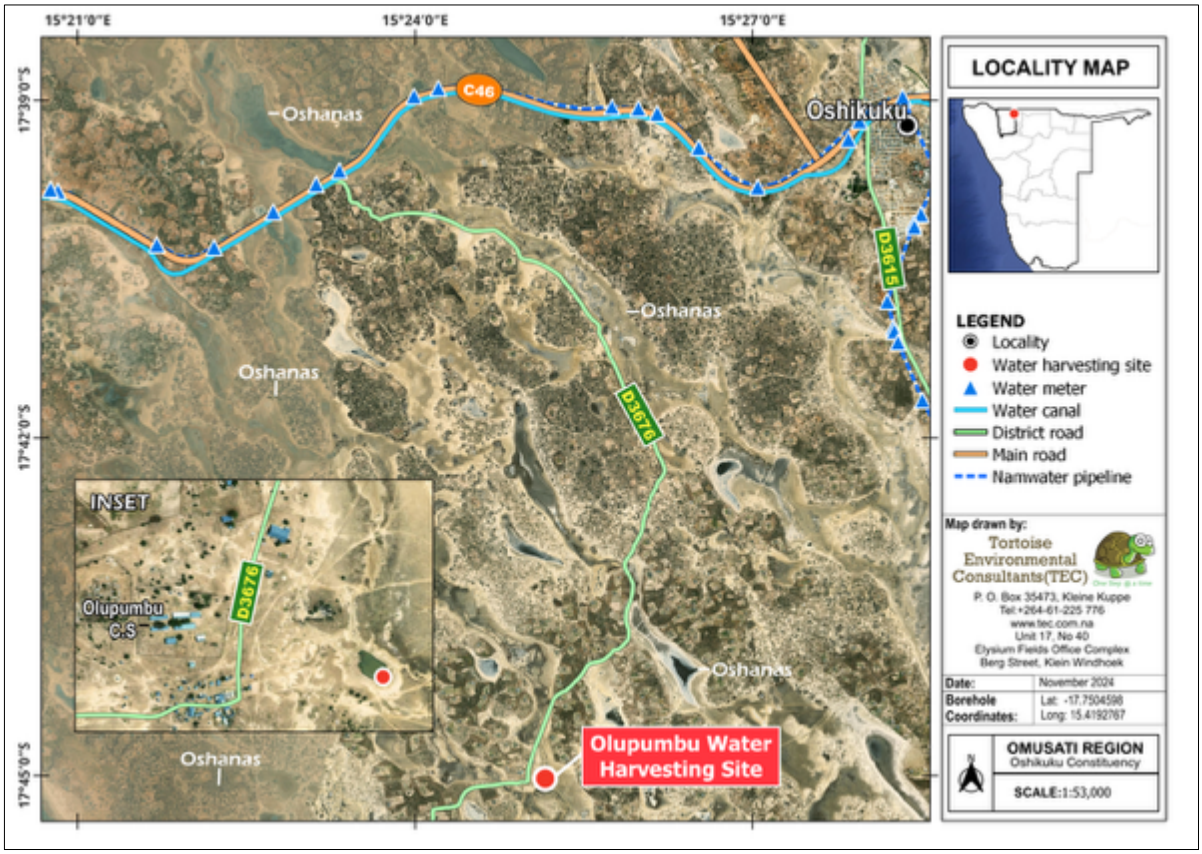

Figure 5-17: Locality map of proposed rainwater harvesting earth ponds site in Olupumbu

d. Piloting of Flood early warning systems for communities

The implementation of a flood early warning system in Shanalumono, Ohaingu Village in Ohangwena, and Shapoko, Omambuumbu Village in the Omusati region is essential to mitigate the recurring and severe impacts of flooding along the two streams. This intervention involves the rehabilitation of existing hydrometric stations in flood-prone areas, which will include the installation of secure hardened steel enclosures, vandal-proof solar systems, protected probes, and stable foundations (see Appendix 2).

The Department of Water's Hydrology Unit will lead the implementation, utilizing limited community labour for minor tasks. The risks associated with the system are low, and mitigation measures will focus on minimizing disturbances during installation. These measures will also aim to prevent vandalism through community sensitization and government branding, while adhering to standard safety protocols for workers.

The strategy for early flood warnings will be multi-channel, incorporating radio, WhatsApp, SMS, sirens, and trained Flood Marshals. This approach is designed to provide timely, inclusive, and accessible alerts for various community groups, ensuring that the effects of flooding on many villages and constituencies are significantly reduced. Overall, the goal of the flood early warning systems is to enhance community resilience against flooding events, specifically through:

- Improved preparedness within the community
- Timely evacuation, which reduces loss of lives and avoids people getting trapped in the flood.
- Access to healthcare facilities and other services during floods.
- Enhanced flood data collection supports sustainable water and land use planning.
- Controlled flooding strategies can help mitigate soil erosion and loss of fertile agricultural land.

- **Past Flood Experiences**

Estimates on the extent of flooding are available for 68 of the past 81 years (Atlas of Namibia Team, 2022). Of these, 23 years (34%) experienced no significant water flows, 14 years (21%) had minor flows, 20 years (29%) saw moderate flows, and 11 years (16%) recorded major flows (Atlas of Namibia Team, 2022). On average, *omafundja* categorised as medium or major flows occurred nearly every other year, with major floods happening approximately every six years.

The Frequency and severity of flooding in the Cuvelai from 1941 to 2021 is illustrated in Figure 5-18 below.

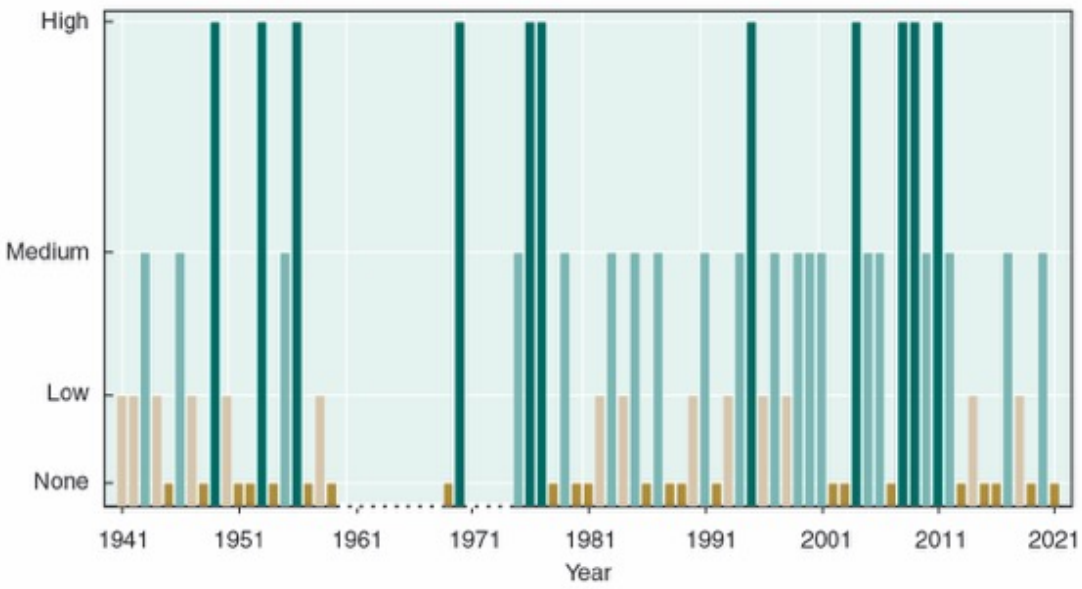

Figure 5-18: Frequency and severity of flooding in the Cuvelai between 1941 and 2021 (Atlas of Namibia Team, 2022)

In January 2023, heavy rains fell in the southeastern parts of Angola and northeastern Namibia, particularly in the Cuvelai catchment, leading to widespread flooding in Ondjiva and nearby areas (IFRC, 2023). The first floodwaters were recorded in some of the eastern-flowing Cuvelai Iishanas (river plains). The hydrological recording station at Shanalumono, located approximately 10 km southwest of Oshikango reported floodwaters reaching the central Cuvelai Iishanas (IFRC, 2023).

- **Impacts of the 2023 Flood**

After heavy rains, a significant portion of the Cuvelai transforms into an extensive wetland. These flooding events, known as 'omafundja,' bring large amounts of fish to the southern parts of the basin. However, they can also have destructive impacts, such as damaging infrastructure, destroying crops, and even causing loss of life through drownings.

The 2023 floods in the Oshana and Ohangwena regions have severely impacted 2,190, with 582 individuals (111 households) completely displaced as their homes were submerged, and 1,608 people (327 households) partially affected (IFRC, 2023). Families were forced to evacuate, **schools were disrupted,** and **critical infrastructure, including clinics, became inaccessible** (IFRC, 2023).

In some schools, learners had to camp on-site because rising water made daily travel impossible. Additionally, three clinics in the Ohangwena region were cut off, leaving communities without essential healthcare access.

While the government and the Namibia Red Cross (NRC) provided initial support, the scale of the disaster overwhelmed resources, prompting regional councils to formally request additional assistance (IFRC, 2023). Despite a DREF being approved to aid affected households, many areas remained inaccessible, and some people were still in evacuation centres (IFRC, 2023). Figure 5-19 and Figure 5-20 below illustrate the overall impacts of floods on livelihoods:

Figure 5-19: Example of a Submerged House – 2011 Flood (MECC, 2019)

Figure 5-20: Children Crossing Flooded Oshanas to and from School (MECC, 2019)

i. Oshanalumono

The flood early warning system is situated in Ohaingu Village, within the Engela Constituency of the Ohangwena Region, specifically at the Oshana – Oshanalumono site (see Figure 5-21). This location, with GPS coordinates of latitude -17.4485077 and longitude 15.7624978 (Figure 5-23), plays a critical role in monitoring flood conditions in the area.

Figure 5-21: Water Level Measuring Scale at A Road Culvert in Oshanalumono (TEC, 2024)

However, the existing infrastructure at this site is currently in a state of disrepair. Years of poor maintenance have rendered the system non-functional, with outdated technology and a weak communication network significantly limiting its effectiveness. Notably, the data collected from the system is only accessible to a team based in Windhoek, restricting its usefulness for local-level response. One of the visible components of this system is a

simple water level measuring scale (see Figure 5-21**Error! Reference source not found.**), which is a basic yet essential tool for visually monitoring and recording water levels. Despite its simplicity, such a device remains a fundamental part of hydrological monitoring, particularly in climate adaptation projects like this one.

The hydrological recording station below **(**Figure 5-22**)** measures, records data over time. It is crucial for monitoring water resources, assessing climate risks, managing floods and droughts, and planning infrastructure such as dams.

Figure 5-22: Hydrological Recording Station at Shanalumono (Source: TEC, 2024)

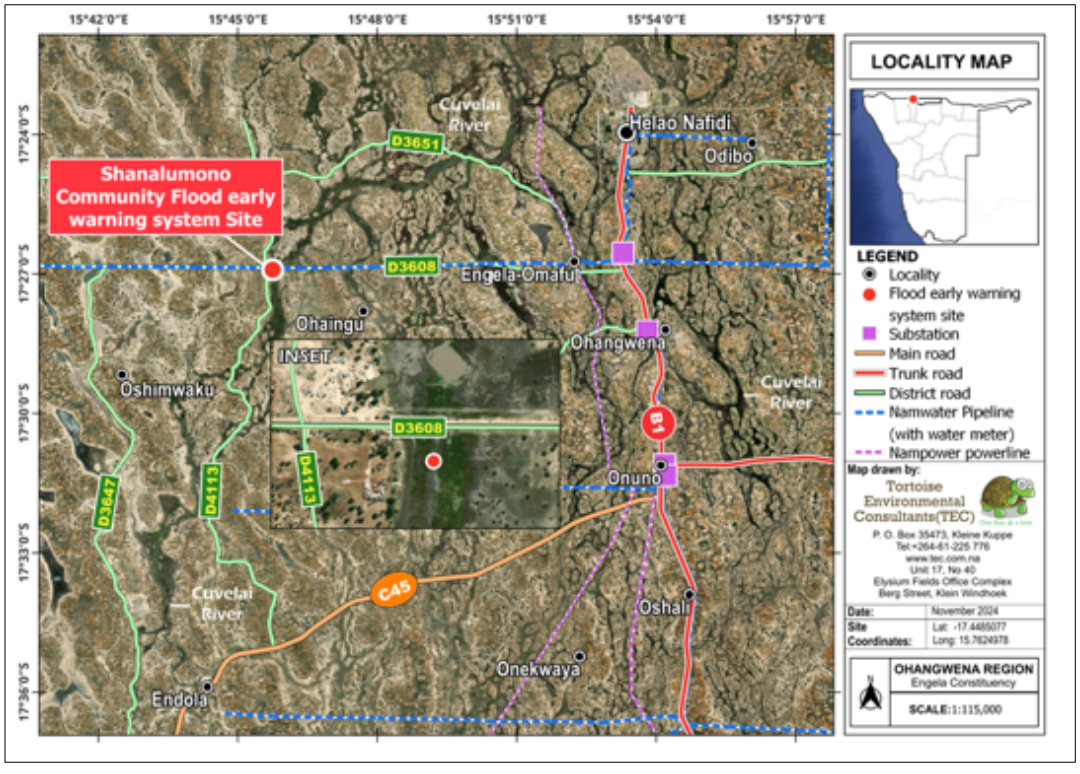

Figure 5-23: Locality Map of the Oshanalumono Flood Early Warning System

ii. Shapoko

The flood early warning system is situated in the Oshana area of Shapoko Village, within Anamulenge Constituency in the Omusati Region. This system, located at latitude -17.456672 and longitude 15.174479, was originally established to help monitor and respond to potential flooding events in the area (see Figure 5-25).

However, the existing infrastructure is currently in a state of disrepair. As shown in the system Figure 5-24 has not been adequately maintained over time, rendering it non-functional. The technology used is outdated, and the communication mechanisms are significantly deficient, limiting the system's effectiveness in delivering timely alerts and ensuring community preparedness.

Figure 5-24: Existing Flood Early Warning Systems (Source: TE, 2024)

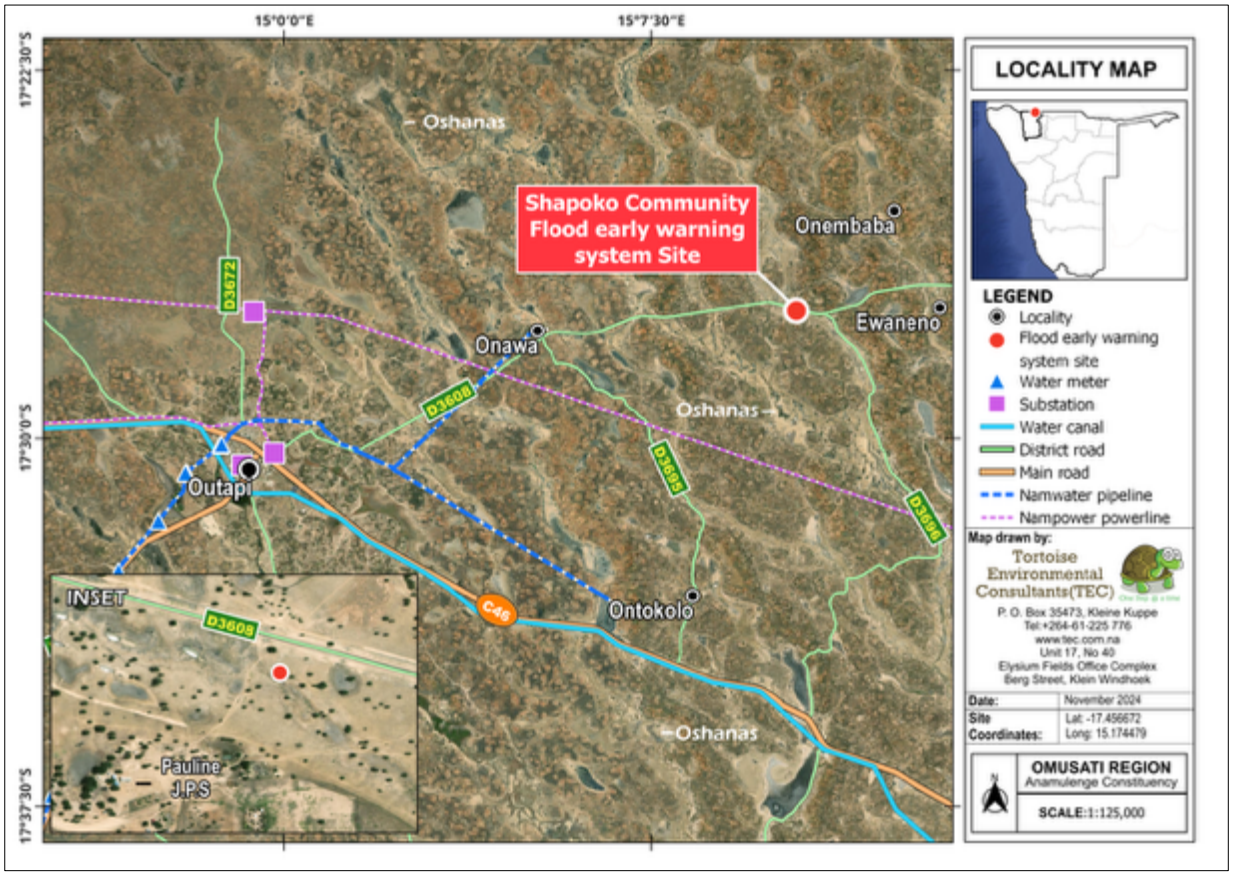

Figure 5-25: Locality Map of the Shapoko Flood Early Warning System

6 Impact assessment methodology

a. ESIA Methodology

The methodology applied to this ESIA study has been developed using the Namibian Draft Procedures and Guidance for EIA and EMP (Republic of Namibia, 2008); international and national best practices; and over 20 years of combined EIA experience. The method of each step in the ESIA process is described in the next sections.

This approach involved a comprehensive review of existing environmental and socio-economic data, complemented by field visits to selected pilot sites. Consultations were held with local communities, traditional authorities, and regional and local government officials. These consultations included public meetings, focus group discussions, and key informant interviews to ensure that both community-level concerns and institutional perspectives were effectively captured. Subsequently, impact screening was performed using checklists and matrices to systematically identify potential impacts, including cumulative and transboundary effects.

I. Scope of Assessment

The Scoping Process is a fundamental stage in the ESIA process. Through a high-level assessment, the likely effects and severity of effects as a result of the development and operations of a proposed project can be identified. Any likely significant effects are taken forward for further assessment (detailed ESIA). This stage is important in the ESIA process to enable the assessment to be concise and focus on key issues that are central to efficient decision-making.

If no likely significant effects are anticipated, a detailed ESIA is not undertaken and a Scoping Report detailing the high-level assessment is submitted as part of the ECC application.

As there was uncertainty around the potential effects and their severity, a scoping process was undertaken for the proposed development. The Draft Procedures and Guideline for Environmental Impact Assessment (ESIA) and Environmental Management Plan (ESMP) (Ministry of Environment and Tourism, 2008) were followed to undertake the scoping stage.

The baseline environment that could be affected by the project was reviewed and potential effects on receptors identified. Receptors under the following aspects were considered (Ministry of Environment and Tourism, 2008). Table xix below shows a dual compliance matrix of the receptors in both the EMA and UNDP SES.

Table xix: Environmental and Social Receptors in alignment with EMA Requirements and UNDP SES

Receptor	Relevant EMA Component	Relevant UNDP SES Standard(s)
Geology and soils	Biophysical environment – Soils & Geology	Standard 1: Biodiversity Conservation and Sustainable Natural Resource Management
Topography	Biophysical setting and physical terrain	Standard 1: Biodiversity Conservation and Sustainable Natural Resource Management
Groundwater and surface water	Hydrology and water resource impact assessment	Standard 1: Biodiversity Conservation and Sustainable Natural Resource Management Standard 8: Pollution Prevention and Resource Efficiency
Environmentally sensitive areas	Ecologically sensitive/critical habitats	Standard 1: Biodiversity Conservation and Sustainable Natural Resource Management
Air quality	Air quality baseline and emissions analysis	Standard 8: Pollution Prevention and Resource Efficiency
Sound levels	Noise and vibration assessment	Standard 8: Pollution Prevention and Resource Efficiency
Socio-economics	Social baseline and impact analysis	Standard 5: Displacement and Resettlement
Infrastructure services	Services and utilities impact assessment	Standard 2: Climate Change and Disaster Risks Standard 3: Community Health, Safety and Security
Project Economics	Economic baseline	Standard 7: Labour and Working Conditions

Embedded mitigation and industry best practice measures were considered in the conclusion drawn, identifying those effects that needed to be assessed further due to the potential severity and significance.

II. Detailed Impact Assessment

A detailed Impact Assessment was conducted based on the three interventions on the Namibian side, namely, the improvement of water sources (e.g. mechanizing wells or installing solar-powered boreholes), installation of early warning equipment, and construction of rainwater harvesting ponds. Then, potential significant impacts were identified through the scoping process.

III. Impact Assessment Criteria

Score	Rating	Social and environmental impacts
5	Extreme	Significant adverse impacts on human populations and/or environment. Adverse impacts of large-scale magnitude and/or spatial extent (e.g. large geographic area, large number of people, transboundary impacts, cumulative impacts) and duration (e.g. long-term, permanent and/or irreversible); areas adversely impacted include areas of high value and sensitivity (e.g. valuable ecosystems, critical habitats); adverse impacts to rights, lands, resources and territories of indigenous peoples; involve significant levels of displacement or resettlement; generates significant quantities of greenhouse gas emissions; impacts may give rise to significant social conflict
4	Extensive	Adverse impacts on people and/or environment of considerable magnitude, spatial extent and duration, but more limited than Extreme (e.g. more predictable, mostly temporary, reversible). *Impacts of projects that may affect the human rights, lands, natural resources, territories, and traditional livelihoods of indigenous peoples are to be considered at a minimum potentially Extensive*[15]
3	Intermediate	Impacts of medium magnitude, limited in scale (site-specific) and duration (temporary), can be avoided, managed and/or mitigated with relatively uncomplicated accepted measures
2	Minor	Very minor impacts in terms of severity and magnitude (e.g. small affected area, very low number of people affected) and duration (short), may be easily avoided, managed, mitigated
1	Negligible	Negligible or no adverse impacts on communities, individuals, and/or environment

Table 3. Rating the 'Likelihood' of a Risk

Score	Rating
5	Expected
4	Very likely
3	Moderately likely
2	Low likelihood
1	Not likely

Table 4. Determining 'Significance' of Risk

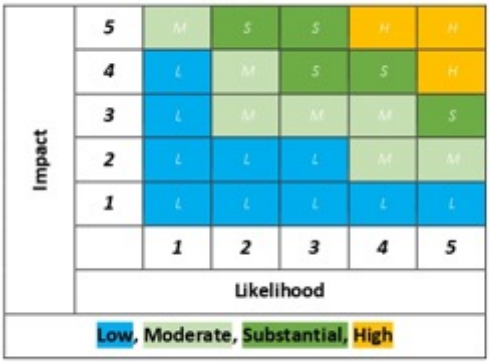

Figure 6-1: UNDP impact assessment matrix

Risk categories proposed by UNDP SES:

Low Risk: Projects that include activities with minimal or no adverse social or environmental risks and/or impacts. However, the SES Programming Principles and stakeholder engagement requirements still apply to project activities.

Moderate Risk: Projects that include activities with potential adverse social and environmental risks and impacts that are few in number, limited in scale, largely reversible and can be identified with a reasonable degree of certainty and readily addressed through application of recognized good international practice, mitigation measures and stakeholder engagement during project implementation. Moderate Risk

projects range from those with very few, well-understood social and environmental risks and impacts to those where the full extent of the limited impacts is unclear and further assessment and management planning is required.

Substantial Risk: Projects that include activities with potential adverse social and environmental risks and impacts that are more varied or complex than those of Moderate Risk projects but remain limited in scale and are of lesser magnitude than those of High Risk projects (e.g. reversible, predictable, smaller footprint, less risk of cumulative impacts). Substantial Risk projects include individual risks rated as "Substantial". Substantial Risk projects may also include those with a varied range of risks rated as "Moderate" that require more extensive assessment and management measures. While the type of assessment methodology for Substantial Risk projects will vary depending on the nature of the risks and type of project, generally a scoped, fit-for-purpose Environmental and Social Impact Assessment (ESIA) would be needed to analyze the range and interactions of potential risks and impacts. Similarly, for Substantial Risk projects that promote plans and policy reforms that may lead to adverse social and environmental risks and impacts, a scoped Strategic Environmental and Social Assessments may be required.

High Risk: Projects that include activities with potential significant adverse social and environmental risks and impacts that are irreversible, unprecedented, and/or which raise significant concerns among potentially affected communities and individuals as expressed during the stakeholder engagement process. High Risk activities may involve significant adverse impacts on physical, biological, socioeconomic, or cultural resources. High Risk projects may have the potential to aggravate existing situations of fragility or conflict, adversely affect human rights and/or lead to extensive environmental degradation. Comprehensive forms of assessment and management plans are required.

Based on the impact assessment results (Tables I–IV), including individual risks rated as 'Substantial', the overall UNDP SES risk classification for the pilot interventions is Substantial.

b. Assessment of Cumulative Impacts

In accordance with Namibia's Environmental Assessment Policy, which emphasizes the need to consider cumulative environmental impacts in all assessment processes, this section builds upon the preliminary cumulative impact assessment conducted during the scoping phase. Cumulative impacts refer to the combined effects of multiple activities, whether from the proposed project alone or in conjunction with existing or planned developments on the same environmental or social receptors. Even if individual impacts appear minor, their collective effect can lead to significant outcomes, particularly for sensitive receptors.

For the CUVKUN project, several cumulative impact pathways have been identified. For instance, the proposed rainwater harvesting ponds could collectively impact local

hydrology when combined with adjacent agricultural water abstraction activities, potentially resulting in altered drainage patterns or fluctuations in the water table. This concern is heightened in areas where traditional floodplains are being modified for water storage or farming, leading to increased risks of sedimentation and erosion downstream.

From a social perspective, introducing multiple externally supported interventions without organized community consultation processes may foster inter-village tensions or perceptions of unequal development benefits. For example, if one village receives a flood early warning system while a neighbouring village benefits from borehole upgrades without clear communication of the project's criteria, this could lead to competition or dissatisfaction, exacerbating latent conflict risks.

Environmental receptors, such as local biodiversity and vegetation cover, may also face compounded pressure. Increased foot traffic, excavation, and machinery use across multiple projects could lead to vegetation degradation and habitat fragmentation, especially in areas designated for earth dam rehabilitation or pipeline trenching.

To mitigate these risks, the Environmental and Social Impact Assessment (ESIA) recommends implementing an integrated project coordination mechanism. This should involve regular information-sharing with regional and local authorities, other development partners, and affected communities. Conducting spatial mapping of all ongoing and planned interventions is essential to avoid overlaps and ensure complementary actions. Additionally, cumulative impact monitoring indicators should be incorporated into the Environmental and Social Management Plan (ESMP), with responsibilities clearly defined among stakeholders.

7 Environmental and social impact assessment

The Environmental and Social Impact assessment was done in alignment with UNDP's Social and Environmental Standards (SES). This section identifies the potential impacts at each phase of development, that is, design/preconstruction, construction, operation and decommissioning phases of the project. These impacts are fully discussed in the UNDP impact assessment matrix (Figure 5-1). In the matrix, the **likelihood of occurrence** is rated on a scale from 1 to 5, where 1 = Not Likely, 2 = Low, 3 = Low-Moderate, 4 = Very Likely, and 5 = Expected. The **magnitude of impacts** is similarly rated from 1 to 5, with 1 = Negligible, 2 = Minor, 3 = Intermediate, 4 = Extensive, and 5 = Extreme. Finally, the **overall risk significance** is assessed on a scale of 1 to 4, where 1 = Low, 2 = Moderate, 3 = Substantial, and 4 = High. Tables I-IV present the project potential impacts during the four phases of Preconstruction, construction, operation and decommissioning.

I. Design/ Preconstruction Phase

Task/Activity	Anticipated Risk	Likelihood	Impact	Significance level
Site selection for water points	Unequal access, ownership conflicts	2	2	Low
Planning mechanized wells / solar boreholes	High labour intensity if inappropriate tech selected	2	2	Low
Rainwater/floodwater ponds design	Siltation if ponds poorly designed	2	2	Low
Early warning system design	Limited coverage or exclusion of vulnerable groups	2	2	Low

II. Construction Phase

Task/Activity	Anticipated Risk	Likelihood	Impact	Significance level
Clearing of vegetation, soil erosion, and accidental spills of fuel or chemicals during construction	Habitat destruction, water contamination, long-term land degradation	3	3	Moderate
Installation of wells / solar boreholes	Temporary disruption of water access	3	3	Moderate
Training and engagement of local labour	Fatigue or minor injuries	3	3	Moderate

Pond excavation and construction	Soil erosion, temporary mosquito breeding	3	5	Substantial
Installation of early warning infrastructure	Minor disturbance to community; vandalism risk begins	3	3	Moderate
Increased dust and noise levels due to construction activities	Community disturbance, respiratory issues, complaints	3	3	Moderate
Worker-community interactions	Risk of Sexual Exploitation, Abuse, and Harassment (SEAH); conflicts over access and allocation	2	4	Moderate
Well rehabilitation works (lining, desilting, deepening)	Risk of well collapse, fall hazards, confined space risks, flooding during rains	3	4	Moderate
Installation of fencing and well covers	Injury risk during manual handling; potential exclusion conflicts if access not managed	2	3	Moderate
Construction of livestock troughs and hard standing	Soil erosion and ponding if poorly built; safety hazards from livestock near works	2	3	Moderate
Construction and rehabilitation activities	Construction waste, such as rubble and the handling of old parts	2	2	Low
Installation of drainage, collars, and elevated structures	Floodwater backwash and silt entry if poorly constructed; worker safety risks	2	4	Moderate

III. Operation Phase

Task/Activity	**Anticipated Risk**	**Likelihood**	**Impact**	**Significance level**
Routine maintenance and local operation	Theft/vandalism of solar panels; disputes over cost-sharing	2	2	Low
Operation of ponds	Malaria risk	2	2	Low

Operation of mechanized boreholes	Over-abstraction of groundwater; equipment failure; inequitable access	2	3	Moderate
Household and small-scale farming use of water	Increased water demand; risk of unsustainable usage	2	3	Moderate
Water Pollution	aquaculture was found not feasible due to persistent water scarcity. Priority remains water security for domestic and livestock use; hence, risks of water pollution and invasive species are not applicable to current interventions.	1	1	Low
Air quality	Dust and emissions from maintenance vehicles and activities	2	2	Low
Solar pumps & pressurized storage	Mechanical failure; reduced water access; risk of exclusion of vulnerable groups	2	3	Moderate
Hydrometric stations / early warning systems	Vandalism or equipment failure; gaps in coverage	2	2	Low
Community water governance & committees	Conflicts over access and allocation; inequitable decision-making	2	3	Moderate
Routine maintenance of infrastructure (labour	Minor hazards such as fatigue or injuries	2	2	Low
Increased water demand during dry periods	Pressure on resources; risk of conflict	2	3	Moderate

IV. Decommissioning Phase

Task/Activity	**Anticipated Risk**	**Likelihood**	**Impact**	**Significance level**

Dismantling ponds	Abandoned ponds may cause mosquito habitats or land degradation	4	3	Moderate
Equipment redistribution / solar panels	Conflicts or theft if not managed	4	3	Moderate
Loss of employment for caretakers / operators	Reduced income; community dissatisfaction	2	2	Low
Abandonment of community water committees	Breakdown in local governance structures; potential conflicts	2	2	Low
Removal of pipelines / water infrastructure	Soil disturbance; waste generation; disruption of natural drainage	3	2	Low

Risk analysis

The potential impact assessment across the four project phases indicates that the Design/Preconstruction phase presents relatively low risks. Activities such as site selection, planning of mechanized wells or solar boreholes, pond design, and early warning system design are generally associated with minor impacts, including the risk of unequal access, or exclusion of vulnerable groups. The likelihood and significance of these risks are low, reflecting that careful planning and participatory decision-making can effectively manage potential issues at this stage.

Construction Phase Risks

In contrast, the Construction phase carries a higher concentration of moderate risks, particularly related to environmental and community disturbances. During the construction phase, risks are primarily associated with physical hazards, environmental disturbance, and social considerations. Vegetation clearing, soil erosion, pond excavation, and installation of infrastructure can lead to habitat loss, water contamination, dust, noise, and minor injuries.. For the well interventions, desilting, lining installation, deepening, and fencing activities carry the potential for well collapse, falls into unlined shafts, and injuries from manual excavation, particularly for women, the elderly, and untrained community labour. Contamination from livestock, erosion around wellheads, and siltation from floodwater backwash present environmental risks. Mitigation involves structural reinforcement, fencing, PPE provision, training, supervision by competent personnel, and scheduling works in the dry season. For floodwater harvesting ponds, excavation, desilting, and fencing pose risks of soil instability, accidental drowning, and minor injuries during manual labour, mitigated through secure perimeter fencing, safe access points, and nature-based solutions such as vegetative buffers to reduce silt inflow. Hydrometric station rehabilitation entails minor civil works with risks of vandalism or misuse, addressed via secure enclosures, government-led installation, and pre-installation community awareness. Across all activities, participatory approaches, and clear governance arrangements are critical to manage social and ownership-related risks.

Operation Phase Risks

Similarly, the Operation phase introduces moderate risks largely involving maintenance, equitable access, and public safety. These risks are linked to increased water demand, and potential worker-community interactions, though many routine maintenance and pond operation activities remain low-risk. For the well interventions, over-abstraction, inequitable water distribution, and potential contamination remain concerns, while solar pumps and pressurized storage reduce manual lifting risks. Routine maintenance may involve minor labour hazards, while monitoring and community water committees help ensure sustainable usage. Overall, while many risks are low to moderate and can be managed through the ESMP, the presence of individual risks rated as Substantial results in an overall Substantial UNDP SES risk classification for the project. Floodwater ponds carry risks of mosquito breeding, water contamination, and inequitable access if fences or troughs fail, mitigated through regular maintenance, larval control, and cooperative water governance. Hydrometric stations may face vandalism or equipment failure, but government oversight, trained flood marshals, and multi-channel early warning messaging reduce risks to community safety. Across all operational assets, inclusive management, monitoring, and health and safety measures are central to maintaining functionality and reducing exposure to environmental or social hazards.

Decommissioning Phase Risks

Finally, the Decommissioning phase also exhibits moderate risks, primarily associated with abandoned ponds, equipment redistribution, and soil disturbance, while the potential impacts on governance and livelihoods are low. Other risks are associated with infrastructure removal, redistribution of assets, and continuity of governance. Well and pond decommissioning could create mosquito habitats, soil disturbance, or erosion if structures are abandoned, mitigated through drainage, filling, and site restoration. Equipment redistribution, including solar panels and pumps, may lead to theft or conflicts without transparent plans and community involvement. The withdrawal of caretakers or local operators can cause loss of livelihoods and community dissatisfaction, while abandonment of water committees risks a breakdown in local governance. Proper handover procedures, livelihood support, and training ensure that decommissioning does not compromise community safety, access, or environmental integrity.

Overall, the assessment indicates that most risks are low to moderate; however, a limited number are rated Substantial, resulting in an overall Substantial SES risk classification. The construction and decommissioning phases require the most careful mitigation and monitoring to protect environmental integrity and community well-being.

8 Mitigation

I. Mitigation Measures

For each impact assessed during the scoping phase and detailed assessment, mitigation measures are identified to reduce and/ or avoid negative impacts (Table xx and **Error! Reference source not found.**). These mitigation measures are also incorporated in the ESMP document to ensure that they are implemented throughout the lifespan of the proposed project. The ESMP forms part of the Scoping Report, and upon project approval, the implementation thereof would become a binding requirement.

II. Mitigation Hierarchy

Actions to mitigate a potential impact can be done in as systematic manner as guided by what is referred to as Mitigation Hierarchy (see Figure 33). From the onset, the positive impacts of the proposed project should be **enhanced**, however, where an impact in is inevitable, the following sequence should be followed.

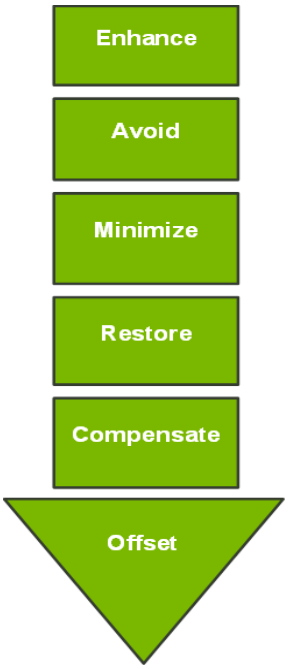

Figure 8-1- Mitigation Hierarchy

Impact avoidance: This step is most effective when applied at an early stage of project conceptualization and planning. It can be achieved by:

- Not undertaking certain projects or elements that could result in adverse impacts;
- Avoiding areas that are environmentally sensitive; and
- Putting in place preventative measures to stop adverse impacts from occurring.

Impact minimisation: This step is usually taken during impact identification and prediction to limit or reduce the degree, extent, magnitude, or duration of adverse impacts. It can be achieved by:

- Scaling down or relocating the proposal;
- Redesigning elements of the project; and
- Taking supplementary measures to manage the impacts.

Impact compensation: This step is usually applied to remedy unavoidable residual adverse impacts. It can be achieved by:

- Rehabilitation of the affected site or environment, for example, by habitat enhancement;
- Restoration of the affected site or environment to its previous state or better; and

- Replacement of the same resource values at another location (off-set), for example, by wetland engineering to provide an equivalent area to that lost to drainage or infill.

Table xx: Project development impacts with Linked Mitigation Measures

I. Design / Preconstruction Phase		
Task/Activity	**Anticipated Risk**	**Mitigation Measures**
Site selection for water points	Unequal access, ownership conflicts	Conduct participatory site selection with community representatives; ensure inclusion of women, youth, and vulnerable groups; establish transparent criteria for site prioritization; formalize agreements with local authorities to prevent disputes.
Planning mechanized wells / solar boreholes	High labour intensity if inappropriate technology selected	Conduct technical feasibility studies to select appropriate technology; evaluate local capacity and maintenance requirements; phase in mechanization gradually; provide preliminary training for local operators.
Rainwater/floodwater ponds design	Siltation if ponds poorly designed	Use hydrological assessments to inform pond design; include sedimentation basins and overflow channels; design for easy maintenance and desilting; consult communities on site placement to minimize erosion.
Early warning system design	Limited coverage or exclusion of vulnerable groups	Map vulnerable groups to ensure equitable coverage; design communication channels accessible to all (SMS, radio, sirens); include community engagement in system planning; provide training and awareness campaigns.
II. Construction Phase		
Task/Activity	**Anticipated Risk**	**Mitigation Measures**
Clearing of vegetation, soil erosion, and accidental spills	Habitat destruction, water contamination, long-term land degradation	Limit vegetation clearance to essential areas; implement erosion control measures (silt fences, sediment traps, vegetative buffers); prepare spill response plans; store fuel and chemicals securely; train staff on handling and emergency response.
Installation of wells / solar boreholes	Temporary disruption of water access; dust/noise	Schedule works to minimize disruption; provide alternative water sources during construction; implement dust suppression measures (watering, covering materials); use noise-reducing equipment where possible.
Training and engagement of local labour	Fatigue or minor injuries	Provide occupational health and safety training; supply protective equipment; enforce work/rest cycles; have first aid and emergency response readily available.

Pond excavation and construction	Soil erosion, temporary mosquito breeding	Stabilize pond embankments and surrounding soil; schedule construction to avoid rainy season if possible; design ponds with drainage and mosquito control features; apply larval control measures. install temporary safety fencing/barriers and warning signs during construction; and permanent fencing with controlled access for operation.
Installation of early warning infrastructure	Minor disturbance to community; vandalism risk begins	Engage community prior to installation; install equipment in secure, tamper-resistant structures; assign local monitoring responsibility; provide awareness on system benefits.
Increased dust and noise levels	Community disturbance, respiratory issues, complaints	Implement dust suppression (water spraying); limit noisy activities to daytime hours; provide PPE to workers; communicate schedule to local communities in advance.
Well rehabilitation works (lining, desilting, deepening)	Risk of well collapse, fall hazards, confined space risks, flooding during rains	Conduct structural assessment before works; use shoring/bracing for stability; train workers on confined space entry; provide harnesses and safety gear; suspend work during heavy rainfall; establish emergency rescue plans.
Installation of fencing and well covers	Injury risk during manual handling; potential exclusion conflicts if access not managed	Provide lifting aids and team handling for heavy materials; train workers on safe manual handling; design fencing with inclusive access points; engage community on access rules prior to completion.
Worker-community interactions	Risk of Sexual Exploitation, Abuse, and Harassment (SEAH); conflicts over access and allocation	Implement worker codes of conduct; conduct SEAH awareness training; establish community grievance mechanisms; ensure strict supervision and reporting protocols.
Engagement of local labour for construction activities	Risk of child labour in construction, manual labour, and material handling	Conduct age verification for all workers before engagement (national ID, birth certificate, or other official documentation) Establish worker registry with age documentation Coordinate with Regional Councils and constituency offices to verify worker registration and unemployment status

Construction of livestock troughs and hard standing	Soil erosion and ponding if poorly built; safety hazards from livestock near works	Compact and stabilize soils; install proper drainage channels; fence construction sites until works are complete; design troughs to reduce overcrowding and trampling.
Construction and rehabilitation activities	Construction waste, such as rubble and the handling of old parts	Segregate waste (metal, rubble, packaging), reuse and recycle materials where possible, dispose of waste at an approved landfill, and keep the site clean and hazard-free.
Installation of drainage, collars, and elevated structures	Floodwater backwash and silt entry if poorly constructed; worker safety risks	Follow engineering specifications; supervise works with qualified technician; use quality materials; train workers on safe installation methods; monitor performance after first rains.
III. Operation Phase		
Task/Activity	**Anticipated Risk**	**Mitigation Measures**
Routine maintenance and local operation	Theft/vandalism of solar panels; disputes over cost-sharing	Install anti-theft devices (locks, alarms); engage local watch groups; establish clear cost-sharing agreements; conduct community awareness campaigns on ownership and responsibilities.
Operation of ponds	Malaria risk	Regular pond maintenance and drainage; larval control measures; health education campaigns
Operation of mechanized boreholes	Over-abstraction of groundwater; equipment failure; inequitable access	Establish water use quotas; monitor water levels; implement routine equipment maintenance; provide training for operators; inclusive governance through community water committees.
Household and small-scale farming use of water	Increased water demand; risk of unsustainable usage	Promote water-efficient irrigation practices; monitor consumption; encourage crop planning and rotation; include water use rules in community governance frameworks.
Aquaculture Activities	Aquaculture determined not feasible due to water scarcity. Risk of invasive species introduction from SESP not	No mitigation required as activity not included in project. Future aquaculture would require separate screening, ESIA, and species management protocols using only indigenous/non-invasive fish species.

	applicable to current interventions.	
Air quality	Dust and emissions from maintenance vehicles and activities	Control dust during maintenance; minimize vehicle emissions through scheduling and maintenance; monitor air quality; raise community awareness on safe practices.
Solar pumps & pressurized storage	Mechanical failure; reduced water access; risk of exclusion of vulnerable groups	Schedule preventive maintenance; keep spare parts available; train local technicians; ensure inclusive water distribution rules.
Hydrometric stations / early warning systems	Vandalism or equipment failure; gaps in coverage	Install protective enclosures; community-based monitoring; backup communication systems; routine calibration and servicing.
Community water governance & committees	Conflicts over access and allocation; inequitable decision-making	Develop transparent rules; promote inclusive participation (youth, women, vulnerable groups); provide conflict resolution training; establish grievance redress mechanisms.
Routine maintenance of infrastructure (labour)	Minor hazards such as fatigue or injuries	Provide personal protective equipment (PPE); schedule rest breaks; ensure training on occupational safety; maintain first aid kits at worksites.
Community-led maintenance and livelihood activities	Risk of children being involved in ongoing maintenance, water collection, or agricultural support activities	- Coordinate with Regional Councils to prioritize unemployed youth (18+) for any paid maintenance roles - Establish community water committee bylaws that explicitly prohibit child labour - Establish clear protocols for reporting child labour concerns through GRM
Increased water demand during dry periods	Pressure on resources; risk of conflict	Monitor seasonal demand; strengthen water use quotas; promote water conservation awareness campaigns; establish contingency water-sharing agreements.
IV. Decommissioning Phase		
Task/Activity	**Anticipated Risk**	**Mitigation Measures**
Dismantling ponds	Abandoned ponds may cause mosquito habitats or land degradation	Drain ponds or fill with soil if no longer used; maintain temporary water circulation if ponds remain; conduct health awareness campaigns on mosquito control; restore vegetation on embankments.

Equipment redistribution / solar panels	Conflicts or theft if not managed	Create transparent redistribution plans; involve community representatives; track assets; provide security during relocation.
Loss of employment for caretakers/operators	Reduced income; community dissatisfaction	Provide early notice and alternative livelihood support; involve affected personnel in decommissioning activities; offer training for new roles.
Abandonment of community water committees	Breakdown in governance; potential conflicts	Transition responsibilities gradually; provide training to ensure continuity; formalize handover agreements; maintain advisory support during early post-decommissioning phase.
Removal of pipelines / water infrastructure	Soil disturbance; waste generation; disruption of natural drainage	Plan removal to minimize disturbance; recycle or safely dispose of removed materials; restore drainage channels; re-vegetate disturbed areas.

Mitigation measures for the CUVKUN Livelihood Support Project are designed to address potential impacts at each phase of the project, ensuring environmental protection, community well-being, and sustainable resource management. During the design and preconstruction phase, participatory approaches are emphasized, including community involvement in site selection for water points and early warning systems, and the inclusion of vulnerable groups in decision-making. Technical feasibility studies and hydrological assessments guide the planning of mechanized wells, solar boreholes, and rainwater/floodwater ponds, while designs incorporate features to reduce siltation, erosion, and exclusion risks. Awareness campaigns and training are integrated early to build local capacity and ensure equitable access to project benefits.

During the construction, operation, and decommissioning phases, mitigation focuses on practical measures to reduce environmental and social risks. In construction, erosion control, spill management, dust and noise suppression, and occupational health and safety practices minimize habitat destruction, community disturbance, and worker injuries. Operation phase measures include anti-theft devices, water use monitoring, larval control, and community governance mechanisms to address risks of inequitable access, over-abstraction, water pollution, and SEAH. Finally, during decommissioning, careful dismantling of ponds and infrastructure, transparent redistribution of assets, continuity of water committees, and restoration of vegetation and drainage systems ensure minimal environmental impact and maintain social cohesion. Across all phases, mitigation relies on community engagement, inclusive governance, technical safeguards, and ongoing monitoring to sustainably manage risks.

8.3 Child Labour Prevention Framework

The SESP identified child labour as a substantial risk (Impact = 4, Likelihood = 4) given documented prevalence in Namibia and Angola in sectors such as agriculture, construction, and domestic work. However, field assessments conducted during the ESIA reveal contextual factors that significantly mitigate this risk in the project areas:

Key Mitigating Factors

1. **High Youth Unemployment:**
   Regional Councils in Ohangwena, Omusati, and Oshikoto maintain registers of unemployed youth (18+), ensuring an adequate pool of adult labour for project activities.

2. **Structured Recruitment Process:**
   Labour recruitment is coordinated through established authority structures:
   - Village level: Traditional Authorities and Headmen
   - Constituency level: Councillors
   - Regional level: Regional Councils

3. **Government Oversight:**
   The Ministry of Labour, Industrial Relations and Employment Creation provides continuous oversight of labour practices in all regions.

4. **Community Monitoring:**
   Strong traditional governance systems and community committees provide additional layers of social monitoring and accountability.

Prevention Framework

Despite these mitigating conditions, the project enforces a zero-tolerance policy on child labour, operationalized through the following measures:

1 1. Age Verification

- Mandatory verification using national ID cards, birth certificates, or other official documents.
- Minimum employment age: 18 years for all project-related work.
- Worker registry maintained with copies of verification documents.

2 2. Institutional Coordination

- Collaboration with Regional Councils to access verified unemployed youth databases.
- Coordination with Traditional Authorities and constituency offices for recruitment.
- Partnership with Ministry of Labour offices for compliance monitoring.

3 3. Contractual Safeguards

- Inclusion of *"No Child Labour"* clauses in all contracts and partner agreements.
- Labour Management Procedures explicitly prohibiting child labour.
- Contractor reporting obligations on labour practices.

4 4. Community Engagement

- Awareness campaigns on child rights and child labour laws.
- Integration of child labour prevention into community water committee bylaws.
- Training for committee members and community liaisons on recognising and reporting child labour.

5 5. Monitoring and Reporting

- Random site inspections by project staff and labour inspectors.
- Community-based monitoring through the Grievance Redress Mechanism (GRM).
- Quarterly reports on labour practices submitted to UNDP.
- Established investigation protocol for any child labour allegations.

9 Stakeholder consultation

In compliance with the Environmental Management Act and the UNDP Social and Environmental Standards, a comprehensive stakeholder engagement process was undertaken for the project. The process aimed to ensure transparency, inclusivity, and meaningful participation of all affected and interested parties. Key Informant Interviews (KIIs) and other engagement methods were used during consultations with government officials, local authorities, and technical experts (see the attached SEP Report). Field visits and community public meetings were conducted for Open forums at communities to present project information, discuss anticipated impacts, and gather feedback (as shown in Table 9-1).

Table xxi: List of Stakeholders mapped

Stakeholder Groups	Examples of Stakeholders
Policy and regulatory Actors	Ministry of Agriculture, Water and Land Reform (MAWLR) - Directorate of Resource Management (DRM)
	MAWLR - Directorate of Agricultural Extension and Engineering Services (DAPEES)
	MAWLR - Directorate of Water Supply and Sanitation and Coordination (DWSSC)
	MAWLR - Directorate of Land Reform
	Ministry of Environment, Forestry and Tourism (MEFT) - Directorate of Environmental Affair
	Office of the Prime Minister - Disaster Risk Management Unit
	Ministry of Urban and Rural Development
	Ministry of Mines and Energy
	Ministry of Finance
	Office of the Attorney General
	National Planning Commission
	Namibia Meteorological Services
Parastatals and State-Owned Enterprises	Namibia Water Cooperation (NamWater)
	NamPower
	AgriBusDev
	AMTA
Local Government	Kunene Region: Opuwo Town Council
	Ohangwena Regional Council: Eenhana Town Council, Helao Nafidi Town Council, and Okongo Village Council
	Omusati: Oshikuku Village Council, Outapi Town Council, Ruacana Town Council, Okahawu Town Council, Tandi Village Council
	Oshana: Ondangwa Town Council, Oshakati Town Council, Ongwediva Town Council
	Oshikoto: Omuthiya Town Council, Municipality of Tsumeb, Oniipa Town Council
	Environmental Investment Fund (EIF)
	Bundesanstalt für Geowissenschaften und Rohstoffe (BGR)

International and Regional Partners	KFW Bank
	Deutsche Gesellschaft fur Internationale Zusammenarbeit (GIZ)
	The United Nations Educational, Scientific and Cultural Organization (UNESCO)
	The Southern African Science Service Centre for Climate Change and Adaptive Land Management (SASSCAL)
	United Nations Development Programme (UNDP)
	African Development Bank
	World Bank
	Food and Agriculture Organization (FAO)
	World Food Programme (WFP)
	SADC Transboundary Water Management Programme
Civil Society	Basin Management Committees: Tsumeb sub-basin, Niipele sub-basin, Olushandja sub-basin, and Iishana sub-basin
	Conservancies: Nehale LyaMpingana, Okongo, Uukwaluudhi, Sheya Shuushona, Iipumbu ya Shilongo, Kunene Conservancy Association
	Non-Governmental Organisations: Namibia Redcross Society, Namibia Association of CBNRM Support Organisation, Integrated Rural Development and Nature Conservation (IRDNC), and Institute of Ecological Research, Namibia Nature Foundation (NNF) Namibia Development Trust (NDT)
	User Associations: Namibian National Farmers Union, Karst Water Management Body, Water Point Committees
Research and Academia	Namibia University of Science and Technology
	University of Namibia
	International University of Management
Private Sector and Industry	Smallholder Farmers
	Mines
	Irrigation Schemes
	Namibia Chamber of Mines
	Team Namibia

Table xxii: Summary Table of Public Meeting during the Field Consultation

Dates of visits	Community engaged	Key Resolutions/ Concerns
3rd March	Onamatende	• Requested rainwater harvesting pond for drinking water and livestock. • Challenges include saline well and seasonal depression. • Sixty-seven households would benefit, reducing the current 2–3 km journey for water. • Land is donated by a resident • Proposed fencing, pump, taps, troughs, and fish farming. Youth, women should be actively engaged.
4th March	Okanyanona	• Requested deepening and modernisation of a hand-dug-well and if possible, make provision for a new borehole. • 115 households rely on a shared well with three other villages. • Risk of manual digging during the dry season. • Water gets muddy, and residents are forced to walk 4–5 km for clean water. • They reported that there are no Indigenous People were relocated to designated settlements. • Potential risks raised include: the solar water system does not function on cloudy days, theft and vandalism of solar equipment. Lack of financial sustainability.
5th March	Oluwaya	• Requested the installation of a solar-powered pump for their hand dug wells. • The community relies on saline borehole water for their livestock and deep wells that often dry up during the dry season. • Some of the households that depend on this water source are located up to 2 kilometres away. • Despite organized community committees, including a drought relief committee that prioritises vulnerable households, water scarcity remains a critical issue.
5th March	Opepela	• Requested the existing dam to be dredged to increase water retention. • This village struggles with maintaining its colonial-era earth dam, which serves multiple neighbouring communities. • Due to climate change impacts, the dam dries up, necessitating alternative water sources.

6th March	Shanalumono and Shapoko villages	• Proposed Early Warning System (EWS) installation. • Requested a secure and tamper-proof early warning system to reduce the risk of theft or vandalism. • Both villages experience seasonal flooding, which disrupts access to schools and health services. • Previous equipment was vandalised due to a lack of community consultation and visibility. • Community members have proposed fencing and awareness campaigns to protect this critical infrastructure.
6th March	Oshuudhi and Ombundamuti	• Requested the construction of a rainwater harvesting pond to help manage seasonal flooding and to reduce pressure on NamWater and avoid livestock migration. • Households move livestock to distant cattle posts during the dry season, forcing men to live apart from their families and increasing the financial burden of supporting two locations.
7th March	Olupumbu	• Requested rehabilitation of an existing rainwater harvesting earth pond, constructed in 1970. • Pond is silted and barely functional. • Residents use costly potable water or walk 10 km to Kunene River-fed canals. • Community began self-funding dredging; plan to expand effort in August 2025 after dry season.

9.1. Free, Prior and Informed Consent (FPIC)

During the project's initial screening in 2021, Indigenous Peoples (IPs) were considered that they occupy the demonstration sites, which triggers safeguards for Free, Prior, and Informed Consent (FPIC). Indeed, the Cuvelai and Kunene basins have historically been home to the San and OvaHimba peoples, necessitating a careful assessment of their rights and the potential impacts of any projects in the area. The principle of Free, Prior, and Informed Consent (FPIC), as outlined by international frameworks such as the UN Declaration on the Rights of Indigenous Peoples (UNDRIP) and ILO Convention 169, is essential in this context. FPIC serves as a crucial safeguard, ensuring that Indigenous Peoples have a voice in decisions that affect their lands and cultural heritage. While Namibia's legal framework recognizes Indigenous rights, there are still gaps in enforcement, highlighting the need for greater attention to these issues.

From March 3rd to March 15th, 2025, a field visit to Namibia and Angola was conducted as part of the Free, Prior, and Informed Consent (FPIC) process for the proposed water interventions under the CUVKUN project. A primary objective of this mission was to assess the necessity of obtaining FPIC from Indigenous communities, ensuring that engagement was culturally appropriate and aligned with UNDP's Social and Environmental Standards (SES). During the visit, stakeholders were consulted, which included local leaders, government agencies, community members, and relevant ministries, aimed at fostering broad and inclusive participation. Special emphasis was placed on including women, youth, and the elderly, highlighting the project's commitment to equitable representation within the community.

Following the field visit, extensive consultations with local stakeholders, community representatives, and relevant authorities, alongside a literature review, concluded that there are no distinct Indigenous Peoples within the project area that meet the internationally recognized criteria for defining Indigenous Peoples (as outlined by UNDRIP, ILO, and the World Bank). As a result, the FPIC process was deemed unnecessary. This determination was based on assessments of key indicators, including distinct cultural practices (such as dwelling types, language, clothing, and customary institutions), self-identification as Indigenous Peoples, historical continuity with pre-colonial societies, and a unique relationship with the land.

In villages like Oluwaya and Okunyanona, where a few Indigenous individuals (specifically, members of the San community) reside, it was observed that they are fully integrated into the broader community and do not exhibit distinct vulnerabilities related to the proposed interventions. These individuals have transitioned from traditional hunting and gathering practices to sedentary agriculture. Despite the determination that the FPIC process is not applicable, community consultations were carried out (Figure 34**).** To address the concerns raised during consultations, a comprehensive project-level Stakeholder Engagement Plan (SEP) will be developed. Observations gathered during the site visits are summarized in Table 9-1.

Figure 9-1*: San People at Oluwaya Village have integrated into the broader community (Source: TEC, 2024)*

9.2. Gender Considerations

During the field assessment in Oluwaya, it was noted that Gender-Based Violence (GBV) cases occur at an average of 1–2 incidents per month, primarily linked to alcohol-related domestic violence. While community committees effectively address minor cases through local interventions, more serious or recurring incidents are referred to the Ministry of Gender Equality, Poverty Eradication, and Social Welfare for further action.

To address these challenges and promote gender inclusion, we will implement a Gender Action Plan (GAP) as part of our project. The GAP will focus on several key initiatives:

- Raising awareness and preventing GBV within the community.
- Strengthening referral pathways and community protection mechanisms.
- Ensuring active participation of women and youth in decision-making processes, training, and benefit-sharing opportunities.
- Integrating gender-responsive design in infrastructure development.

By implementing this Gender Action Plan, we aim to effectively tackle these issues and ensure the inclusion of vulnerable groups, particularly women and youth, in our initiatives.

10 Grievance redress mechanism

This section contains the processes and procedures for managing grievances raised by stakeholders and establishing a Grievance Mechanism. Effective grievance management is essential for maintaining a constructive dialogue with project stakeholders. It ensures that the negative impacts and social risks to the Project are addressed timeously, prompt and suitable manner. Effective Monitoring and Evaluation (M&E) of a Grievance Mechanism's performance will lead to proactive (instead of reactive) impact management, and should, eventually, lead to a reduction in repeat grievances

I. The objectives of a Grievance Redress Mechanism

The purpose of the CUVKUN project's Grievance Redress Mechanism (GRM) is to address concerns and complaints by stakeholders, individuals, and communities connected to its initiatives. It aims to assure stakeholders, individuals, and communities that they will be heard and assisted in a timely and consistent manner and have all grievances addressed.

II. Grievance management process

This Grievance Mechanism will be informed by UNDP (as the implementing entity) & GWPSA (as the executing entity) and will consider the presence of vulnerable groups (e.g. women and people living with disabilities) and prefers in-person interaction with complainants to ensure that decisions and outcomes are thoroughly understood.
The process has eleven steps, outlined in Figure 10-1 and described in as indicated below.

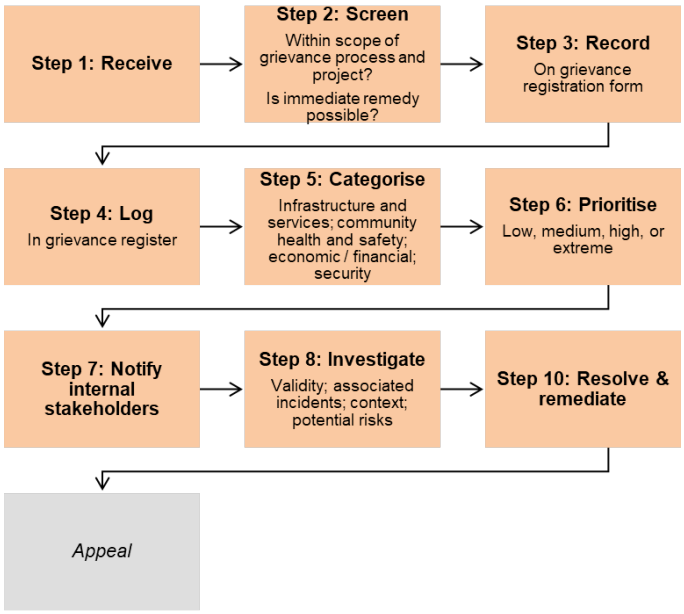

Figure 10-1: Grievance management process

11 Conclusion

The Environmental and Social Impact Assessment (ESIA), conducted in alignment with UNDP's Social and Environmental Standards (SES), has systematically evaluated potential impacts across all project phases: design/preconstruction, construction, operation, and decommissioning. While most risks are low to moderate, the assessment identifies specific risks rated as **Substantial**; therefore, consistent with UNDP SES risk categorisation, the project's overall environmental and social risk category is classified as **Substantial**, with no high-significance impacts identified..

During the design and preconstruction phase, risks are generally low and relate to equitable access, ownership conflicts, and technical appropriateness. In the construction phase, moderate impacts such as vegetation clearance, soil erosion, temporary disruption of water access, and community disturbance from dust and noise, risk of well collapse, fall hazards, confined space risks, flooding during rains, floodwater backwash and silt entry if poorly constructed; worker safety risks can be effectively mitigated through standard environmental management practices and health and safety measures.

In the operation phase, risks remain manageable and are mainly associated with equitable water distribution, groundwater over-abstraction, potential theft or vandalism of infrastructure, malaria from ponds, air quality impacts, vandalism or equipment failure, conflicts over access and allocation, inequitable decision-making, gaps in coverage and SEAH-related social risks. Aquaculture-related pollution is low but requires monitoring. Mitigation measures, including inclusive Water Committees, technical maintenance, community engagement, and health and safety programs, are designed to address these risks.

In the decommissioning phase, moderate risks may arise from pond dismantling, equipment redistribution, and social impacts such as loss of employment or weakened governance structures. Proper closure planning, asset redistribution strategies, and community participation can minimize these impacts.

Overall, the ESIA concludes that the project is environmentally and socially feasible. By implementing the recommended mitigation measures, promoting community participation, and maintaining continuous monitoring, the project can deliver sustainable, equitable, and resilient benefits while minimizing potential adverse impacts across all phases of implementation.

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Appendix 1: Population demographics for the CUVKUN pilot regions in Namibia.

Appendix 1A

***Table 32**: Ohangwena– Census Indicators, 2011 and 2023*

	2011	2023			2011	2023
Population Size				Education Attainment, %		
Total	245 446	337 729		Primary Education	40.8	45.8
Males	112 130	159 701		Secondary Education	8.5	19.3
Females	133 316	178 028		Tertiary Education	2.7	7.3
Annual growth rate (%)	0.7	2.7		Fertility		
				Average number of children per woman	4.6	5.0
Population in Urban/Rural areas, %				Disability, %		
Urban	10.1	14.5		Prevalence	-	5.0
Rural	89.9	85.5		Private households		
Sex ratio: Males per 100 females	84	90		Number	43 723	67 820
Population density				Average size	5.6	4.8
People per sq. km.	22.9	31.7		Household headship		
Age composition, %				Female-headed	56.5	58.0
Under 5 years	15.5	16.2		Child-Headed	2	1.5
5 – 14 years	28.6	29.1		Orphan-headed	0.9	0.3
15 – 34 years	32.9	29.9		Elderly-headed	37.4	28.4
35 – 59 years	13.7	16.8		Housing conditions, %		
60+ years	9.2	8.0		Households with		
Marital status: 15+ years, %				Safe water for drinking	56.4	84.3
Never married	65.1	73.2		No toilet facility	80.0	61.7
Married with certificate	17.5	15.5		No Toilet facility in urban	52.5	41.3
Married traditionally	7.0	4.6		Electricity for lighting	11.0	20.7
Consensual union	3.1	1.2		Wood/charcoal for cooking	88.0	83.2
Divorced/Separated	1.9	1.0		Household living		
Widowed	5.3	3.9		Improvised housing units (shacks)	5.1	11.3
Citizenship, %				Sanitation, %		
Namibian	98.6	95.2		Urban Household access to flush toilet	33.0	48.5
Non-Namibian	1.4	4.6		Rural Household access to flush toilet	2.9	11.3
				Urban Household access to garbage collection	44.5	62.7

20-24 yeas who were married				Rural household access to Garbage collection	4.5	3.0
Before age 15	-	0.1		Main source of income, %		
Before age 18	-	0.4		Household main income		
Birth Registration				Wages & Salaries	22.2	24.9
% of children under 5 years		69.0		Old age Pension	28.5	23.8
ICT, % of the population 3yrs and above				Farming	25.7	22.1
Access to internet	2.6	14.0		Business, non-farming	12.1	10.5
Own Cellphone	43.5	41.8				
Literacy rate, 15+ years, %	86.3	84.6				
ECD, % of 0-5 years attending	16.8	22.3				
Education, 15+ years, %						
Never attended school	13.5	14.8				
Currently at school	41.7	24.2				
Left school	39.9	57.7				

Appendix 1B

***Table 33**: Omusati– Census Indicators, 2011 and 2023*

	2011	2023		2011	2023
Population Size			Education Attainment, %		
Total	243 166	316 671	Primary Education	48.1	45.3
Males	109 545	147 265	Secondary Education	14.0	19.6
Females	133 621	169 406	Tertiary Education	3.5	8.0
Annual growth rate (%)	0.6	2.2	Fertility		
			Average number of children per woman	3.8	4.3
Population in Urban/Rural areas, %			Disability, %		
Urban	5.7	11.1	Prevalence	-	5.7
Rural	94.3	88.9	Private households		
Sex ratio: Males per 100 females	82	87	Number	46 698	72 437
Population density			Average size	5.2	4.2
People per sq. km.	9.1	11.9	Household headship		
Age composition, %			Female-headed	55.3	58.3
Under 5 years	13.9	14.7	Child-Headed	1.4	1.4
5 – 14 years	26.3	27.3	Orphan-headed	0.6	0.2
15 – 34 years	32.8	29.2	Elderly-headed	40.3	32.4
35 – 59 years	16.3	18.4	Housing conditions, %		
60+ years	10.7	10.4	Households with		
Marital status: 15+ years, %			Safe water for drinking	51.6	89.9
Never married	64.5	74.0	No toilet facility	77.9	57.8
Married with certificate	20.0	16.0	No Toilet facility in urban	30.7	17.1
Married traditionally	5.7	4.1	Electricity for lighting	9.0	20.2
Consensual union	3.1	1.3	Wood/charcoal for cooking	88.0	82.4
Divorced/Separated	1.5	0.1	Household living		
Widowed	5.0	4.2	Improvised housing units (shacks)	1.1	8.2
Citizenship, %			Sanitation, %		
Namibian	98.4	94.0	Urban Household access to flush toilet	49.0	65.6
Non-Namibian	1.6	5.7	Rural Household access to flush toilet	2.5	11.7
			Urban Household access to garbage collection	65.1	76.7

20-24 years who were married				Rural household access to Garbage collection	5.2	2.1
Before age 15	-	0.1		Main source of income, %		
Before age 18	-	0.4		Household main income		
Birth Registration				Wages & Salaries	25.4	27.0
% of children under 5 years		70.3		Old age Pension	30.8	26.3
ICT, % of the population 3yrs and above				Farming	22.0	19.5
Access to internet	2.6	15.3		Business, non-farming	10.4	7.6
Own Cellphone	44.3	46.4				
Literacy rate, 15+ years, %	87.6	84.1				
ECD, % of 0-5 years attending	14.9	22.0				
Education, 15+ years, %						
Never attended school	13.0	12.3				
Currently at school	23.0	21.1				
Left school	60.0	63.2				

Appendix 1C

***Table 34**: Oshikoto – Census Indicators, 2011 and 2023*

	2011	2023		2011	2023
Population Size			Education Attainment, %		
Total	181 973	257 302	Primary Education	38.7	46.2
Males	87 066	127 374	Secondary Education	14.6	20.8
Females	94 907	129 928	Tertiary Education	3.0	8.5
Annual growth rate (%)	1.2	2.9	Fertility		
			Average number of children per woman	4.1	4.4
Population in Urban/Rural areas, %			Disability, %		
Urban	13.0	18.3	Prevalence	-	4.6
Rural	87.0	81.7	Private households		
Sex ratio: Males per 100 females	92	98	Number	37 400	60 643
Population density			Average size	4.8	4.1
People per sq. km.	4.7	6.7	Household headship		
Age composition, %			Female-headed	48.6	51.4
Under 5 years	14.1	14.7	Child-Headed	1.5	1.2
5 – 14 years	25.8	24.8	Orphan-headed	0.5	0.2
15 – 34 years	33.9	31.9	Elderly-headed	29.4	24.3
35 – 59 years	17.7	20.3	Housing conditions, %		
60+ years	8.5	8.3	Households with		
Marital status: 15+ years, %			Safe water for drinking	69.7	90.2
Never married	62.2	72.2	No toilet facility	68.9	54.6
Married with certificate	22.7	18.6	No Toilet facility in urban	29.9	26.5
Married traditionally	4.4	2.9	Electricity for lighting	20.0	28.6
Consensual union	5.1	2.2	Wood/charcoal for cooking	80.0	74.5
Divorced/Separated	1.2	0.9	Household living		
Widowed	4.0	2.9	Improvised housing units (shacks)	4.8	15.6
Citizenship, %			Sanitation, %		
Namibian	97.8	93.7	Urban Household access to flush toilet	64.9	62.4
Non-Namibian	2.2	6.0	Rural Household access to flush toilet	8.3	17.7
			Urban Household access to garbage collection	65.1	54.0

20-24 yeas who were married				Rural household access to Garbage collection	4.2	6.4
Before age 15	-	0.2		Main source of income, %		
Before age 18	-	0.8		Household main income		
Birth Registration				Wages & Salaries	29.7	33.3
% of children under 5 years		69.2		Old age Pension	18.2	18.3
ICT, % of the population 3yrs and above				Farming	33.3	23.6
Access to internet	3.9	18.1		Business, non-farming	8.5	8.3
Own Cellphone	47.1	48.7				
Literacy rate, 15+ years, %	88.0	85.2				
ECD, % of 0-5 years attending	17.8	22.2				
Education, 15+ years, %						
Never attended school	14.0	12.3				
Currently at school	20.0	19.4				
Left school	63.0	65.3				

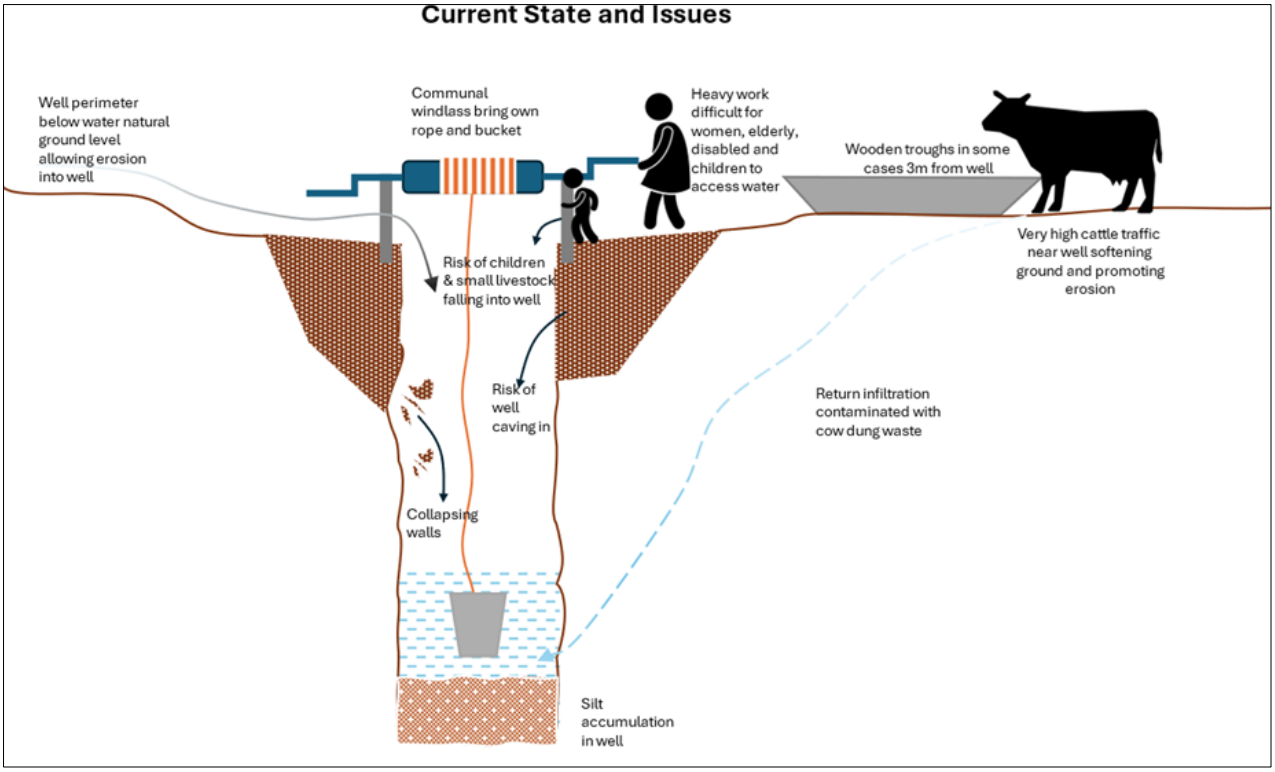
Appendix 2: Design features

1) CUVKUN Well Intervention Model

Current Challenges at Traditional Community Wells

Traditional community wells manually operated windlass system (ropes and buckets) are exposed to multiple safety, quality, and resilience risks, especially where livestock watering is combined with domestic access.

Key Issues Identified see diagram and summarised below:



- Risk of well collapse and injury from unlined vertical shafts
- Manual lifting fatigue (especially for women, elderly, and disabled persons), equity issues
- Contamination risks due to proximity of livestock and open surfaces
- Erosion from animal trampling near the wellhead
- Floodwater backwash causing siltation and contaminated infiltration
- Lack of monitoring or usage tracking leading to low well sustainability - they sometimes let well rest for 2 days after over abstraction

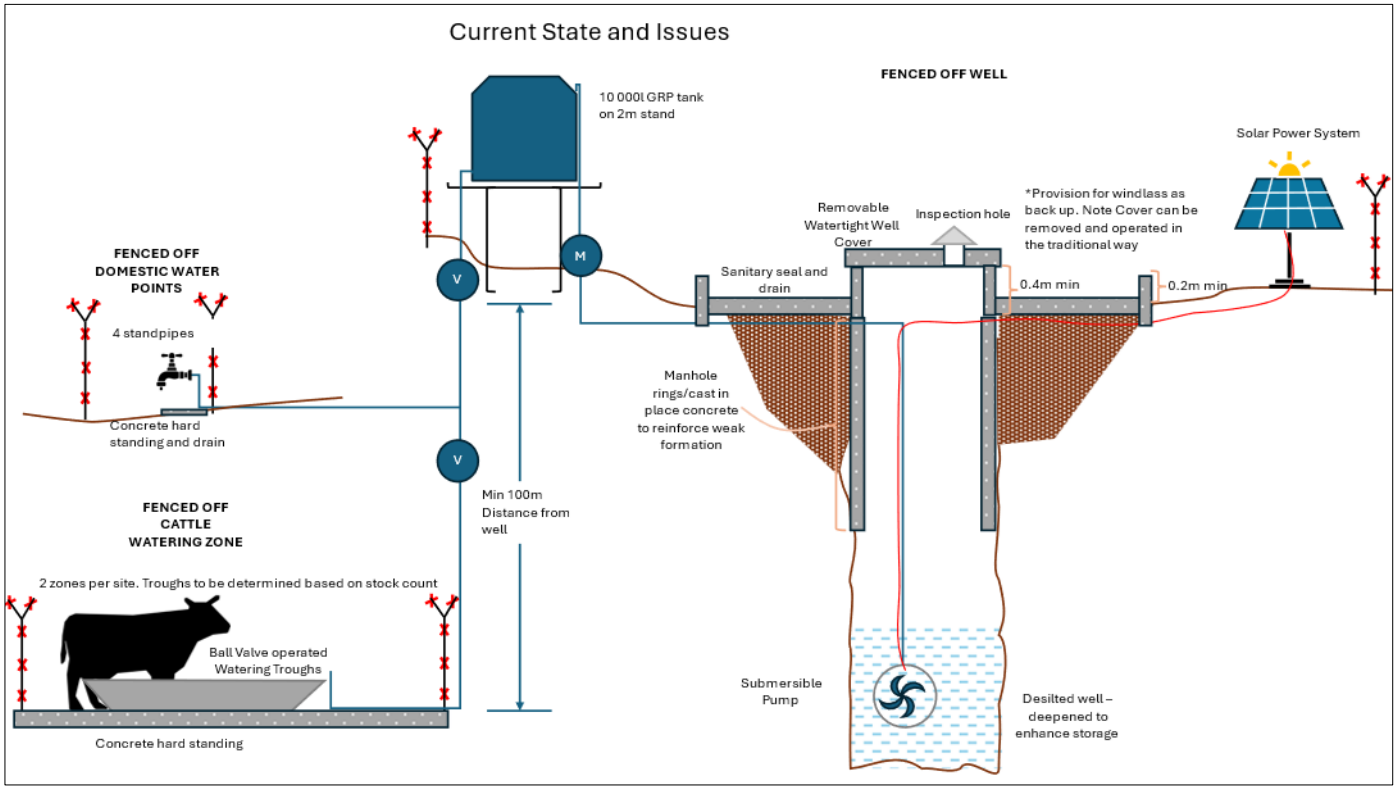
These risks compromise health, safety, and the sustainability of groundwater access, especially under increasing pressure from climate variability and livestock concentrations.

Proposed Generic Design Intervention

Specifics will be done on a well-by-well basis. Below are the key components of the design – what may change are dimensions, but the principles will remain the same.

The improved design integrates technical reinforcement, safeguards, and institutional arrangements to address both infrastructural and socio-environmental concerns. These were informed by a participatory design approach at all sites. The details will follow later of how this was done.

Key Features (see diagram below and notes below):



- Reinforced well lining using cast-in-place or pre-cast rings to prevent collapse
- Sanitary seal and removable watertight cover to prevent contamination
- Solar-powered submersible pump with elevated tank storage for pressurised distribution
- Separate, fenced domestic water standpipes (lockable, with hard standing and drainage)
- Dedicated, fenced livestock troughs 100 m+ from well, using ball valves and concrete base (stock levels to determine quantity of troughs)
- Monitoring elements: inspection hole, water level access, to inform allocation and adequacy to water heard and when to move herd to cattle posts

This design also allows continued manual operation via windlass during system failure, respecting traditional use patterns (communities were sceptical about maintenance) and ensuring redundancy.

Summary of Issues and Response Measures

Challenge	Design Response / Additionality
Open well prone to collapse	Structural lining (rings/concrete) and cover to reinforce integrity
Risk of children/livestock falling in	Fencing + sealed cover with controlled access
Heavy manual lifting	Solar pump + tap points; fallback to windlass maintained
Livestock trampling and erosion	Cattle troughs relocated 100 m away (mminimum), hard stand & fencing

Water contamination from return flows	Separation of livestock zones; sealed surface + drainage
Flood backwash and silt entry	Elevated well collar, watertight removable cover
Unreliable water access	Increased storage (10,000 L tank), solar system ensures pressurised, off-grid supply
Lack of usage data or monitoring	Inclusion of inspection hole and access for level measurements (to inform allocation)

Images that can help visualise interventions

Ball Valve operated water trough ours will be made of brick and concrete with concrete hardstanding to avoid erosion and ponding (potential disease vectors)

Typical sanitary seal

Risks and Mitigation for Well Rehabilitation

Activity Context

Labour-based approach under the supervision of a competent person for:

- Desilting traditional wells
- Installing lining (precast rings or cast-in-situ concrete)
- Excavation (manual deepening)
- Site fencing and basic civil works
- Installation of solar systems and tanks

Triggered Standards and Mitigation Measures

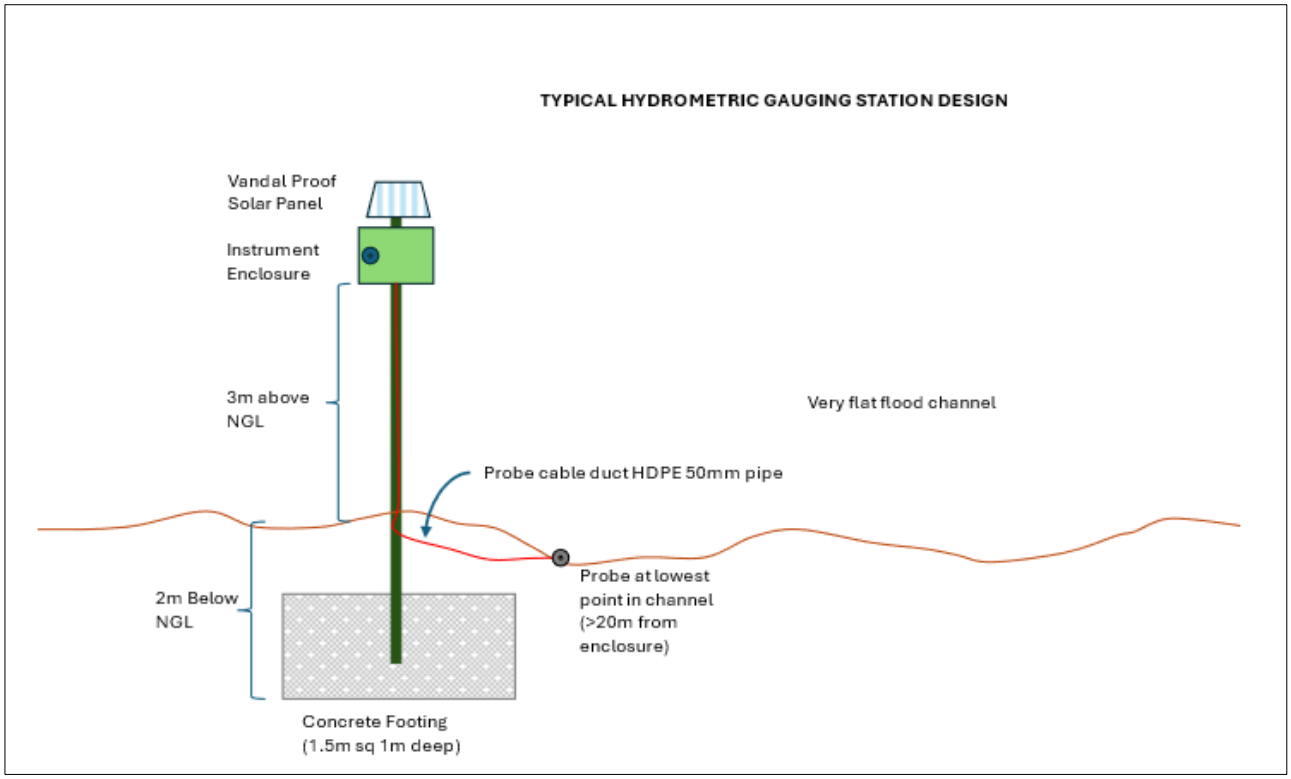
SES Standard	Risk/Concern	Mitigation Measure
Standard 3: Community Health, Safety and Security	- Risk of well collapse during desilting or deepening - Fall hazards for untrained labour - Work in confined spaces with low oxygen or unstable walls - Flooding risks if site is open during rains	- Engage competent person or trained overseer for deepening and wall works - Train local labourers on excavation safety, risk recognition, and response - Use shoring if required for depths >3 m - Provide PPE: boots, gloves, helmets, harness (if needed) - Schedule works in dry season to avoid flash flood exposure
Standard 1: Environmental and Social Assessment and Management	- Poor oversight could lead to unidentified site-specific risks (e.g. proximity to latrines or flood zones)	- Apply simplified ESMP checklist and visual screening per site - Ensure contractor/lead worker adheres to agreed siting and protection measures
Standard 2: Labor and Working Conditions	- Community workers may lack basic safety training or protective equipment - Potential for involuntary or unpaid labour during communal works	- Follow voluntary participation model (in line with FPIC) - Clarify work expectations in community meetings - Provide PPE and training - Keep daily records of work, roles, and supervision

2) CUVKUN Hydrometric Station Rehabilitation (Flood Early Warning System (FEWS))

Scope of Work

- Rehabilitation of existing hydrometric stations in key flood-prone locations.
- Where housing structure is deemed no longer secure it will be replace using Interlock Systems proprietary hardened steel equipment enclosures (you can read more about these here https://interlock.co.za/, including:
    - Hardened steel post mounting and tamper-proof instrument enclosure
    - Vandalproof Solar panel integrated onto top of post
    - Probe and cable installed in HDPE tube via ≤5 m trench (max 20 m where needed) – area is very flat and this structure will be in the flood channel
    - See arrangements in diagram below
- Foundations: 1.5 m × 1.5 m footprint; 2 m deep; 1 m poured concrete base.

- No complex technical procedures, equipment installation is easy, comparable to changing a car battery.



Proposed Implementation Modality

- The Department of Water (Hydrology Unit) will lead implementation using in-house technical teams with prior experience in similar station installations and sensor maintenance.
- Community labour not required, except for light clearing, concrete mixing, etc, where agreed locally – under supervision of department.

SES Risk Profile and Mitigation

SES Standard	Risk/Concern	Mitigation
Standard 1: E&S Assessment	Minor civil works at known locations; low ecological	Use existing station footprints; ensure minimal disruption
Standard 3: Community Health, Safety and Security	Risk of vandalism or misuse post-installation	Pre-installation awareness with local leaders; assign roles (e.g. community contact/flood marshal); branding with government logos to discourage tampering
Standard 2: Labour and Working Conditions	casual labour may be involved	Implementation by government teams with standard protocols and safety equipment

Flood Early Warning Messaging Strategy

Insights from community engagement:

- TV and radio are most effective for elders
- WhatsApp groups preferred by youth and working-age residents
- Flood Marshals: Trained locals who:
    - Relay alerts
    - Track vulnerable individuals (elderly, children, disabled)
    - Coordinate evacuation if needed

EWS rollout will prioritize multi-channel communication, including:

- Radio, sirens, loudhailers as per final institutional arrangement
- Community WhatsApp and SMS groups
- Flood Marshal system integrated with local DRR platforms

The following pictures illustrate some of the systems in use:

3) CUVKUN Floodwater Harvesting Pond Rehabilitation

General Scope of Work

The intervention focuses on rehabilitating existing floodwater harvesting ponds with the aim of improving water access while reducing environmental and safety risks. This includes:

- Desilting of ponds (mechanical methods)
- Fencing around ponds to prevent animal and human accidents (especially to address prior drowning incidents)
- Water access point relocation outside the fenced area to reduce contamination from animal dung
- Collaboration with NamWater on designs and standards and potential partnership in implementation. They have equipment near the sites
- Integration of Nature-Based Solutions (NbS) such as vegetative buffers to reduce silt inflow

Special Case: Ombundamuti

- About 20–35 individually owned shallow wells are located at the most viable site.
- Intervention will require excavation and interconnection of these wells into a communal system.
- Raises issues of ownership, access, and governance, requiring negotiated consensus and potential conversion into cooperative/shared management.

Issues and Design Considerations

Issue Identified	Design Response / Additionality
Siltation of ponds	Desilting + NbS (e.g., upstream vegetative buffer strips or diversion berms)
Contamination from livestock	Fence around ponds + provision of off-pond watering troughs
Risk of drowning (notably one site with incident)	Secure perimeter fencing, safe access points, community sensitization
Poorly defined communal access and governance	Inclusive planning + cooperative models, especially at Mbundamuti
Degraded infrastructure	Alignment with Namibia's DoWR pond rehab standards + support from NamWater
Environmental degradation at pond sites	NbS integration + education on sustainable pond catchment protection

SES Risk Profile and Mitigation – Floodwater Harvesting Ponds

SES Standard	Risk/Concern	Mitigation
Standard 1: Environmental and Social Assessment	Minor excavation, pond desilting, and trenching may affect soil stability or catchment vegetation	Follow Namibia Department of Water standard design; apply visual screening checklist; integrate Nature-Based Solutions (e.g. buffer vegetation) to stabilize and reduce siltation
Standard 2: Labour and Working Conditions	Potential use of voluntary community labour for fencing or vegetation work; safety risk during manual desilting	Ensure all labour is voluntary, supported by community agreements; provide PPE and basic orientation on safe practices; supervise works involving excavation or machine use
Standard 3: Community Health, Safety and Security	Risk of drowning (historic incident reported); contamination from animals if fencing fails; informal child access	Secure perimeter fencing; safe access zones with signage; troughs placed away from pond; community sensitization and child safety messaging during planning and handover
Standard 4: Displacement and Resettlement	(Only for Mbundamuti): Risk of perceived or real loss of control over individual wells when converted to communal infrastructure	Facilitate stakeholder mapping and dialogue; co-develop access rules and a shared operations model with well owners; explore cooperative or rotational management frameworks



CUVKUN

Enhanced Water Security and Community Resilience in the Adjacent Cuvelai & Kunene Transboundary River Basins

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