

Environmental and Social Impact Assessment for the Climate Proof Water4Food project (W4F) in Gambella Region, Ethiopia



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Abbreviation	
ADF	African Development Fund
AfDBs	African Development Bank's
CAW	Climate Action Window
CRGE	Climate Resilient Green Economy
CSA	Climate Smart Agriculture
EIA	Environmental Impact Assessment
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
EPA	Environmental Protection Authority
FGDs	Focus Group Discussions
GBV	Gender-Based Violence
GRM	Grievance Redress Mechanism
GTA	Gender Transformative Approach
ISS	Integrated Safeguard System
KIIs	Key Informant Interviews
MoWE	Ministry of Water and Energy
MoA	Ministry of Agriculture
NAP	National Adaptation Plan
PRA	Participatory Rural Appraisal
SEA/SH	Sexual Exploitation and Abuse/Sexual Harassment
SEP	Stakeholder Engagement Plan
TOR	Term of Reference
WASH	Water, Sanitation, and Hygiene
W4F	Water 4 Food

Executive Summary of the Water for Food Project

1. Overview of the Project

The Climate-Proof Water for Food Project in Gambella Region, Ethiopia seeks to enhance food security, livelihoods, and climate resilience through sustainable water management and agricultural development. The project will be implemented in five woredas Gog, Abobo, Abol, Itang, and Lare, and this study covered eight kebeles (Tata, Okuna, Penkiew, Nykwo, Drong, Winkey, Kutogn and Nib Nib), representing the five woredas. Its goal is to secure reliable and climate-resilient water resources for domestic use, small-scale irrigation, and livestock, while ensuring social inclusion and environmental sustainability. The project's objectives are to expand access to climate-proofed water supply, promote climate-smart agriculture (CSA) practices such as drought-tolerant crops and agroforestry, improve sanitation and hygiene, and strengthen community-based water and land resource management with a focus on gender equity and participation of vulnerable groups. The W4F program has two components; Component 1: Climate-smart agriculture and value chain; and Component 2: Inclusive, gender transformative, integrated flood-and drought-adapted water resource management and access.

Key activities of the W4F program will include construction of water supply and irrigation infrastructure, rehabilitation of degraded watersheds, promotion of CSA practices, hygiene and sanitation promotion, and capacity building for local institutions. In the with-project scenario, Gambella's communities will benefit from improved food production, diversified livelihoods, higher incomes, reduced health risks, and enhanced resilience to climate shocks, with increased participation of women, youth, and marginalized groups. In the without-project scenario, however, the region would face worsening water scarcity, recurrent crop failures, deteriorating WASH conditions, and heightened socio-economic vulnerability, reinforcing existing inequalities and livelihood insecurities.

Amharic translation of the Executive Summary

የውሃ ለምግብ ፕሮጀክት የአካባቢ እና ማህበራዊ ተጽዕኖ ግምገማ ማጠቃለያ

1. የፕሮጀክቱ አጠቃላይ እይታ

በጋምቤላ ክልል ሊተገበር ታሰበው የአየር ንብረት ደህንነትን ያረጋገጠ የውሃ ለምግብ ፕሮጀክት የውሃ አያያዝና አጠቃቀምን በማሻሻል በኢትዮጵያ የምግብ ዋስትና፣ የኑሮ ሁኔታን እና የአየር ንብረት ለውጥን በዘላቂነት በመፍታት የግብርና ልማትን ለማሳደግ ታሳቢ ያደረገ ነው። ፕሮጀክቱ በአምስት ወረዳዎች ማለትም በጎግ፣ አበቦ፣ አበል፣ ኢታንግ እና ላሬ የሚተገበር ሲሆን ይህ ጥናት አምስቱን ወረዳዎች የሚወክሉ ስምንት ቀበሌዎችን (ታታ፣ ኦኩና፣ ፔንኪው፣ ኒኮ፣ ድሮንግ፣ ዊንኪ፣ ኩቶኝ እና ንብ ንብ) ያካተተ ነው።

ግብ አስተማማኝ እና ለአየር ንብረት ለውጥ የማይበገር የውሃ ሀብትን ለቤት ውስጥ አገልግሎት፣ ለአነስተኛ መስኖ እና ለከተላት እርባታ መጠቀም ሲሆን ማህበራዊ አካቶ ትገበራን እና ዘላቂ የሆነ የአካባቢ ጥበቃን በማረጋገጥ ይተገበራል። የፕሮጀክቱ ዓላማዎች ለአየር ንብረት ለውጥ የማይበገር የውሃ አቅርቦት ተደራሽነትን ማስፋት፣ የአየር ንብረት ለውጥን ታሳቢ ያደረጉ ዘመናዊ የግብርና ልማት ስራዎችን ማለትም ድርቅ መቋቋም የሚችሉ ሰብሎችን ማዘመር እና የደን ልማትን ማሳደግ፣

የአካባቢ ጽዳትና ንፅህና አጠባበቅን ማሻሻል፣ የስርዓተ-ፆታ እኩልነትን ማረጋገጥ እንዲሁም የችግሩ ተጋላጭ ወገኖች ተሳትፎ ላይ በማተኮር የማህበረሰብ አቀፍ የውሃ እና የመሬት ሀብት አስተዳደርን ማጠናከር ናቸው።

የውሃ ለምግብ ፕሮጀክት ሁለት ክፍሎች አሉት። እነሱም፦

1. የአየር ንብረት ለውጥን ታሳቢ ያደረገ ዘመናዊ የግብርና ልማት እና እሴት የመጨመር ስራ
2. አካባቢ፣ የሥርዓተ-ፆታን እኩልነት የሚረጋገጥ፣ የጎርፍ እና የድርቅ አደጋን የሚቋቋም የተስተካከለ የውሃ ሀብት አስተዳደር እና ተደራሽነት ናቸው።

የውሃ ለምግብ ፕሮጀክት ቁልፍ ተግባራትን ስንመለከት የውሃ አቅርቦትና የመስኖ መሠረተ ልማት ግንባታ፣ የተራቆቱ ተፋሰሶችን መልሶ ማቋቋም(ማልማት)፣ የተሻሻለ የግብርና አሰራርን ማስተዋወቅ፣ የአካባቢ ጽዳትና ንፅህና አጠባበቅን ማሻሻል እና የአካባቢውን ማህበረሰብ የሚጠቅሙ ተቋማትን አቅም ማሳደግ ይገኙበታል።

ፕሮጀክቱ ወደ ተግባር ምዕራፍ ቢሸጋገር የጋምቤላ ክልል ማህበረሰብ ምርታማነት ይሻሻላል፣ የተለያዩ የገቢ ማስገኛ አማራጮችን በመጠቀም ከፍተኛ ገቢ ይገኛል፣ የጤና ስጋቶችን በመቀነስ እና የአየር ንብረት አደጋዎችን የመቋቋም አቅምን በማጎልበት የሴቶች፣ የወጣቶች እና ትኩረት የሚሹ ወገኖች ተሳትፎም በእጅጉ ይጨምራል። ፕሮጀክቱ ሳይተገበር ቢቀር ግን ክልሉ የከፋ የውሃ እጥረት፣ ተደጋጋሚ የሰብል ውድመት፣ የምርታማነት መቀነስ ፣ የንጽህና ጉድለት እና የአካባቢ ብክለት የሚገጥመው ሲሆን ማህበራዊና ኢኮኖሚያዊ ተጋላጭነቱ ጨምሮ አሁን ያለው የእኩልነት መጓደል እና በምግብ ራስን አለመቻል ተባብሶ እንዲቀጥል መፍቀድ ይሆናል።

2. Brief Description of the Project Site and Baseline Conditions

The Climate-Proof Water for Food Project will be implemented in five woredas—Gog, Abobo, Abol, Itang, and Lare—in the Gambella Region of western Ethiopia. The project influence area is part of the Baro-Akobo Basin, characterized by flat topography, seasonal wetlands, fertile floodplains, and extensive river networks. Land cover is dominated by grasslands, agricultural plots, woodlands, and wetlands that support both biodiversity and subsistence livelihoods. The region hosts diverse ethnic groups, pastoralists, and smallholder farmers, with settlements often located near rivers and low-lying areas vulnerable to flooding. Refugee camps also exist in parts of Gambella, adding to demographic pressures. Key Valued Environmental Components (VECs) in the region include fertile croplands, riverine ecosystems, wetlands, and forest patches—which contain a vulnerable trees like the 'Sheha' (*Vitellaria paradoxa*) found in Gambella and Assosa. A prime example of these VECs is the Gambella National Park, the largest protected area in Ethiopia. The park provides vital habitat for fish, birds, and wildlife, including critical populations of megafauna like elephants and lions, and acts as a crucial migratory corridor between Ethiopia and South Sudan, which may be affected if the project is scaled up towards the park.

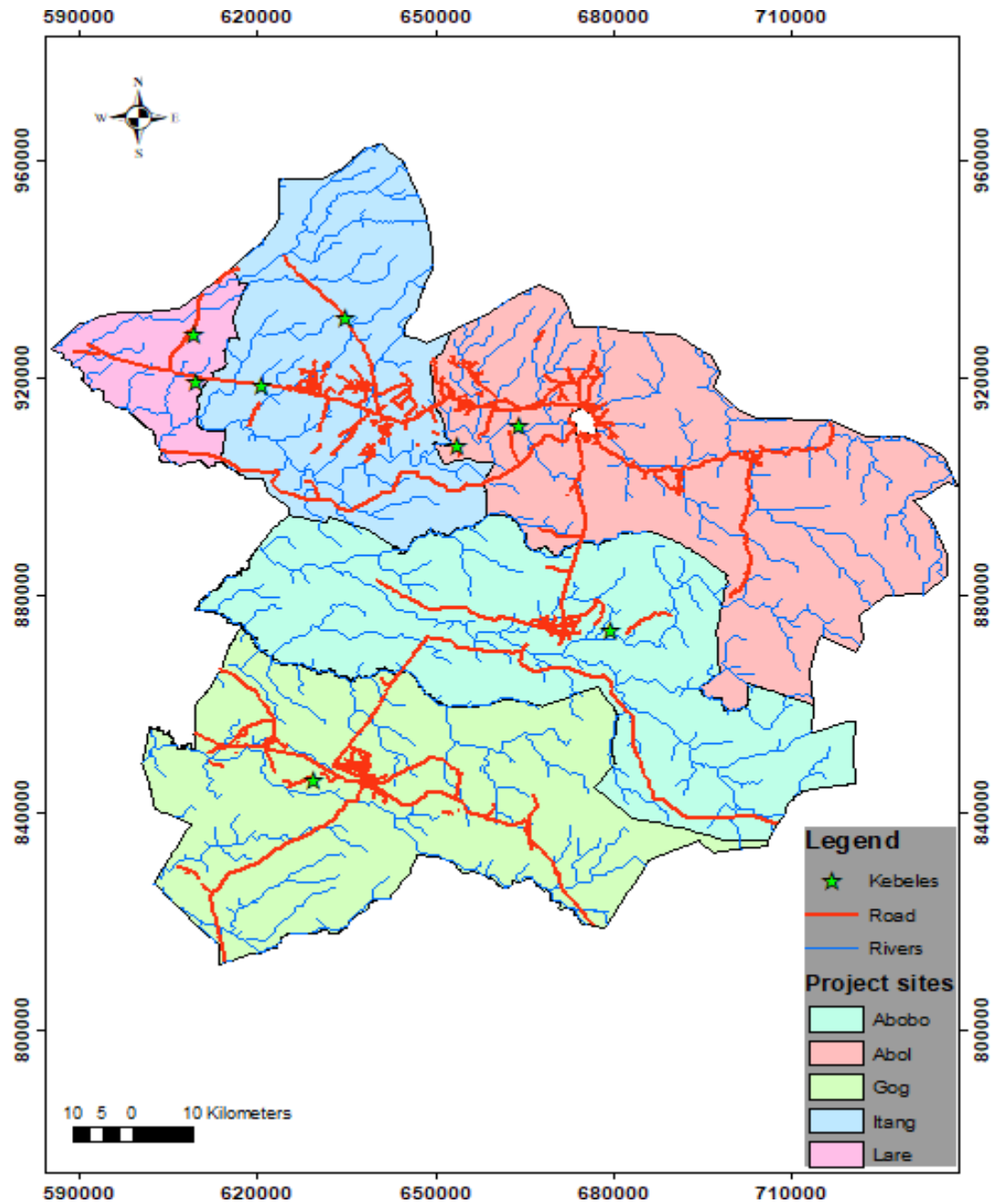


Figure: Accessibility of the project sites

As evidenced from the baseline study, the W4F Project area has a tropical climate with distinct wet (May–October) and dry (November–April) seasons. Rainfall peaks in July–August, causing flood risks, while dry months are hot and arid, increasing irrigation demand. The Baro, Akobo, and Gilo rivers, along with wetlands and floodplains, provide vital water resources. However, seasonal variability and threats like water hyacinth (*Eichhornia crassipes*) in Tata Lake, for example, require careful management. Landforms range from flat plains to mountainous areas, influencing drainage and erosion. The population is largely agrarian (crop farming and livestock producers), with women playing key roles in water and sanitation, and

vulnerable groups facing heightened climate and resource challenges. These conditions highlight the need for climate-resilient water management to support food security and sustainable livelihoods.

According to FAO's nationwide assessment (FAO 1984), soils in Gambella are primarily Alisols Humic, Vertisols, Fluvisols, and Acrisols, with smaller areas of Nitosols and Lithosols; highlands are dominated by Dystric Liptosols. Vertisols are the most widespread and fertile soils, supporting intensive agriculture. Land cover varies with topography: highlands have dense broad-leaved forests with scattered cultivation patches, while lowlands feature extensive commercial agricultural lands, grasslands, and wetlands. This combination of fertile soils, vegetation, and water resources underpins the region's agricultural potential and informs crop selection, irrigation planning, and sustainable land management strategies for the Water-for-Food Project.

The Agriculture is predominantly smallholder and mixed, focusing on maize and sorghum, with supplementary legumes, vegetables, and fruit trees (mango, banana, papaya, guava). Many households integrate crop and livestock production, and some practice small-scale fish farming. Intercropping is slightly more common than mono-cropping, enhancing soil fertility, buffering against climate shocks, and supporting sustainable yields. Organic fertilizers, primarily livestock manure and crop residues, are widely used, but mechanization and modern inputs are limited, leaving households vulnerable to floods and droughts. Only a minority of farmers adopt flood- or drought-tolerant varieties (20%) or other CSA techniques such as raised beds and mulching (31%). Positive outcomes include improved nutrition, soil fertility, and food security, while challenges remain due to labor-intensive farming and limited access to resilient technologies. These findings highlight the need for targeted extension services, resource support, and institutional strengthening to scale up CSA adoption, diversify cropping systems, and enhance agricultural resilience in the Water-for-Food Project area.

The baseline assessments also indicated significant environmental and social challenges in the without-project scenario. Communities face recurrent flooding, droughts, and pest outbreaks that damage crops and erode soil fertility. Access to safe water is limited, sanitation facilities are inadequate, and waterborne diseases are prevalent. Agricultural productivity is low due to reliance on rain-fed farming, limited irrigation infrastructure, and poor access to improved seeds and technologies. Forest degradation and wetland encroachment are increasing due to population pressures and unsustainable resource use. Socially, households experience high poverty levels, limited livelihood diversification, and gender inequalities, with women disproportionately responsible for water collection and household care. Without intervention, these conditions are projected to worsen under climate variability, further threatening food security, health, and sustainable resource management in Gambella.

3. Institutional and Legal Framework for Implementation of the Project

- Environmental Policy of Ethiopia (1997): Mandates consideration of environmental effects in project planning, early integration of mitigation measures, public consultation, and monitoring mechanisms.
- Environmental and Social Impact Assessment Proclamation, No.299/2002: Requires ESIA approval for designated projects prior to implementation.
- Ethiopia's Climate Resilient Green Economy (CRGE) Strategy: The project directly contributes to the CRGE's goals of building climate resilience and fostering sustainable agriculture.

- National Water Resources Management Policy: Provides the overarching principles for equitable, sustainable, and integrated water resource management.
- Applicable AfDB Operational Safeguards (OS): From the point of view of the AfDB, the relevant policies are the Operational Safeguard (OS) 1, 2, 3, 4 and 5.

Organizational Responsibilities in the Implementation of the Project: The following institutions will have important roles to play in the implementation of this Project:

- Environmental Protection Authority: Mandated to review and approve Environmental and Social Impact Assessments (ESIAs), and monitor compliance with environmental regulations.
- Ministry of Water and Energy (MoWE)/ Ministry of Agriculture (MoA): This will be the primary government body responsible for the overall coordination, management, and execution of the W4F project.
- Regional Bureaus of Water, Agriculture, and Environmental Protection: Responsible for contextualizing project activities, and monitoring at the regional and woreda (district) levels.
- Woreda Administrations and Kebele (Community) Authorities: Facilitate community mobilization, participation, and resolve local-level issues.
- The Grievance Redress Committee (GRC): A Grievance Redress Committee (GRC) will be put in place by the Project and will play a crucial role in the Plan’s implementation process by addressing complaints and concerns raised resulting from the Project activities.

The Climate-Proof Water for Food Project will be implemented under the Project Implementation Entity (PIE), coordinated by a Project Implementation Unit (PIU), with oversight from a Project Steering Committee (PSC). The PIU will manage day-to-day operations, ensure compliance with environmental and social safeguards, coordinate implementing partners, and monitor ESMP implementation. Implementing agencies include Gambella regional and woreda-level water, agriculture, and social affairs offices, while local kebele administrations will support community engagement and grievance redress.

The project will adhere to national legislative and regulatory requirements, including the Ethiopian Environmental Impact Assessment Proclamation, the Labor Proclamation (1156/2019), and relevant sectoral policies on water, agriculture, and social protection. Compliance with Plan International and African Development Bank (AfDB) environmental and social safeguard standards will guide ESMP implementation. Roles and responsibilities are clearly defined to ensure accountability, timely reporting, stakeholder consultation, and proper grievance management throughout the project cycle.

4. Major and Moderate Impacts

Major Impacts:

- Land clearance and vegetation loss: Approximately 60% of natural vegetation and cropland could be cleared, including useful non-timber forest products (NTFP) species, and small fauna displaced and spread of invasive plants or animals. The project area includes Sheha tree (vulnerable species), whose habitat may be affected.
- Soil erosion and sedimentation: Construction of water infrastructure may increase localized soil erosion rates by 20–30% if not mitigated.

- Water quality risks: Increased turbidity and sediment loads in nearby streams during construction; risk of exceeding local water quality standards for TSS (Total Suspended Solids).
- Health risks: Potential rise in water-borne diseases (diarrhea, cholera) and vector-borne diseases (malaria) due to temporary water stagnation during construction.
- Displacement and land acquisition: 15–20 households may require resettlement or compensation; about 40 ha of cropland may be affected.

Moderate Impacts:

- Noise and dust pollution: Temporary increases in dust and noise levels during construction, potentially exceeding local occupational exposure limits.
- Disturbance to wildlife: Minor disruption to habitats of small mammals, birds, and fish species in affected streams, but no other globally endangered species identified within the immediate project footprint.
- Socio-economic effects: Temporary disruption of local market activities and access roads in 8 kebeles; minor short-term livelihood impacts for farmers during construction.
- Community health and safety: Increased traffic and machinery operations may pose moderate risk of accidents to workers and residents if safety protocols are not strictly followed.
- Gender and social dynamics: Temporary labor influx may increase risks of gender-based violence (GBV) or social tensions, particularly in construction camps.

5. Consultations

Stakeholder consultations were conducted across the project’s influence area, beginning from regional level water and agriculture sector officials and experts. In addition, representatives from the eight Kebeles of Tata, Okuna, Penkiew, Nykwo, Drong, Winkey, Kutogn, and Nib Nib, in the five Woredas of Gog, Abobo, Abol, Itang, and Lare, were consulted. The process involved community focus group discussions, and interviews with key stakeholders, including local community members, farmers, women’s and youth groups, elders, Kebele and Woreda officials, and the project implementation team. During these consultations, potential risks and impacts were presented, such as land acquisition and loss of cropland, habitat disruption affecting the Sheha (*Vitellaria paradoxa*) tree and other local flora, health and safety risks during construction, temporary disruption of livelihoods, lack of willingness for new projects (by some community members), and potential gender-based violence linked to labor influx.

Community members raised concerns regarding compensation for affected households, protection of local forests and endangered species, safety of women and children near construction sites, access to clean water, and employment opportunities for local youth. In response, the developer committed to design an Environmental and Social Management Plan (ESMP) addressing environmental and health risks, establishing an accessible Grievance Redress Mechanism (GRM), adopting gender-sensitive workforce policies, and promoting local employment and capacity-building initiatives for the affected communities.

6. Environmental and Social Management Plan (ESMP)

The W4F Project has developed a comprehensive Environmental and Social Management Plan (ESMP) to mitigate identified environmental and social risks and ensure sustainable project implementation.

- **Specific measures addressing significant/moderate impacts:**
 - Implement reforestation programs and biological offsets in areas affected by construction.
 - Protect endangered Sheha trees and other critical natural habitats during project activities.
 - Restore cleared vegetation and rehabilitate construction sites upon completion of works.
 - Control dust, noise, and vibration during drilling, excavation, and heavy vehicle movement.
 - Manage solid and liquid wastes using the 3Rs principle (reduce, reuse, recycle) and designate proper disposal sites.
 - Apply erosion control, drainage, and groundwater recharge measures to prevent waterlogging and groundwater depletion.
 - Implement conflict resolution mechanisms for water use among communities.
- **Environmental, Occupational Health, and Safety (EOHS clauses to be included in works contracts)**
 - General Hygiene, Health, and Safety (HHS) rules on construction sites.
 - STD/HIV awareness programs for workers and nearby communities.
 - Management of employee-community interactions, with emphasis on protection of minors and vulnerable groups.
 - Promotion of gender equity, prevention of gender-based violence (GBV), sexual exploitation, and abuse (SEA).
 - Procedures for managing “chance finds” of archaeological or cultural significance.
- **Capacity-building measures:**
 - Training of project staff, contractors, and local stakeholders on environmental and social safeguards.
 - Awareness sessions for communities on water resource management, hygiene, and GBV prevention.
 - Technical training for operation and maintenance of water infrastructure.
- **Resettlement Action Plan (RAP) main provisions:**
 - Compensation for affected land, crops, and property based on valuation.
 - Relocation assistance for displaced households.
 - Livelihood restoration programs, including skill development and employment opportunities linked to project activities.
 - Special support for vulnerable groups (women-headed households, elderly, disabled, landless).
 - Grievance redress mechanism specific to resettlement issues.

All the measures are intended to prevent, minimize, remedy, or compensate for significant negative impacts identified during the ESIA process, while also enhancing positive outcomes such as environmental and social benefits. In this context, mitigation measures encompass both operational controls and management actions. Where significant impacts are identified, a hierarchy of mitigation options is carefully considered.

Hierarchy of options for mitigation

- **Avoidance:** Completely prevent the impact by not proceeding with the activity or by changing the project's design, location, or process.

- **Minimization (or Reduction):** Reduce the intensity, extent, or duration of the unavoidable impact through modified design, technology, or operational practices.
- **Rectification (or Restoration):** Repair, rehabilitate, or restore the affected environment after the impact has occurred.
- **Compensation (or Offset):** Compensate for residual, unavoidable impacts by providing substitute resources or benefits to the affected environment or community. This is a last resort.

Impact Mitigation Measures

Mitigation measures were developed to prevent, reduce, control, or compensate for potential adverse impacts of the Proposed Project, while enhancing positive effects. The goal is to reduce impacts to **as low as reasonably practicable (ALARP)** and maintain the climate-smart integrity of the environment. Measures were identified based on potential effects on the environment, society, and human health and safety, considering site conditions, available resources, public concerns, and technology options. They were informed by baseline assessments, field observations, stakeholder consultations, and expert discussions.

The impact assessment matrix rated most impacts as Medium or Low, and corresponding mitigation strategies were proposed with expected residual ratings. Priority is given to addressing impacts at their **source** (avoidance and reduction) before applying compensatory or offset measures to minimize residual effects.

Significance Matrix

Impact → Probability ↓	Insignificant	(Minor)	Moderate	Major	Catastrophic
(Almost Certain)	Low	Medium	High	High	High
Likely	Low	Medium	Medium	High	High
Possible	Low	Medium	Medium	Medium	High
Unlikely	Low	Medium	Low	Medium	Medium
Rare	Low	Medium	Low	Low	Low

Impact Significance and Management Approach

- **High (Unacceptable):** These impacts must be mitigated immediately. Project operations cannot proceed until the risk is reduced. They require a dedicated management plan, substantial resources, and continuous or daily monitoring.
- **Medium (Tolerable):** These impacts require targeted mitigation measures and adherence to standard procedures. They must be monitored on a regular basis (e.g., weekly or monthly).
- **Low (Acceptable):** These impacts can be managed through routine operational procedures and require only periodic monitoring or audits (e.g., quarterly).

The management approaches should be performed based on the actions indicated in the Environmental and Social Management Matrix, and implementation arrangements.

Environmental and Social Management Matrix

Project Activity	Potential Environmental impacts	Proposed Mitigation Measures	Institutional Responsibilities	Implementation schedule (Time frame)	Costs(in USD)	Key Performance Indicator
Pre-Construction Phase						
Land acquisition and Ownership transfer	Taking land permanent and temporary, restrict land use right of the owners	<ul style="list-style-type: none"> • Before the implementing the infrastructure consult the public on the land acquisition process. • Replace the same types of land use for the land owner • Provide adequate compensation for the property loses and damages 	Woreda and Kebele Administrations	During pre-construction phase	In-kind compensation, Voluntary land provision	Public consultation minutes signed by community representatives and Land transfer agreements finalized before construction
Construction Phase						
Vegetation clearing	Vegetation clearing impacts	<ul style="list-style-type: none"> • Involvement of local committees in tree planting at the village level is recommended for sustainability after the contractor has left. • Landscaping of the site and project areas. • Planting of trees and rehabilitating the construction site once construction is over. • The design to consider protecting the old standing native trees as much as possible. 	Woreda agricultural and natural resource office, Community	Construction phase	20,000	No clearing of protected native trees; survival rate of planted vegetation after one year
Excavated soil and dust impacts	Dust emission	<ul style="list-style-type: none"> • Ensure construction site watering. • Limit vehicles speed. 	Contractor	Construction phase	4,000	Watering logbook maintained and verified daily
	Disperse excavated soil from quarry site	<ul style="list-style-type: none"> • Ensure proper handling and maximize re-use of all excavated soils and materials in the project construction works. • Dispose surplus materials at designated sites 	<ul style="list-style-type: none"> • Contractor • Kebele administration 	Construction Phase	3,000	Disposal sites approved by Kebele administration with no off-site dumping
Drilling of borehole and movement of heavy duty vehicle	Noise pollution and Vibration	<ul style="list-style-type: none"> • Maintain all its work equipment at optimal operating conditions. • Restrict all activities during day time. • Employ water spraying 	<ul style="list-style-type: none"> • Contractor • Woreda Water and Energy Bureau 	Construction Phase	3,000	Noise levels at nearest sensitive receptor within local standards

Drilling wells	groundwater contamination and other related impacts	<ul style="list-style-type: none"> • Drain immediate surroundings of water wells to avoid infiltration of contaminated water. • restore the site affected by drilling to its initial condition; • Dry drilling fluid of the site, mix with earth and spread over the site. • Construct properly designed and water tight well heads with proper pump sealing to well heads. • Pump and other equipment submerged into wells need initially disinfected and at each extraction. 	<ul style="list-style-type: none"> • Contractor 	Construction Phase	Project budget	Post-construction water quality test meets potable standards
Workers Health and Safety	Occupational health and safety hazards (injuries, accidents)	<ul style="list-style-type: none"> • Provision of PPEs to all personnel working in potentially hazardous areas or with potentially hazardous equipment. • Conduct safety training for workers prior to beginning work. 	<ul style="list-style-type: none"> • Contractor 	Construction Phase	2,500	100% of workers using appropriate PPE during random inspections; Safety training attendance records for 100% of workforce.
Waste management	Poor Waste Management and Pollution	<ul style="list-style-type: none"> • Manage the wastes based on the three Rs (reduce, re-use, recycle) • Providing training for all contractor's personnel • Minimize the production of waste that must be treated or eliminated • Control placement of all construction waste to disposal sites • Identify and demarcate equipment maintenance areas (>15m) 	<ul style="list-style-type: none"> • Contractor • Kebele administrator 	Construction Phase	Contractors' Overhead	Designated waste collection and disposal sites are clean and organized
Labor handling	Labor risks involving working conditions, management of worker relationships, child labor and minimum age, and labor grievance	<ul style="list-style-type: none"> • Introduce the GRM • Implement LMP 	<ul style="list-style-type: none"> • Contractor • Woreda Social affair office • Kebele administrator 	Construction Phase	Part of project budget	GRM is operational and accessible to all workers; 100% of workers have signed contracts adhering to national labor laws
	Gender-based violence, sexual	<ul style="list-style-type: none"> • Put in place a functioning GRM for workplace complaints at the project site. 	<ul style="list-style-type: none"> • Contractor 	Construction Phase	Part of project budget	Confidential GBV/SEA/SH

	exploitation and abuse, and sexual harassment (GBV/SEA/SH)	<ul style="list-style-type: none"> • Address complaints in timely and appropriate manner using the GRM and legal channels. 	<ul style="list-style-type: none"> • Woreda Women and Social Affair • Kebele administrator 			reporting procedure is displayed and communicated to all workers
Operation Phase						
Supply of drinking water for domestic use and animal	Waterborne and Water Related Health Impacts	<ul style="list-style-type: none"> • Promote waterborne and water related disease control and prevention. • Provide safe water supply for the intended communities to promote domestic uses and enable to keep personal hygiene. • Monitor and prevent releases and leakage of materials/pipeline with the potential to pollute water. • Protect the entrance of animals within fence on the water point, • Reduce the mobility of the user by shift arrangement. 	<ul style="list-style-type: none"> • Woreda water and energy office • Water users committee, • Kebele administration • Beneficiary. • Health personnel 	Operation phase	8,000	Regular water quality tests confirm safety for drinking; Fence around water point is functional and maintained.
Water Supply system	Water logging	<ul style="list-style-type: none"> • Provision of surface or sub-surface drainage systems. • Avoid excess application of water by providing basic training on the utilization and management of water. • Regular maintenance of pipes and canals to control seepage losses is an important control measure. 	<ul style="list-style-type: none"> • Woreda water and energy office • Woreda health office • Water user committees 	During Operation phases	15,000	No observed water logging or ponding around infrastructure
Improper water use	Impacts of overflow of water	<ul style="list-style-type: none"> • Form Water Users committee of the beneficiaries. • Maintain Economic Sustainability of the water. • Maintain Technical Sustainability. • Maintain Institutional Sustainability. • Strengthen schemes operation monitoring and evaluation. 	<ul style="list-style-type: none"> • Water users committee, • Woreda water sector, • beneficiary 	Operation phase	10,000	Annual technical audit of the system confirms functionality
Sustainability of the Groundwater	Lowering the ground water table	<ul style="list-style-type: none"> • Enhancing groundwater recharge by applying soil and water conservation works, tree planting, and reduce contamination of water 	<ul style="list-style-type: none"> • Woreda water, mining and energy office, • Water User Committee 	Operation phase	22,000	Annual monitoring of groundwater levels shows stable or recovering trends

Conflict on water source	Affect sustainable use of water for the community	<ul style="list-style-type: none"> • Community consultation on the water utilization, and management • Implement the local conflict resolution mechanism at early stage by the elders and clan leaders, • Form stakeholders committee with responsibilities, in which any communal resource use among beneficiaries shall be guided by the committee; and • Promote community awareness; 	<ul style="list-style-type: none"> • Woreda administration, • Woreda Water Resource Development Office, • Kebele development committee 	Operation phase	15,000	Zero unresolved conflicts reported to Woreda authorities per year
Agricultural activity	Dust emission during ploughing	<ul style="list-style-type: none"> • Wetting of field during field clearing, • workers provided eye shields and masks 	<ul style="list-style-type: none"> • Woreda Agriculture Office • Agriculture officer 	Operation phase	3,000	PPE is available and used by workers during dusty operations; No complaints from adjacent communities about agricultural dust
Agricultural activity	Oil and grease drops from the farm machinery will contaminate the soil and	<ul style="list-style-type: none"> • Carry out periodic pre-mob of machinery • Ensure that equipment and Machine are kept in good working condition 	<ul style="list-style-type: none"> • Woreda Agriculture Office • Driver 	Operation phase	3,000	Pre-operation checklists are maintained for all machinery.

Environmental Monitoring Matrix

The Environmental Monitoring (EM) matrix outlines key parameters (air and water quality, soil health, biodiversity, and community and occupational safety) along with monitoring methods, frequency, responsible institutions, and reporting mechanisms. It is essential for systematically tracking potential environmental and social impacts, ensuring compliance with regulations and safeguard standards, and enabling timely corrective actions. By providing clear responsibilities and schedules, the matrix supports sustainable project implementation, protects ecosystems and public health, and enhances accountability to stakeholders.

The Environmental Monitoring Matrix

Code	Parameter to Monitor	Sampling Method / Approach	Frequency / Cost	Responsibility	Reporting
EM-01	Air quality (dust, PM ₁₀ , PM _{2.5})	Field measurements using portable air quality meters; visual inspection of dust suppression measures	Monthly; budgeted under contractor's EOHS costs	Regional EPA, PIU	Monthly site report; consolidated quarterly report to PIU/Authority
EM-02	Noise and vibration levels	Noise meters at sensitive receptors (schools, hospitals, communities)	Quarterly; included in contractor's site monitoring costs	Regional EPA, PIU	Same as above
EM-03	Surface and ground water quality (pH, turbidity, oil/grease, BOD/COD, heavy metals)	Grab sampling; analysis in accredited laboratory	Quarterly; lab analysis costs in monitoring budget	Regional EPA, Independent laboratory; PIU verification	Lab certificates attached to reports
EM-04	Soil quality (contamination, erosion, compaction)	Soil sampling and laboratory analysis; visual inspection of erosion control	Semi-annual; moderate budget	Regional EPA, PIU	Semi-annual report
EM-05	Vegetation/land cover (reforestation success, offset programs)	Transect surveys; % survival rate of planted trees	Bi-annual; cost included in reforestation program budget	Community monitors; PIU, Regional and Woreda Agriculture Bureau, Kebele head	Annual reforestation monitoring report
EM-06	Wildlife/biodiversity (if relevant to project area)	Field observation, camera traps, local knowledge	Annual; external specialist budget	Regional EPA; Regional and Woreda Agriculture Bureau, PIU	Annual biodiversity report
EM-07	Occupational health & safety (accidents, incidents, PPE use)	Daily logbooks; incident reports; random inspections	Continuous; cost covered under EOHS	EPA, Regional and Woreda H&S officer, PIU	Weekly & monthly reports
EM-08	Community health & safety (traffic safety, communicable disease awareness, GBV/SEA complaints)	Surveys, health statistics from local clinics, grievance redress log	Quarterly; included in RAP/GBV program costs	Regional and Woreda Social affair bureau, PIU	Quarterly monitoring reports

Risk Management Matrix

The Risk Management Matrix provides a structured overview of potential hazards associated with the project, including their nature, severity, preventive measures, and response actions. It assigns clear responsibilities for monitoring, alerting, and supervising each risk, covering areas such as construction safety, environmental pollution, social issues, and resettlement impacts. This matrix is crucial for proactively identifying and mitigating risks, ensuring the safety of workers and communities, maintaining regulatory compliance, and enabling rapid, coordinated responses to incidents to minimize negative impacts on people, the environment, and project outcomes.

Risk Management Matrix

Code	Event	Risk Nature / Description	Risk Level	Prevention Measure	Preparedness / Management Action	Alert Notification Officer	Supervision
RM-01	Accidents on construction site	Injuries due to unsafe equipment use, lack of PPE	Medium	Strict enforcement of H&S rules; daily safety briefings; PPE provision	First aid response; emergency evacuation plan; referral to hospital	Contractor H&S Officer	PIU Environmental & Social Specialist
RM-02	Air & noise pollution	Excessive dust, PM ₁₀ , noise above permissible limits	Medium	Water spraying; noise barriers; equipment maintenance	Stop works during peak complaints; provide protective gear to workers	Contractor EOHS Officer	Environmental Specialist (PIU)
RM-03	Soil erosion & sedimentation	Runoff from cleared land affecting rivers and farmland	Medium	Erosion control (silt fences, terracing, vegetation cover)	Rapid stabilization; rehabilitation of affected areas	Site Engineer	PIU Environmental Specialist
RM-04	Water pollution	Accidental spills of oil, chemicals, or construction waste	Medium	Secure storage of hazardous materials; spill kits available	Immediate containment; notify authorities; cleanup and remediation	Contractor Environmental Officer	Independent Environmental Auditor
RM-06	Gender-based violence (GBV) / SEA	Sexual exploitation or harassment by project workers	Medium	GBV Code of Conduct; awareness training; confidential reporting channels	Activate GBV Action Plan; support services for survivors	Contractor Social Officer	PIU Gender/GBV Specialist
RM-07	Child labor or exploitation of minors	Employment of underage workers or abuse of vulnerable persons	Medium	Age verification for all workers; strict hiring rules	Immediate dismissal; referral to child protection services	Contractor HR Manager	PIU Social Specialist
RM-08	Resettlement & livelihood disruption	Loss of land, crops, or access to resources	Medium	Implement RAP; timely compensation; livelihood restoration	Grievance redress; targeted support for vulnerable households	RAP Implementation Officer	PIU Resettlement Specialist

Grievance Redress Mechanism (GRM) Matrix

The Grievance Redress Mechanism (GRM) include a multi-level structure for receiving, addressing, and resolving complaints related to the project, ensuring accountability, transparency, and community participation. It operates across four levels: Kebele, Woreda, Regional, and Federal, each with defined committee members, roles, and responsibilities.

Grievance Redress Mechanism Matrix

Structure	Responsible Grievance Redress Committee	Composition of Committee	Grievance Redress Committee Task	Location of the Committee
Level I – Kebele Level	Local Grievance Redress Committee (Local GRC)	Kebele head, the village development committee chairperson, the youth representative, the religious leader, the women representative	<ul style="list-style-type: none"> • Receive and register a grievance/complaint at the site. • Investigate and internally review the grievance/complaint. • Propose a resolution for the grievance/complaint. • Report the grievance/complaint and proposed resolution to the Woreda level 	Kebele (Lower administration)
Level II- Woreda Level	Woreda Grievance Redress Committee (Woreda GRC)	Woreda Administrator, Water and Energy Office Head, Agriculture Office Head, Women and Social Affair Office Head	<ul style="list-style-type: none"> • Establish a procedure for receiving and logging complaints. • Resolve disputes and verify grievances and their merits. • Communicate decisions to complainant and provide necessary documentation. • Implement and monitor redress actions. • Record grievances, categorize them, and prioritize those to be resolved by the Committee • Maintain records, including registers, meeting minutes, and correspondence, for reference and inspection. • Document all received complaints and the progress of remediation for future reference. • Report to the Regional Level where grievances cannot be handled at the Woreda level. 	Woreda
Level III: Regional Level	Regional Grievance Redress Committee (Regional GRC)	Regional Focal Person, Regional Water Bureau Water and energy head, Regional Agriculture Head, Regional Women and Social Affair Head, Regional Environmental Protection Authority Head	<ul style="list-style-type: none"> • Records, categorizes, and prioritizes all grievances, focusing on those requiring immediate resolution. • Resolve disputes and verify grievances and their merits. • Communicate decisions to complainant and provide necessary documentation. 	Region

			<ul style="list-style-type: none"> • Maintains comprehensive records—including registers, meeting minutes, and correspondence—to ensure transparency and accountability. • All received complaints and the progress of their remediation are documented for future reference. • Escalating complaints it cannot resolve at the regional level to Federal Level. 	
Level IV: Federal Level	Federal Grievance Redress Committee (Federal GRC)	Ministry of Water and Energy, Ministry of Agriculture, and Federal Environmental Protection Authority (EPA), Ministry of Women and Social Affairs	<ul style="list-style-type: none"> • Records, categorizes, and prioritizes all grievances, focusing on those requiring immediate resolution. • Resolve disputes and verify grievances and their merits. • Communicate decisions to complainant and provide necessary documentation. • Maintains comprehensive records—including registers, meeting minutes, and correspondence—to ensure transparency and accountability. • All received complaints and the progress of their remediation are documented for future reference. 	Federal

ESMP Implementation, Monitoring, and Institutional Arrangements

Key indicators will be monitored to assess the effective implementation of the ESMP, including: (1) the number of native and endangered trees, such as the Sheha tree, planted or conserved; (2) the number of households resettled and fully compensated according to the RAP; (3) compliance rates with EOHS and GBV/SEA/SH measures on-site; (4) water quality standards at beneficiary points; and (5) local employment uptake and capacity-building completion among project staff and contractors. An independent, locally empowered, and accessible Grievance Redress Mechanism (GRM) will be established at the project level to ensure timely resolution of complaints and concerns raised by affected communities or workers.

The Project Implementation Entity (PIE) and Project Implementation Unit (PIU) will have clearly defined roles and responsibilities to ensure efficient enforcement of the ESMP, supported by temporary and permanent committees as required. These bodies will oversee all aspects of environmental and social management, including monitoring, auditing, and reporting.

ESMP Implementation Institutional Arrangements

Level/ Responsible Party	Roles and Responsibilities
Federal Level (MoWE, MoA)	<ul style="list-style-type: none"> ❖ Provide support, oversight, and quality control to the PIUs staff, RPCU, and WPCU staff working on environmental and social risk management. ❖ Collect, review, and provide quality assurance and approval to screening reports and ESMPs as relevant. Keep documentation of all project activity progress. ❖ Oversee overall implementation of the Environmental and Social Risk Management (ESRM) instruments and monitor the environmental and social mitigation measures and management activities, compile progress reports from PIUs, and report to the AfDB and Plan International on a quarterly basis. ❖ Train the key implementing partners' staff at federal and regional levels, Woreda level staff, and some contractors who will be responsible for implementing the ESMP and other instruments during project implementation. ❖ If contracting is managed at federal level, ensure that all bidding and contract documents include all relevant E&S management provisions. ❖ Support the regional and Woreda level experts in organizing capacity building programs. ❖ Disclose this ESIA, and other instruments to the public/stakeholders. ❖ Facilitate and provide training for sector office experts and E&S experts at regional and woreda levels.
FEPA	<ul style="list-style-type: none"> ❖ Reviewing and provide approval of ESMP related to the W4F. ❖ Facilitate and provide training for the staff of Implementing Agencies, and E&S experts at federal and regional levels.
Regional Bureaus (Water and Energy Bureau, Agriculture Bureau)	<ul style="list-style-type: none"> ❖ Coordinate and facilitate the execution of project activities, oversee the monitoring of environmental and social risk mitigation measures, and provide monthly progress and performance reports to the respective PIUs/TCs as relevant. ❖ When managing contracting at the regional level, make sure that all bidding and contract documents contain all necessary E&S risk management provisions.

	<ul style="list-style-type: none"> ❖ Offer training to contractors on pertinent environmental and social risk mitigation measures in consultation with Regional Environmental Protection Authority (REPA).
Regional EPA (REPA)	<ul style="list-style-type: none"> ❖ Review and clear screening reports submitted by implementing sector bureaus. ❖ Review the preparation of ESMPs by consultants where required, review and clear ToR, review and clear ESMPs and participate on public consultation activities. ❖ Oversee the execution of environmental and social risk mitigation measures by the sector offices at the regional level and local contractors. ❖ Deliver capacity-building training and additional technical assistance, as required, to regional and woreda level experts and E&S safeguard focal persons.
Woreda Offices (Water and Energy Office, Agriculture Office)	<ul style="list-style-type: none"> ❖ Oversee day-to-day implementation and monitoring of environmental and social risk and impact mitigation measures, and reports progress and performance to the RPCU on a monthly basis. ❖ Oversee implementation of this ESMP and other project specific environmental and social instruments at Woreda level.
Local contractors	<ul style="list-style-type: none"> ❖ Adhere to the environmental and social mitigation and management measures outlined in the ESMPs, and contract documents of the project, in addition to complying with relevant national and local laws. ❖ Implement all essential measures to safeguard the health and safety of workers and community members, and prevent, reduce, or address any environmental damage arising from project operations. ❖ Ensure complete adherence to AfDB Operational Safeguard Policy.

Estimated Budget for ESMP Implementation and Monitoring

The E&S management mechanism is crucial to prevent adverse impacts and potential risks to society and the environment that emanate from the implementation of project activities. Hence, the E&S management instruments serve to ensure sustainability of project interventions. This indicative budget includes cost for the following activities of the environmental and social measures.

- ✓ Management, implementation, monitoring (staffing and operation).
- ✓ Training and capacity building.
- ✓ E&S auditing.

The estimated overall budget for full ESMP implementation, including environmental and social mitigation measures, capacity-building, monitoring, audits, and volunteer community resettlement compensations is **USD 219,000 (ETB 31, 463, 730.00)**, financed jointly by the W4F Project and its implementing partners.

Estimated budget for ESMP Implementation

No	Activity	Estimated Cost (USD)	Estimated Cost (ETB)
Management, implementation and monitoring			
1	Preparation of site-specific ESMPs and other site-specific plans	20,000	2,873,400
2	Supervision and monitoring of the implementation of site-specific ESMPs and other site-specific plans	30,000	4,310,100
3	Cost of obtaining clearances or permits	3,000	431,010
Total		53,000	7,614,510
Training and Capacity Building			
1	Training of Federal level experts and stakeholders (2 per year)	40,000	5,746,800
2	Trainings for stakeholder and Regional staff (2 per year)	20,000	2,873,400
3	Trainings for Woreda (3 per year)	30,000	4,310,100
4	Biannual Environmental and Social workshop organized by MoWE and MoA	18,000	2,586,060
5	Training materials preparation	3,000	431,010
Total Cost		111,000	15,947,370
E&S Audit			
1	Environmental and Social Audit (E&S safeguard staff)	15,000	2,155,050
2	E&S audit by external consultants	40,000	5,746,800
Total Cost		55,000	7,901,850
Grant Total		219,000	31,463,730

Conclusion and Recommendations

The Climate-Proof Water for Food Project in Gambella is critical for enhancing food security, climate resilience, and sustainable livelihoods while conserving biodiversity. The region's fertile soils, abundant water resources, and diverse ecosystems provide strong potential for climate-smart agriculture, but communities face challenges from floods, droughts, limited irrigation, and low adoption of resilient practices. Thus, for effective implementation of the project the following recommendations should be executed.

- Scale up climate-smart agriculture, including intercropping, drought- and flood-tolerant crops, and soil and water conservation techniques.
- Strengthen water resource management through infrastructure development, groundwater recharge, and community-led governance.
- Protect biodiversity and critical habitats, including reforestation and safeguarding endangered species like the Sheha tree.
- Enhance community capacity through training, awareness programs, and gender-sensitive participation.
- Ensure continuous monitoring, grievance redress, and adaptive management to mitigate environmental, social, and health risks.

CHAPTER ONE

INTRODUCTION

1.1. General Background

The implementation of the Climate Proof Water for Food (W4F) program in five woredas in the Gambella region aims to increase adaptation to extreme weather events and climate change within the agriculture and water sectors, thereby leading to a doubling of food production, increased food security, and improved access to water and sanitation. Environmental and Social impact assessment is an integral part of the study and design phase of the project by aiming at meeting the national and regional legal requirement and ensuring that the proposed project is environmentally and socially sound in ensuring sustainability.

The ESIA aligns with national legislation of EIA Proclamation No. 299/2002, Pollution Control Proclamation No. 300/2002, and Water Resources Management Proclamation No. 197/2000- alongside Ethiopia's Climate Resilient Green Economy (CRGE) Strategy, National Adaptation Plan (NAP), and Nationally Determined Contributions (NDCs). It also follows AfDB Integrated Safeguard System (ISS) and Plan International Safeguard Policies, ensuring environmental protection, social inclusivity, and equitable benefit distribution. By integrating climate adaptation, resilient WASH infrastructure, and sustainable agriculture, this ESIA provides a scientifically robust and legally compliant framework to manage risks, optimize positive impacts, and support sustainable development in flood-affected Gambella communities.

1.2. Objectives of ESIA

1.2.1 General Objective

The ESIA aimed to assess the potential environmental and social impacts of the W4F program and developed mitigation measures through a comprehensive management plan to ensure the program was implemented sustainably and in a socially responsible manner.

1.2.2 Specific Objectives

The specific objectives of the ESIA of the project are to:

- Describe the proposed project, including its components, plans, and supporting maps, figures, and tables.

- Review relevant policy, legal, and administrative frameworks and identified gaps in service provision and legislation.
- Define and justified the project study area for environmental and social assessment.
- Collect and analyzed baseline data on the physical, biological, and human environments, including interactions and societal values attached to environmental components.
- Present and analyzed project alternatives, including the “without-project” option, based on technical, economic, environmental, and social criteria.
- Conduct household surveys, focus group discussions, key informant interviews, and structured observations to assess WASH conditions, livelihoods, health, agricultural practices, and gender-specific vulnerabilities.
- Carry out hydrological, biodiversity, and climate-smart agriculture assessments.
- Engage primary and secondary stakeholders through consultations to obtain their views, ensuring safe, inclusive, and non-discriminatory participation.
- Identify, predict and evaluate adverse and beneficial environmental and social impacts of the project’s construction and subsequent operation activities.
- Propose environmental and social mitigation measures for the identified adverse impacts and recommend enhancement measures for the beneficial impacts of the projects.
- Develop environmental and social management and monitoring plans and define institutional responsibilities to guide implementation of the recommended remedial measures.

1.3. Scope of Work

The ESIA covered the environmental and social aspects of the W4F program, assessed expected inputs and outputs, and provided recommendations for sustainable implementation. The study collected and analyzed baseline data on physical, biological, and human environments, identified vulnerable groups, evaluated project alternatives, and conducted hydrological, biodiversity, and climate-smart agriculture assessments. It also assessed WASH conditions, livelihoods, health, and gender-specific vulnerabilities, engaged stakeholders.

1.4. Guiding Requirements and Principles

The ESIA for the W4F program followed international standards, national legislation, and co-financier requirements to ensure environmental sustainability, social inclusiveness, and ethical compliance. It applied Plan International’s Gender Transformative Approach, child and youth safeguarding policies, and ethical MERL framework to ensure gender sensitivity, participation, and do-no-harm practices. The assessment aligned with AfDB Environmental and Social Safeguards, Ethiopia’s ESIA Proclamation No. 295/2002, and Water Resources Management Policy, ensuring sustainable water use, flood and drought management, and ecosystem protection. It also considered Ethiopia’s commitments to international agreements, including the Convention on Biological Diversity, the Paris Agreement, and the Basel Convention. These principles ensured a participatory, rights-based, and scientifically robust ESIA, providing a strong foundation for the ESMP and long-term program sustainability.

1.5. Approach and Methodologies

The ESIA study combined desk reviews of project documents with the collection and analysis of baseline environmental and social data. It employed five interrelated data collection methods: desk review, FGDs, KIIs, structured household surveys, and field observations. The project description was developed through consultations with the technical team and a review of design documents, capturing details on the project type, purpose, location, boundaries, layout, and components, as well as its environmental, geographical, and socio-economic context. This approach provided a clear overview of the project’s activities, rationale, site characteristics, and implementation schedule across its life cycle, ensuring sufficient detail to guide the impact assessment.

1.5.1. Sampling and Data Collection Techniques

The ESIA applied stratified and purposive sampling to capture diverse population sub-groups and key stakeholders. Eight kebeles across five target woredas (Gog, Abobo, Abol, Itang, and Lare) were selected, and 160 households (20 per kebele) were randomly surveyed on socio-economic conditions, biological environment, hydrology, and climate-smart agriculture. Eight FGDs with 8–10 participants each prioritized women and marginalized groups, while 15 KIIs engaged local leaders, government officers, and facility heads. The team conducted direct observations at households, water points, health and sanitation facilities, communal areas, and biodiversity sites

to triangulate findings. Local-language enumerators facilitated interviews and FGDs to ensure inclusivity and accuracy.

1.5.1.1. Biological Environment

This biological baseline study, conducted across eight kebeles in five flood-affected woredas (Gog, Abobo, Abol, Itang, and Lare), was designed in compliance with AfDB ISS (OS3) and Ethiopian standards. The assessment documented flora, fauna, and ecosystems through a mixed-methods approach: desk reviews of ecological records, KIIs with sectoral experts, and FGDs with community representatives, including farmers, women, elders, and marginalized groups. The team evaluated biodiversity indicators such as species richness; the presence of endemic and threatened species; vegetation cover; invasive species; fauna abundance; habitat quality; and ecosystem services. Field observations were targeted to verify data on critical habitats and identify zones vulnerable to anthropogenic and flood-related pressures. This integrated methodology combined scientific data with expert and local community knowledge to ensure a comprehensive baseline assessment.

1.5.1.2. Physical Environment

The study assessed the hydrological impacts of water abstraction on downstream flows, environmental flow requirements, and cumulative water use project area. Hydrological data on rainfall, temperature, humidity, wind, and discharge were collected from Regional Water Bureaus, and supplemented with field-based water point mapping and community interviews. Rigorous quality control ensured data consistency and addressed missing values. Rainfall frequency analysis (RFA) applied extreme value theory using AMS and PoT datasets to define design storm magnitudes. Spatial inputs—including a 30 m SRTM DEM, land cover, soil data, and station records—were processed into GIS maps for catchment delineation and flood risk assessment. Participatory methods such as FGDs, community flood mapping, and co-design workshops integrated local knowledge with scientific findings.

1.5.1.3. Socio-Economic Environment

The socio-economic assessment used mixed methods. Household surveys (160 respondents) captured quantitative data on gender, WASH, and livelihoods, while FGDs (eight gender-segregated sessions) explored perceptions, roles, and adaptation strategies. Fifteen KIIs with

agricultural officers, cooperative leaders, WASH staff, and health officials provided institutional insights. Structured observations at households, farms, and facilities documented infrastructure, land use, and risks using checklists and photographs. PRA tools, including mapping and risk ranking, identified vulnerable areas and priority needs. Secondary data from policy documents and reports were used to contextualize the findings.

1.5.1.4. Climate-Smart Agriculture (CSA)

CSA data collection combined qualitative and quantitative methods. FGDs, KIIs with agricultural officers and extension agents, and participatory tools (mapping, risk ranking) captured local and institutional knowledge. Structured household surveys and farm-level assessments measured baseline agricultural practices, flood risk perceptions, cropping systems, water access and use, and farmer capacity. Observations documented soil, irrigation, drainage, and land management practices. Desk reviews of policies and reports provided alignment with national frameworks.

1.5.2. Stakeholder Engagement Plan

The team conducted one-on-one interviews to capture stakeholder expectations, concerns, and influence, while desk-based mapping identified actors by influence, interest, and relevance. Public consultations promoted inclusivity, prioritizing gender and vulnerable groups, and considered gender norms, land tenure, and resource access, identifying vulnerable households such as women-led, elderly, and child-headed. Stakeholders were classified by influence and interest: key players (high influence, high interest) were engaged closely; high-influence, low-interest groups were kept satisfied with tailored information; low-influence, high-interest groups were regularly informed; and low-influence, low-interest groups were monitored through general public disclosure.

1.5.3. Grievance Redress Mechanism

The team designed a GRM using community surveys, KIIs, and literature review. Surveys assessed community awareness, trust in institutions, and preferred reporting channels. KIIs with government officials evaluated institutional capacity, existing mechanisms, and coordination structures. Literature review examined workplace- and community-level GRM methods relevant to Climate-Proof W4F projects.

1.5.4. Typical Phase-by-Phase Risk Hotspots

The team identified environmental and social risks across project phases: pre-construction (land acquisition and conflict), construction (dust, noise, contamination, OHS, biodiversity impacts,

waste), operation (water disputes, salinity, pollution, governance, biodiversity), and decommissioning (waste, site stabilization, habitat recovery). Risks were assessed using likelihood and severity matrix, with the Risk Score calculated as Likelihood (L) × Severity (S).

1.5.5. Impact Data Analysis and Project Alternatives

The team analyzed collected data using an integrated multi-method framework to ensure triangulation and reliability. Household and field surveys were processed with descriptive statistics to identify trends in socio-economic conditions, resource use, and climate-smart agriculture practices. FGDs, KIIs, and PRA outputs were transcribed, coded, and thematically analyzed to capture perceptions, vulnerabilities, and institutional challenges. GPS and community mapping data were processed with GIS tools to visualize land use, irrigation systems, and flood-prone areas, while structured observations summarized soil health, erosion, and land management practices. Results were triangulated across methods, with gender-disaggregated analysis ensuring social differentiation. This framework also guided the analysis of project alternatives, including the “without-project” scenario, by integrating technical, environmental, social, and economic considerations to identify the most sustainable and feasible options.

CHAPTER TWO

LEGAL, REGULATORY AND INSTITUTIONAL FRAMEWORK

This section describes the legal, regulatory, and institutional frameworks most relevant to the proposed W4F Project, providing an overview of national environmental policies, EIA proclamation, and the applicable AfDB Integrated Safeguards System (ISS).

Table 1: Ethiopia's and AfDB Environmental and Social Policies and Legal Framework

Framework	Description	Relevance to W4F Project Activities
African Development Bank's Integrated Safeguards System (ISS)	The ISS provides guiding principles for all AfDB-financed projects to ensure development is socially inclusive and environmentally sustainable. It helps identify risks, reduce costs, and improve long-term project sustainability.	Guides W4F in systematically identifying environmental and social risks, ensuring safe water provision, sustainable irrigation, and protection of biodiversity and livelihoods across the five woredas and eight kebeles.
Environmental Policy of Ethiopia (1997)	Mandates consideration of environmental effects in project planning, early integration of mitigation measures, public consultation, and monitoring mechanisms.	Ensures W4F integrates environmental concerns in design and implementation, including safeguarding wetlands, forests, and endangered Sheha trees, and aligning irrigation and water supply activities with sustainability principles.
National Occupational Safety and Health (OSH) Policy and Strategy	Mitigates workplace hazards and promotes worker well-being; MoLS oversees OSH compliance across workplaces.	Ensures W4F construction and operation phases protect workers through PPE, safety training, and risk management during borehole drilling, water system installation, and agricultural activities.
The National Policy on Ethiopian Women (1993)	Promotes gender-sensitive policies, empowering women in education, property rights, and decision-making; emphasizes safe working conditions and protection from harmful practices.	Integrates gender considerations in W4F, ensuring women's participation in water committees, equitable access to water and irrigation resources, and protection from GBV/SEA risks during project activities.
National Employment Policy (2009)	Promotes social welfare by creating productive employment opportunities, ensuring decent working conditions, and harnessing labor for economic growth.	W4F generates local employment in construction, maintenance, irrigation, and community engagement activities, enhancing livelihood opportunities while promoting safe working standards.
Environmental and Social Impact Assessment Proclamation, No.299/2002	Requires ESIA approval for designated projects prior to implementation.	Provides legal basis for W4F ESIA preparation, ensuring environmental and social risks is assessed before constructing boreholes, water points, and irrigation infrastructure.
Environmental Pollution Control Proclamation, No. 300/2002	Establishes ambient environmental quality standards and ensures compliance.	Ensures W4F water systems, soil management, and agricultural practices do not pollute water sources or degrade land quality.
Solid Waste Management Proclamation, No. 513/2007	Establishes framework for proper collection, disposal, and transformation of solid waste.	Guides proper disposal of construction debris, agricultural waste, and maintenance materials at W4F sites, protecting public health and local ecosystems.
Public Health Proclamation, No. 200/2000	Promotes public health and environmental sanitation.	Ensures safe water supply for domestic and irrigation use, prevention of waterborne

		diseases, and protection of public health in the beneficiary communities.
Labour Proclamation, No. 1156/2019	Covers workplace safety, industrial relations, minimum standards, and employee protection.	Ensures occupational safety during W4F construction and operational activities, including borehole drilling, irrigation system maintenance, and labor management.
FDRE Constitution, Article 89 – Historically Underserved Communities (HUCs)	Recognizes least-advantaged communities and mandates equitable participation and benefit sharing.	Ensures W4F includes historically marginalized communities in water access, irrigation support, and livelihood benefits, mitigating disproportionate impacts of project activities.
OS1: Assessment and Management of Environmental and Social Risk and Impact	Provides a framework for identifying and managing risks and impacts across the project lifecycle.	Ensures W4F systematically assesses and mitigates risks during water infrastructure construction, irrigation activities, and community engagement.
OS2: Labour and Working Conditions	Focuses on workers’ rights, occupational health, safety, fair wages, and working conditions throughout the project lifecycle.	Guides W4F in managing worker safety during borehole drilling, pipeline installation, and agricultural interventions, ensuring fair labor practices and grievance mechanisms.
OS3: Resource Efficiency and Pollution Prevention and Management	Promotes efficient use of resources (water, energy, materials) and prevention of pollution during project activities.	Ensures W4F optimizes water use for irrigation and domestic supply, prevents contamination of water sources, manages construction waste, and monitors resource use efficiency.
OS4: Community Health, Safety, and Security	Ensures project activities do not adversely affect local communities, including health risks, road safety, and exposure to project-related hazards.	Mitigates health risks from waterborne diseases, construction accidents, and machinery, and ensures safe access to water points and irrigation systems in the W4F project area.
OS5: Land Acquisition, Restrictions on Access, and Involuntary Resettlement	Requires RAPs to manage land acquisition impacts and restore livelihoods.	This will not be triggered as there will not be involuntary resettlements. It however, should guide W4F in resettlement planning, compensation, and restoration of affected cropland and homesteads in project areas.
OS6: Habitat and Biodiversity Conservation & Sustainable Management of Living Natural Resources	Protects habitats and promotes sustainable resource use.	Ensures W4F preserves critical habitats, conserves Sheha trees, and promotes reforestation and sustainable water management in wetlands and riparian zones.
OS10: Stakeholder Engagement and Information Disclosure	Mandates stakeholder consultation and transparent information disclosure throughout the project.	Supports W4F engagement with community leaders, farmers, water users, and local authorities to co-manage water resources and ensure community acceptance of project interventions.
Plan International’s Global Policy on Gender Equality and Inclusion	Ensures gender mainstreaming, empowerment of women, and inclusion of marginalized groups.	W4F incorporates gender-sensitive measures in water committees, irrigation management, and project employment, ensuring equal participation and benefit sharing.

CHAPTER THREE

PROJECT DESCRIPTION

The African Development Fund (ADF) Climate Action Window (CAW) is a landmark, strategic financing mechanism designed to help Africa's most vulnerable countries cope with the escalating impacts of climate change. It represents a critical part of the African Development Bank Group's (AfDB) response to the climate finance gap on the continent.

The CAW is proactively rallying partners from the public and private sectors around its operationalization. The Climate Action Window includes Mitigation and Adaptation Investment Sub-windows that will support projects across six thematic sectors: agriculture and food security; water security; climate information and early warning; green transport and infrastructure; green energy and energy efficiency; and green finance. The Climate Proof Water 4 Food (W4F) program has been identified for funding under the Adaptation Sub-Window.

The Climate Proof Water 4 Food (W4F) program will take place in 5 woredas (Gog, Abobo, Abol, Itang & Lare) in Gambella region in Ethiopia. W4F seeks to increase adaptation to extreme weather events and climate change within the agriculture and the water sectors leading to a doubling of food production, increased food security and increased access to water and sanitation, through the following two components:

Component 1: Climate-smart agriculture and value chain;

Component 2: Inclusive, gender transformative, integrated flood-and drought-adapted water resource management and access.

The project will be implemented across five flood-affected woredas in the Gambela Region: Gog, Abobo, Abol, Itang, and Lare. This targeted approach addresses the specific vulnerabilities of communities living in a region characterized by seasonal flooding from the Baro River and its tributaries, interspersed with dry periods.

Context and Justification

Dual Climate Threat: The Gambela Region is uniquely affected by a climate paradox: destructive seasonal flooding that inundates farmland and settlements, followed by periods where water

scarcity hinders agricultural production and domestic use. This project directly addresses these issues.

- **Displacement and Vulnerability:** Recurrent flooding erodes livelihoods, destroys crops and infrastructure, and displaces communities, increasing their vulnerability. This project aims to break this cycle by building permanent resilience.
- **Synergistic Approach:** By integrating agriculture and water management (Components 1 & 2), the project ensures that interventions are complementary.

CHAPTER FOUR

ENVIRONMENTAL AND SOCIAL BASELINE CONDITIONS

4.1. Description of the area

The Gambella regional state lies approximately 777 kms southwest of Addis Ababa. It borders the Oromia region to the north and northeast and Southwestern Ethiopia regional state to the southeast and South Sudan to the south and west. The region has three administrative zones (Anyuak, Nuer and Majang) with a total of 13 woredas (districts), one special woreda (Itang) and one city administration (Gambella Zuria). In total the region has 262 kebeles (sub-districts). The current population of the region stands at 288,942. The project target kebeles are confined within the Anyuak and Nuer zones including Itang special woreda and Gambella Zuria administration show in figure 1. The Baro-Akobo River Basin lies in the South-Western part of Ethiopia between latitudes 5° and 10° North and longitudes 33° and 36° East. In the west the basin boundary forms an international boundary with Sudan. The basin covers parts of the Benshangul-Gumuz, Gambella, Oromia and SNNP administrative regions. It is the second largest subbasin in the Eastern Nile basin. The Eastern Nile Basin consists four sub-basins: the Baro-Akobo-Sobat (White Nile) sub-basin in the west, the Abbay (Blue Nile) sub-basin in the north, the Tekeze-Atbara sub-basin on the east and the Main Nile basin from Khartoum to the Nile delta. With a total drainage area of about 76,000 sq km, the basin ranks number eight of the 12 major river basins in Ethiopia. Both Baro and Akobo rivers border with Sudan in their downstream sections and merge to form the Sobat River, which is a major tributary of White Nile.

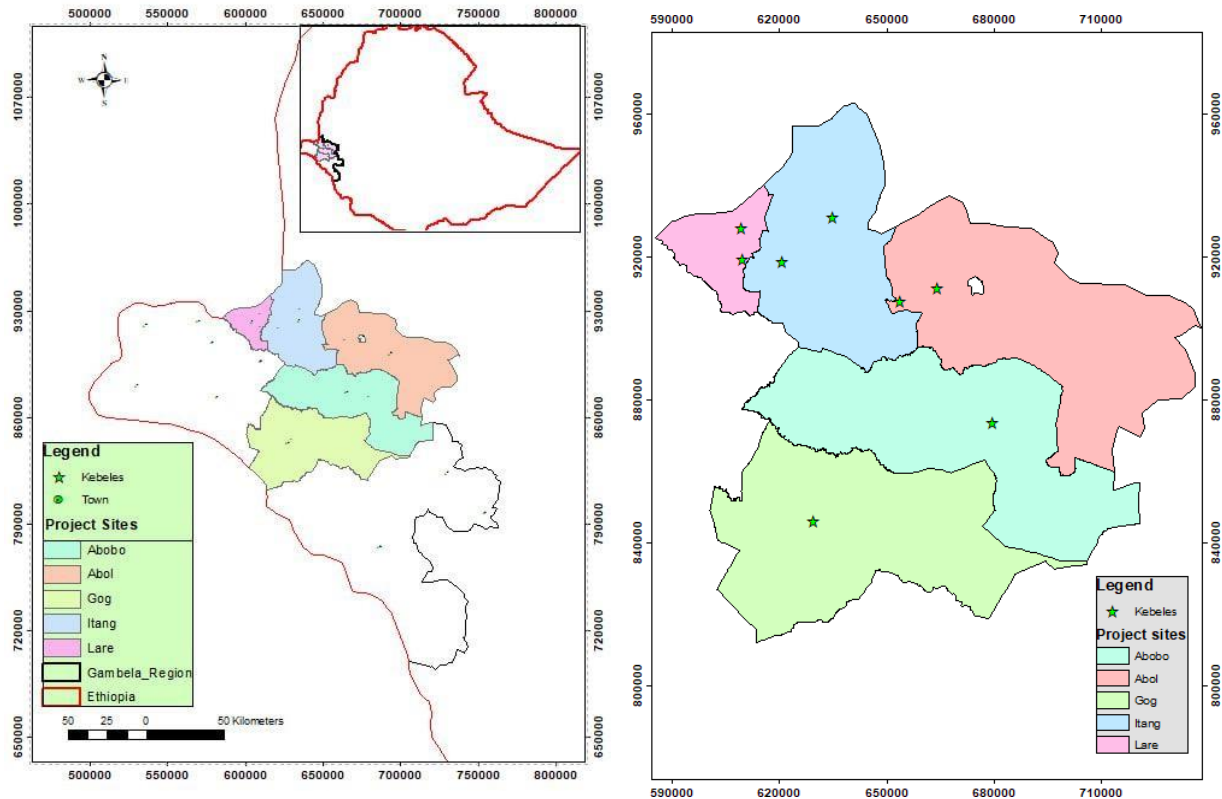


Figure 1: Location map of the project area

4.1.1. Project area accessibility

The project covers eight kebeles distributed across five target woredas: Gog, Abobo, Abol, Itang, and Lare. Accessibility to these kebeles varies considerably depending on location, road conditions, and seasonal weather patterns as shown figure 2 below. Most woredas are connected to Gambella town the regional hub through all-weather gravel or asphalt roads. However, internal connections linking kebeles are largely unpaved and become difficult to use during the rainy season. From June to September, heavy rainfall leads to flooding and road deterioration, significantly restricting mobility. Some remote kebeles may become completely inaccessible during peak flood periods. Thathata kebele is particularly affected, as the main access road is regularly closed due to flooding from Tata Lake. In terms of relative accessibility, Abobo and Abol woredas are better connected due to their proximity to the regional capital. In contrast, Gog and Lare kebeles face greater challenges, mainly due to their remoteness and the presence of extensive floodplains and river crossings.

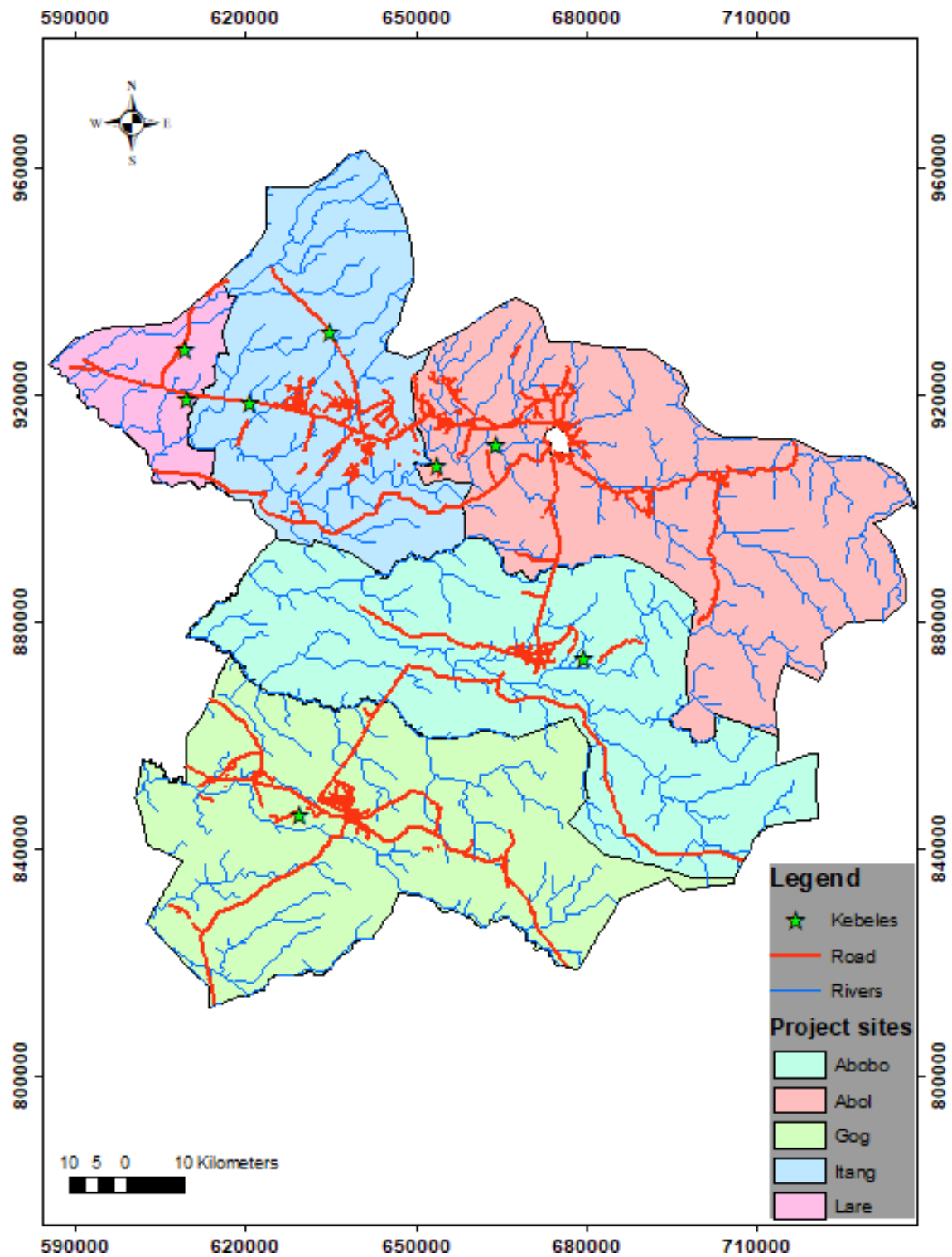


Figure 2: Accessibility of the project sites

4.1.2. Climate of the project area

The project area, covering five woredas (Gog, Abobo, Abol, Itang, and Lare) and eight kebeles (Tata, Okuna, Penkiew, Nykwo, Drong, Winkey, Kutogn, and Nib Nib) in Gambella, experiences a tropical climate with distinct wet and dry seasons. The specific indicators are described in the subsequent sections (4.1.2.1 to 4.1.2.9).

4.1.2.1. Rainfall

The rainfall pattern in the project area is highly seasonal, with a distinct wet season spanning from May to October and a long dry season from November to April. Rainfall is at its lowest during January (5 mm) and February (8 mm), gradually increasing in March (27 mm) and April (56 mm). The onset of the rainy season begins in May with a sharp rise to 156 mm, followed by sustained high rainfall through June (150 mm), July (239 mm), August (228 mm), and September (155 mm). The peak occurs in July, when rainfall reaches nearly 240 mm, creating the highest risk of flooding. After September, rainfall declines but remains relatively significant in October (113 mm) before tapering off in November (48 mm) and December (12 mm) show the rainfall pattern in figure 3 below.

This rainfall distribution has a dual effect on flood risk and water availability for agriculture. The intense rains between June and September often exceed the natural and engineered drainage capacities, leading to river overflows, floodplain inundation, and damage to settlements and infrastructure. However, these same floodwaters also contribute to soil fertility through sediment deposition and sustain natural ecosystems. From a water-for-food perspective, the rainy season generates abundant water resources that can be harnessed for irrigation and storage, ensuring food production during the dry months when rainfall is insufficient for crop growth. Effective flood management strategies and floodplain zoning can transform the challenges of peak rainfall into opportunities for improving agricultural productivity and water security.

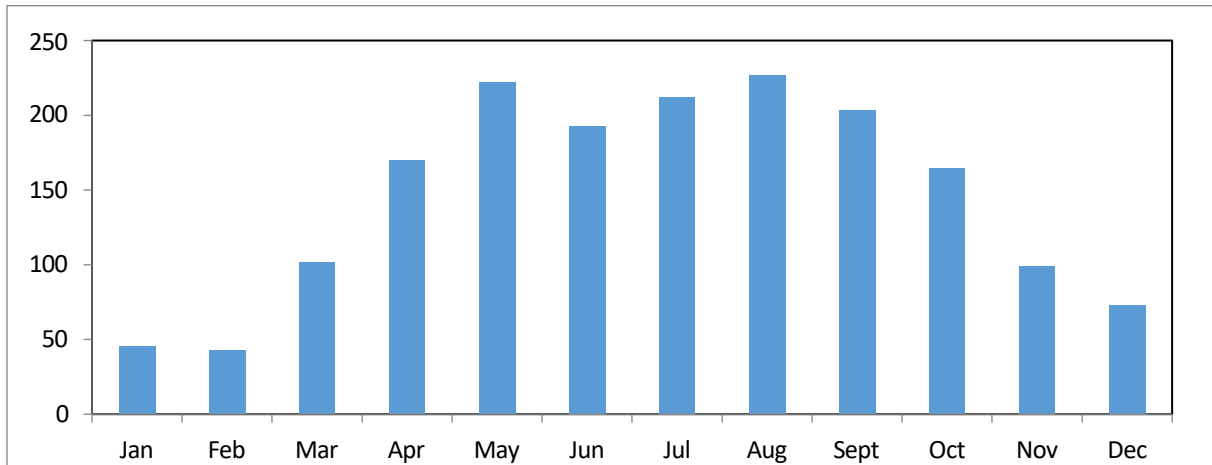


Figure 3: Mean Monthly Rainfall amount of the project area

4.1.2.2. Temperature

Temperature further shapes water demand and agricultural planning. The average minimum temperature is around 20.4°C, while the average maximum is 34.8°C. As shown in Figure 4, the hottest months are March (38.9°C) and February (38.4°C), coinciding with the end of the dry season when water scarcity is most severe. During the rainy season (June–September), temperatures are relatively lower (max 31–33°C), reducing evaporation losses and creating favorable conditions for crop growth. However, the combination of high rainfall and lower temperatures in this period increases the likelihood of flooding. Conversely, during the hot and dry months (January–April), water demand for crops rises sharply due to high evapotranspiration, while rainfall is almost negligible, underscoring the importance of irrigation and water storage to bridge seasonal gaps in the project area.

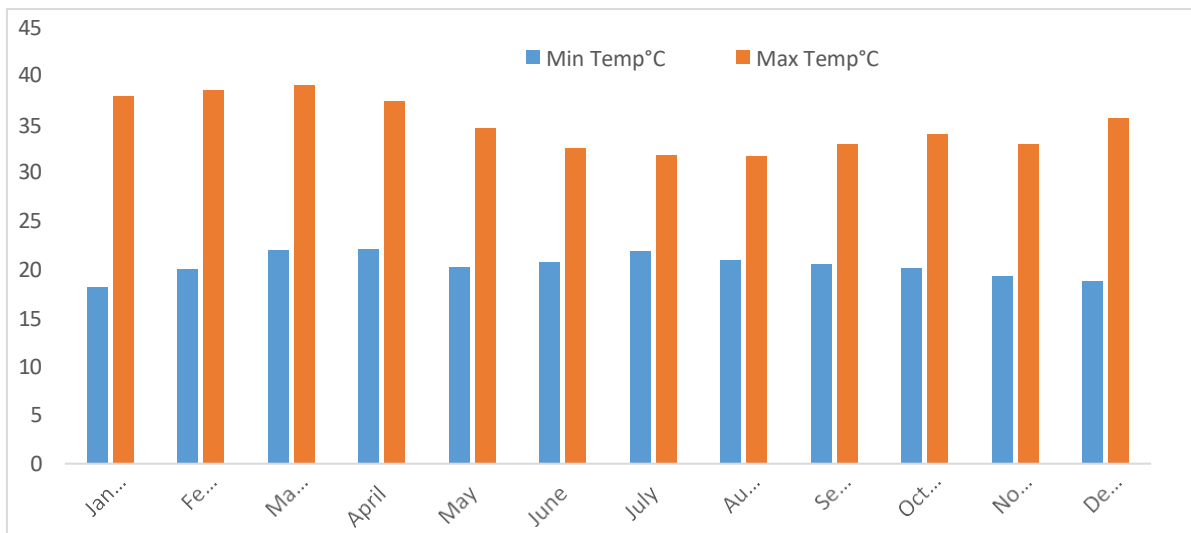


Figure 4: Mean Monthly temperature of project area

4.1.2.3. Relative Humidity

Relative humidity varies seasonally with the lowest values recorded in January–March (43–46%) during the hot, dry months when evaporation is very high and water demand increases (Figure 5). Humidity rises steadily with the onset of rains, reaching 71% in June and peaking at 79% in July and August, the same period of peak rainfall and flooding risk. After September, humidity gradually declines to 54% in December. The annual average humidity is about 61%.

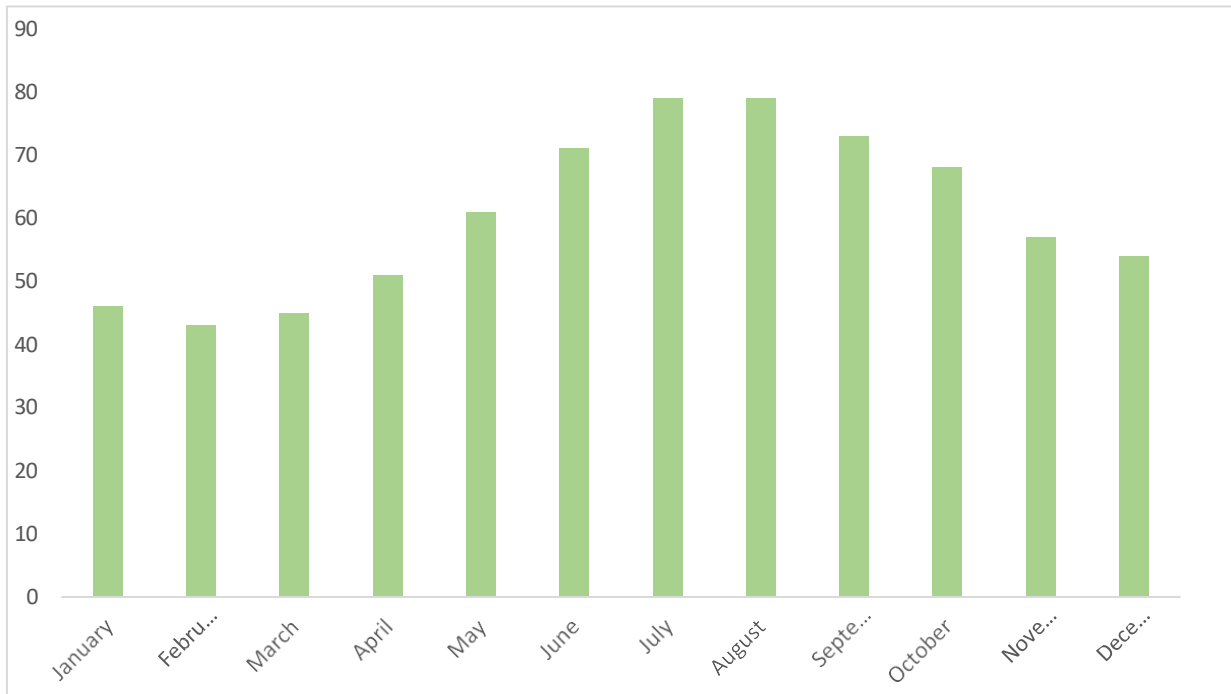


Figure 5: Mean Monthly Relative humidity of the project area

4.1.2.4. Wind Speed

As shown in Figure 6, the wind speeds range from 112 to 130 km/day, with slightly stronger winds in February, May, August–October, and November. During the dry season, winds combined with high temperatures and low humidity accelerates water loss through evapotranspiration. In the wet season, wind plays a role in enhancing rainfall distribution but also increases the spread of floodwaters in low-lying areas.

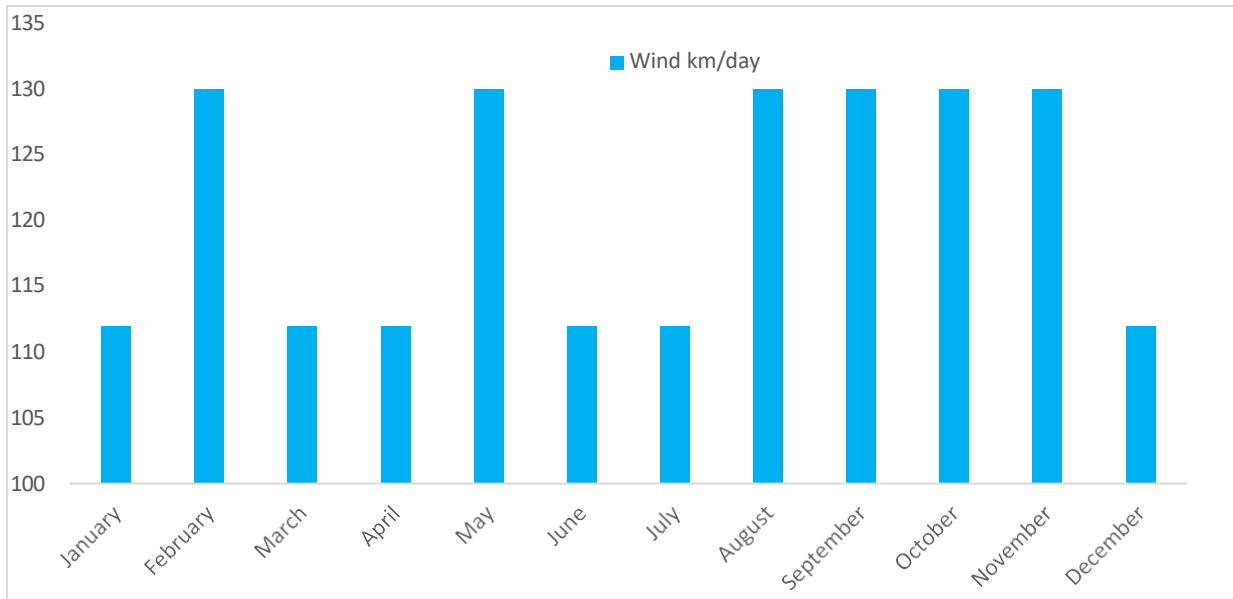


Figure 6: Monthly Wind speed of the project area

4.1.2.5. Sunshine hours

Sunshine duration is inversely related to rainfall. The dry months (January, February, November, and December) receive the highest sunshine (7–8 hours/day) (Figure 7), creating ideal conditions for evapotranspiration and irrigation-based farming. During the wettest months, sunshine is lowest dropping to only 2.5 hours/day in August reflecting heavy cloud cover and prolonged storms. Reduced sunshine at peak rainfall limits evaporation losses but can also temporarily affect crop growth rates.

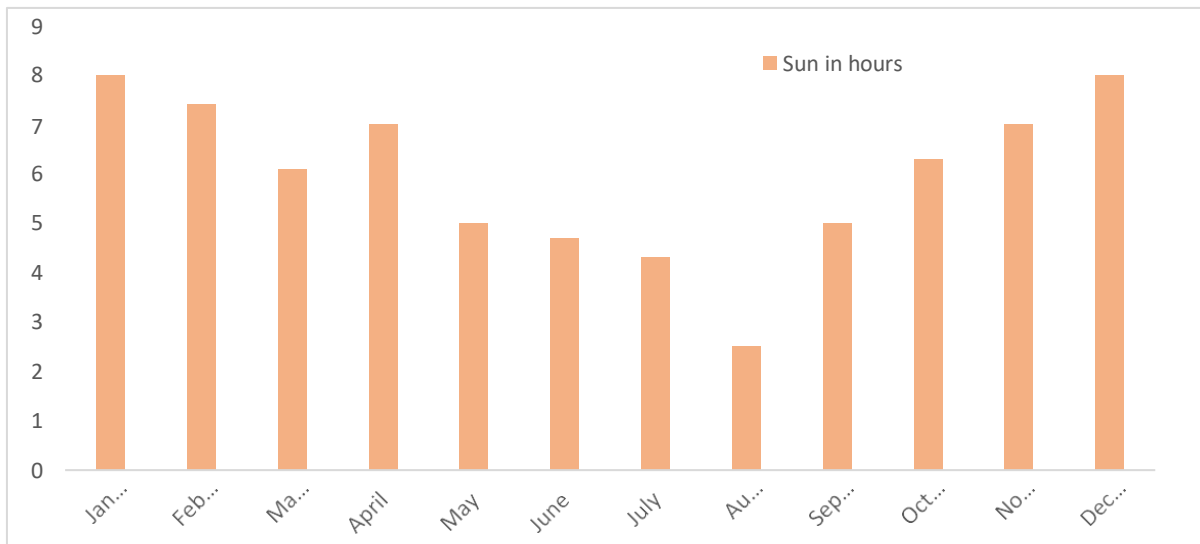


Figure 7: Monthly Sunshine hours of the project area

4.1.2.6. Water Resource

The Baro–Akobo Basin, located in the south-western part of Ethiopia, is one of the country’s richest areas in terms of water resources, with abundant surface and groundwater potential. It is primarily drained by three perennial rivers the Baro, Akobo, and Gilo along with numerous tributaries that provide consistent flow throughout the year and eventually contribute to the White Nile across the border with South Sudan.

The Baro River, the largest in the basin, supports extensive floodplains in Gambella, where seasonal flooding replenishes soil fertility, sustains wetlands, and recharges groundwater. The Akobo River, forming part of the boundary with South Sudan, and the Gilo River further enhance the basin’s hydrological network, ensuring perennial surface water availability. In addition to rivers, the basin hosts vast wetlands and floodplains that serve as natural water storage systems, regulating floods and maintaining ecological balance. Groundwater is also a vital resource, particularly in alluvial deposits and fractured rock aquifers, supporting domestic use, small-scale irrigation, and dry-season resilience. Overall, the Baro Akobo Basin holds immense potential for irrigation, hydropower generation, fisheries, and water supply, but it also faces challenges such as recurrent flooding, limited water storage infrastructure, and pressures from climate variability, highlighting the need for integrated and sustainable water resource management. Tata Lake is facing a serious water hyacinth infestation shown in figure 8 below, which threatens the ecological health of the lake and endangers its sustainability.

The Baro River is by far the larger of the two, with an annual discharge of 12,041 MCM, which is 3.7 times greater than the Gilo's 3,228.5 MCM. Both rivers exhibit a highly seasonal flow pattern typical of the Ethiopian Highlands, with a distinct low-flow period from December to March and a high-flow period from July to September; however, their peaks are offset, with the Baro peaking in August (2,711 MCM) and the Gilo peaking in September. This volatility is further highlighted by the immense variability in the Baro's flow, where its August volume is over 50 times greater than its lowest monthly flow and the monthly mean pattern flow of the two river is shown in figure 9 below, underscoring the river's dependence on seasonal rains and its potential for extreme flooding and drought conditions.



Figure 8: Lake Tata endangered in water hycine and Alwero Dam

4.1.2.7. Land Use/ Land Cover

Regarding land use and land cover, the Gambella region is notably vegetated, with extensive wetlands and major rivers meandering through vast green plains. In the highlands, dense broad-leaved forests and disturbed forest areas with scattered cultivation patches prevail, while the lowlands are predominantly covered by extensive commercial agricultural lands and grasslands interspersed with wetlands

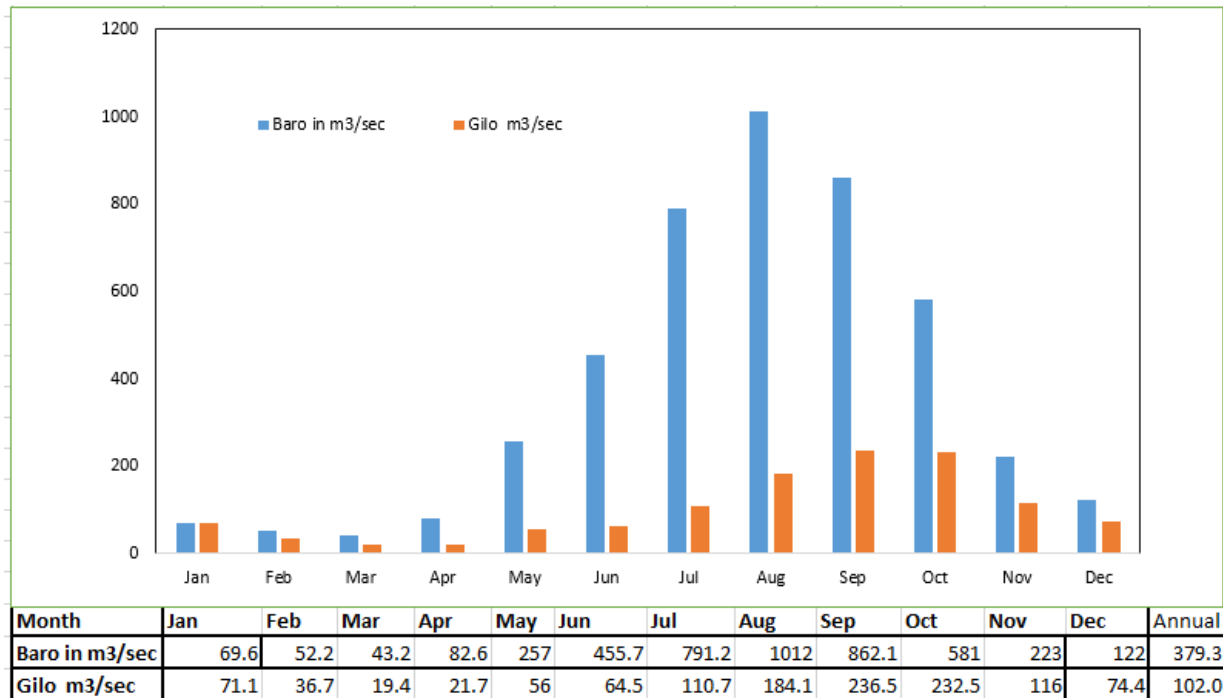


Figure 9: Baro ana Gilo Mean Monthly Flow in m3/sec

4.1.2.8. Slope of the command area

The slope of the study catchment refers to the variation in elevation across the landscape, which significantly impacts water flow, erosion, and sediment transport. In the study area, the slope plays a crucial role in determining runoff characteristics and the behavior of water within the catchment. Steeper slopes typically lead to faster runoff and higher erosion potential, while gentler slopes allow for more water infiltration and slower flow. By analyzing the slope, the catchment's hydrological response, especially during rainfall events, can be better understood. Slope data also informs decisions regarding the design of drainage systems, erosion control measures, and the identification of areas vulnerable to land degradation. This information is essential for effective watershed management, and the planning of infrastructure such as boreholes, Shallow dug well etc. The project sites in five werda catchment is characterized by different landforms which are ranged from flat plains (0-3% slope), undulating plains (3-8%), rolling land (8-15%), hilly (15-35%), steep hilly plains (35-50%) and mountainous (>50%) as shown in Figure 10.

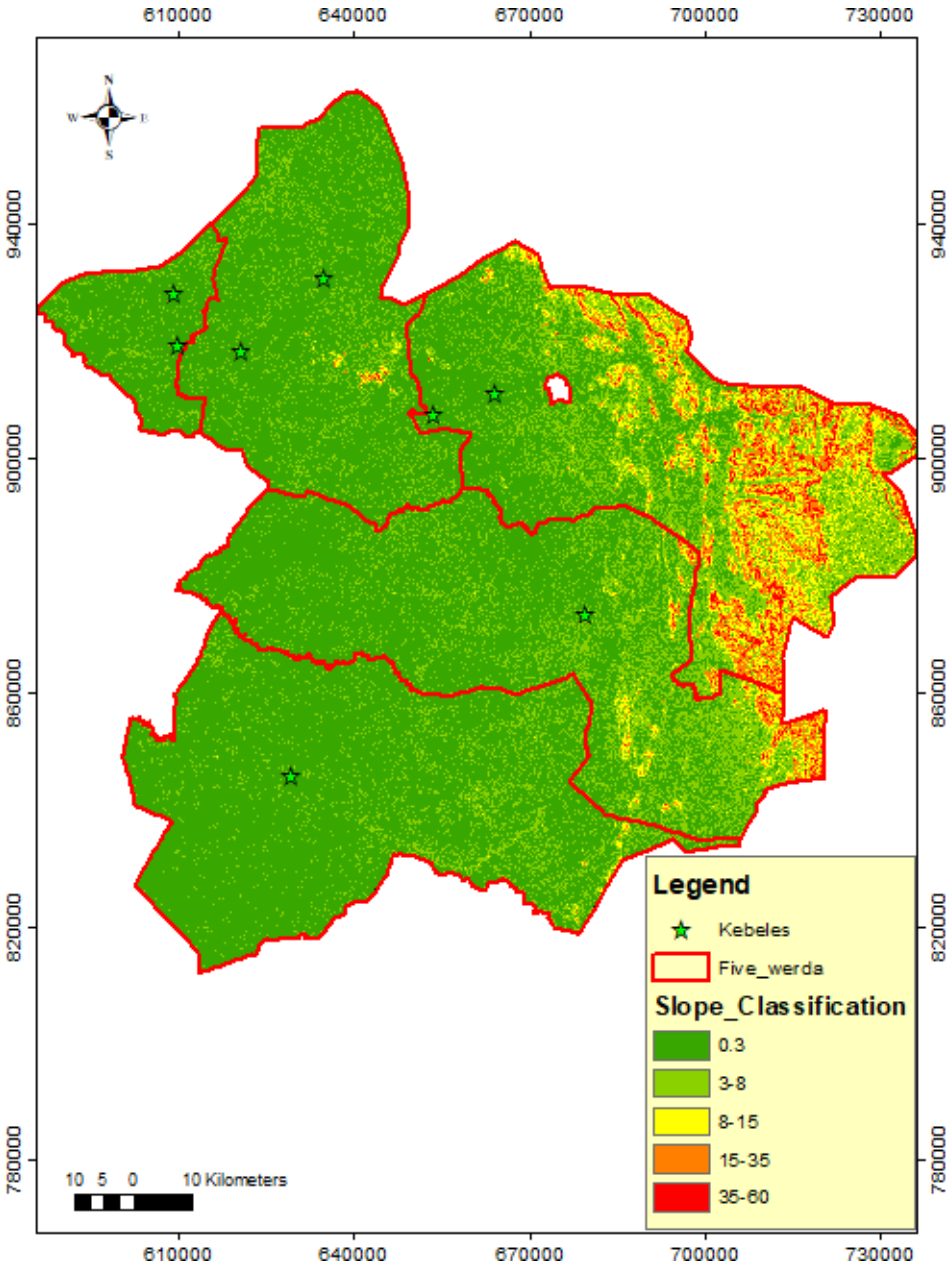


Figure 10: Slope classification of the Target Wereda

4.1.2.9. Topography and Drainage

The project area is characterized by a rolling topography that is dissected by numerous small streams draining into the Baro, Akobo, and Gilo Rivers shown in figure 11 below. The landform changes rapidly, shifting from relatively flat plateau surfaces to very steep slopes and deep valley bottoms within short distances. This diverse terrain includes wetlands, marshes, mountain ranges, and flat floodplains, each with distinct ecological characteristics. The wetlands in the lowlands are

dominated by palm trees, while other wetland areas are covered by ferns, grasses, and mixed tree species. The mountain ranges are largely forested, with dense natural vegetation and extensive bamboo thickets. The elevation profile of the watershed reflects significant relief. Terrain elevations range from 436.4 m to 2,661.3 m above mean sea level (amsl), with a mean elevation of 1,135.7 m amsl. The longest river reach begins at 1,990 m amsl and flows down to an outlet elevation of 432 m amsl, highlighting the steep gradients that influence runoff, drainage, and sediment transport across the catchment.

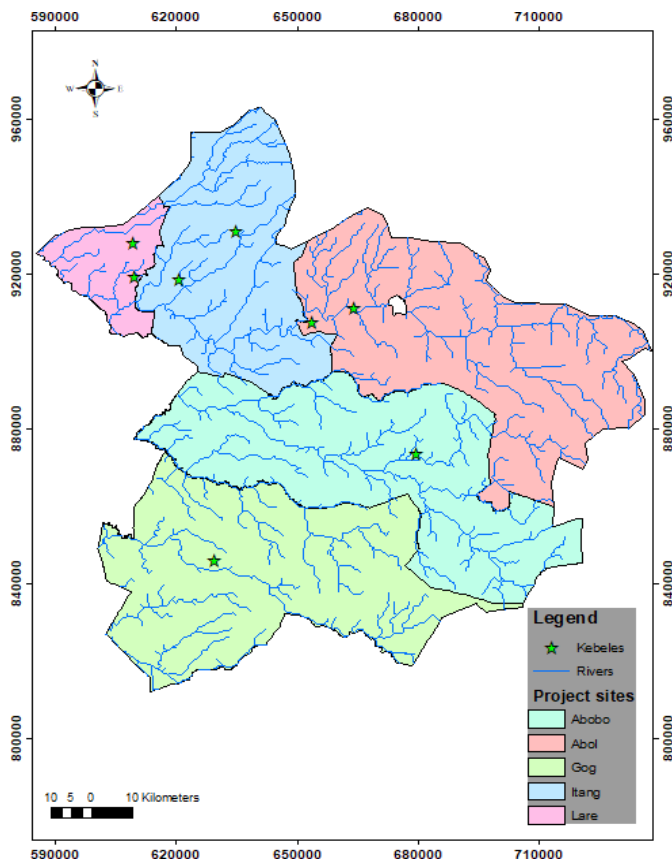


Figure 11: Drainage system of the project area

4.1.3. Socio-economic Profile

The socio-economic profile in Gambella shows a predominantly agrarian community with large family sizes, where most households rely on small-scale farming and livestock for their livelihoods. Household labor is heavily gendered, with women and girls primarily responsible for fetching water, managing sanitation, and care work, while men play a greater role in land-related decisions. Vulnerable groups such as female-headed households, children, the elderly, and persons

with disabilities face heightened challenges in accessing resources and coping with climate stresses. Limited access to improved water, sanitation, and health services, combined with recurrent droughts and floods, exacerbates poverty, food insecurity, and health risks,

4.1.4. Ecology and Biodiversity

4.1.4.1. Vegetation and Flora

Gambella supports diverse lowland ecosystems, including Combretum–Terminalia woodlands, savanna grasslands, floodplain wetlands, and riparian forests along the Baro, Akobo, and Gilo rivers. Woodlands are dominated by *Combretum* spp., *Terminalia* spp., *Anogeissus leiocarpa*, and *Boswellia papyrifera* on well-drained uplands, while savannas in central and eastern areas provide grazing for migratory herbivores. Wetlands and floodplains, seasonally inundated, sustain fish, amphibians, and waterbirds, and riparian forests maintain soil stability, water quality, and connectivity. Unlike Ethiopian highlands, Afro-montane forests are absent. These ecosystems underpin biodiversity and local livelihoods through grazing, fisheries, and forest products.

4.1.4.2. Wildlife (Fauna)

The region is renowned for the white-eared kob (*Kobus kob leucotis*) migration, among Africa's largest mammal movements. Other ungulates include Nile lechwe (*Kobus megaceros*), buffalo (*Syncerus caffer*), roan antelope (*Hippotragus equinus*), tiang (*Damaliscus lunatus*), and warthog (*Phacochoerus africanus*). African elephant (*Loxodonta africana*) and Nubian giraffe occur at low densities but remain ecologically significant. Predators include lion (*Panthera leo*), leopard (*Panthera pardus*), and spotted hyena (*Crocuta crocuta*). Aquatic systems support hippopotamus and Nile crocodile, while avifauna exceeds 230–300 species, with Gambella National Park designated an Important Bird Area (IBA).

4.1.4.3 Rare or Threatened Species

Key threatened species include African elephant (Endangered), Nubian giraffe (Endangered), and Nile lechwe (Vulnerable). Among birds, the shoebill stork (*Balaeniceps rex*, Vulnerable) and Basra reed warbler (*Acrocephalus griseldis*, Endangered) depend on intact wetlands and riparian habitats. These taxa face threats from habitat loss, poaching, and hydrological alteration. Updated surveys are needed, but their occurrence highlights Gambella's critical role in Ethiopia's biodiversity conservation.

4.1.5. Geology

The Cenozoic and Proterozoic volcanic and sedimentary rocks underlie much of southwestern Ethiopia, giving the Gambela region a varied geological setting that reflects a long and complex history. The area is underlain by Precambrian basement complex rocks, which are in turn overlain by thick alluvial sediments. Elevated areas are dominated by basaltic volcanic rocks, while transitional zones, patchy plains, and undulating terrains are characterized mainly by granitic and gneissic rocks of the basement complex. In particular, the Gog basalts extend across much of the escarpments and into smaller portions of the Gambela Plain as shown in Figure 12.

The stratigraphy comprises lithological units ranging from ancient basement rocks to recent unconsolidated deposits. Tertiary volcanics and sediments (T) include basalts, tuffs, and interbedded sedimentary layers, while the Quaternary deposits (Q) form extensive lowland cover in the form of alluvium, floodplain and lake sediments, and unconsolidated sands and gravels. Intrusive rocks are widespread, with several phases of granitic intrusions (gt1, gt3, gt4) representing multiple emplacement episodes. The Neoproterozoic basement includes metavolcanics and metabasalts (PNmb), while the Middle Proterozoic units (PR2b) consist mainly of banded iron formations, schists, and quartzites.

Older formations comprise Archean banded gneiss (ARb), which is largely migmatitic and tonalitic, and Archean layered mafic–ultramafic rocks (ARI) represented by amphibolites, peridotites, and serpentinite lenses. Intrusive mafic to intermediate bodies are expressed by gabbro–diorite and gabbro–tonalite plutons (gd/gd-tn), and the region is cut by swarms of dolerite dykes (dt), emplaced predominantly during the Mesozoic to Cenozoic.

Overall, the Gambela region's geology records a progression from ancient Archean and Proterozoic basement formation, through successive phases of intrusion and volcanism, to the development of the present-day Quaternary floodplains, reflecting both its tectonic complexity and its significance in Ethiopia's geological framework.

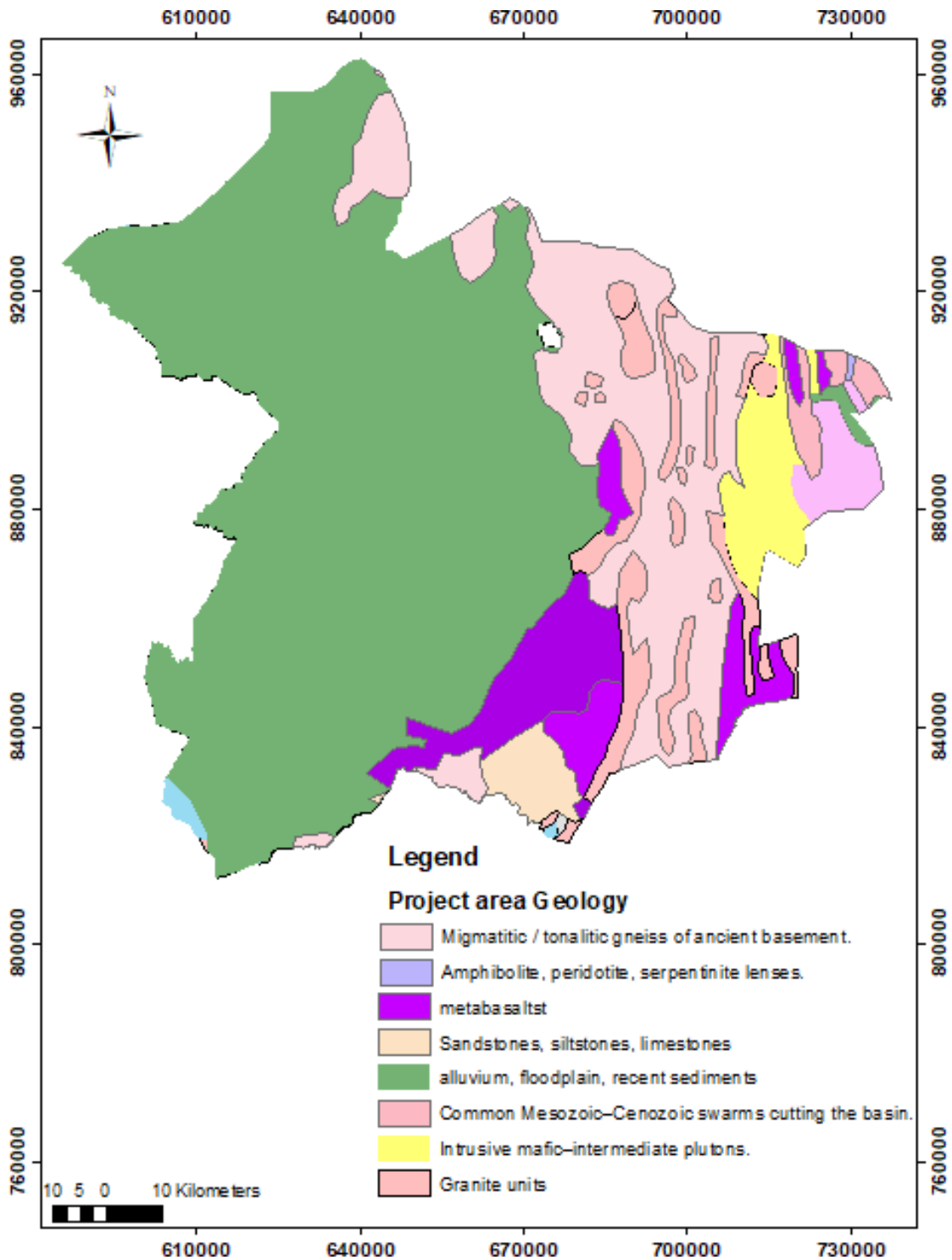


Figure 12: Geology map of the project area

4. 1.6. Soil and Land use

According to FAO's nationwide assessment (FAO 1984), the soils in the region are primarily classified as Alsols Humic, Vertisols, Fluvisols, and Acrisols, with smaller areas of Nitosols and Lithosols. The highland regions are mainly characterized by Liptosols Dystric. The most dominant soil type is vertisols as shown below in figure 13.

Regarding land use and land cover, the Gambella region is notably vegetated, with extensive wetlands and major rivers meandering through vast green plains. In the highlands, dense broad-leaved forests and disturbed forest areas with scattered cultivation patches prevail, while the lowlands are predominantly covered by extensive commercial agricultural lands and grasslands interspersed with wetlands.

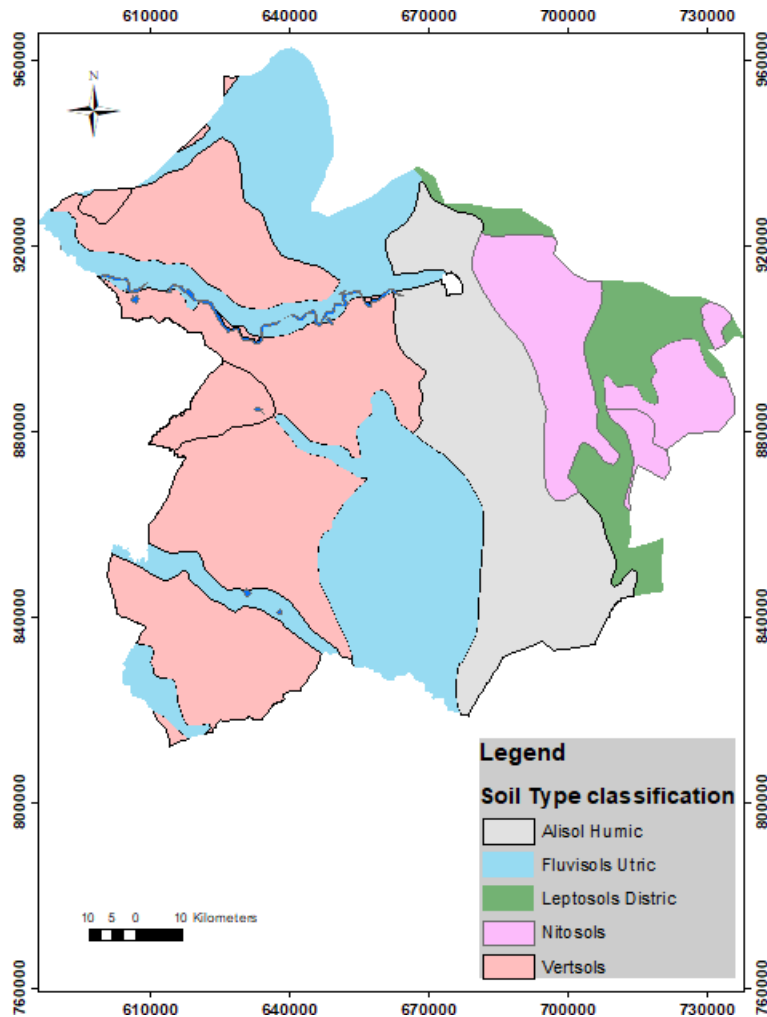


Figure 13: Soil classification in targeted wereda

4.2. Socio-economic Characteristics

4.2.1. Demographic Characteristics

Across the five woredas surveyed, a total of 160 households were included. Of these, 87 households (54.4%) are male-headed, while 73 households (45.6%) are female-headed. This relatively high proportion of female-headed households highlights the gendered dimensions of vulnerability in the region. Female-headed households often face greater challenges in terms of access to land, credit, agricultural inputs, and labor, which can limit productivity and resilience to climate shocks.

Table 2: Gender of the household head per sampled woreda

Woreda	Respondent	Response	
		F	%
Abobo	Male	11	55
	Female	9	45
	Total	20	100
Abol	Male	20	50
	Female	20	50
	Total	40	100
Gog	Male	11	55
	Female	9	45
	Total	20	100
Itang	Male	21	52.5
	Female	19	47.5
	Total	40	100
Lare	Male	24	60
	Female	16	40
	Total	40	100

Source: Survey data

The project's interventions will therefore have significant implications. On the positive side, targeted support such as training, provision of improved seeds, and access to irrigation and climate-smart technologies could help reduce gender disparities by strengthening the adaptive capacity of female-headed households. On the other hand, without deliberate gender-sensitive approaches, there is a risk that women may be excluded from decision-making, extension services, or resource allocation, reinforcing existing inequalities. Ensuring equitable participation and tailored support will be essential for maximizing the project's impact on food security, livelihoods, and resilience.

4.2.2. Household size

The household size distribution has important implications for livelihoods and project design. Most households have 3–6 male (48.1%) and female (54.4%) members, with a significant share also having more than three children (59.4%). This indicates a large family structure, which increases demand for food, water, and health services, while also creating pressure on natural resources. Larger family sizes may intensify economic vulnerability, particularly during periods of climate shocks, as more dependents rely on limited income sources.

Table 3: Family size distribution of respondent households in the study

Family size category	Response	Frequency	%
Number of Males	Below 3	80	50.0
	3–6	77	48.1
	Above 6	3	1.9
	Total	160	100.0
Number of Females	Below 3	57	35.6
	3–6	87	54.4
	Above 6	16	10.0
	Total	160	100.0
Number of Children (<18 years)	Below 3	95	59.4
	3–6	51	31.9
	Above 6	14	8.8
	Total	160	100.0

Source: Survey data

The project may, therefore, have indirect implications for supporting large family sizes. Improved access to safe water, sanitation, and agricultural productivity can enhance food security, reduce child mortality, and improve overall health conditions, which may encourage households to sustain or even increase family size. Reliable water supply and better livelihood opportunities could ease the resource pressures traditionally associated with large families, making it more feasible to support more children. However, this may also place long-term pressure on land, water, and other natural resources if population growth outpaces the project’s capacity to provide services. To balance these effects, the project should be complemented with community awareness programs on family planning, education (particularly for girls), and sustainable resource management to ensure that the benefits of improved services do not unintentionally reinforce unsustainable demographic trends.

4.2.3. Major Ethnic group

The survey findings indicate that the two major ethnic groups in the study area are Anuak (87 households, 54.4%) and Nuer (73 households, 45.6%) (Figure 14). This relatively balanced distribution suggests that both groups are well represented in the sample, with Anuak slightly more dominant. Such representation is significant for the project planning and implementation, as it underscores the importance of designing interventions that are culturally sensitive and inclusive.

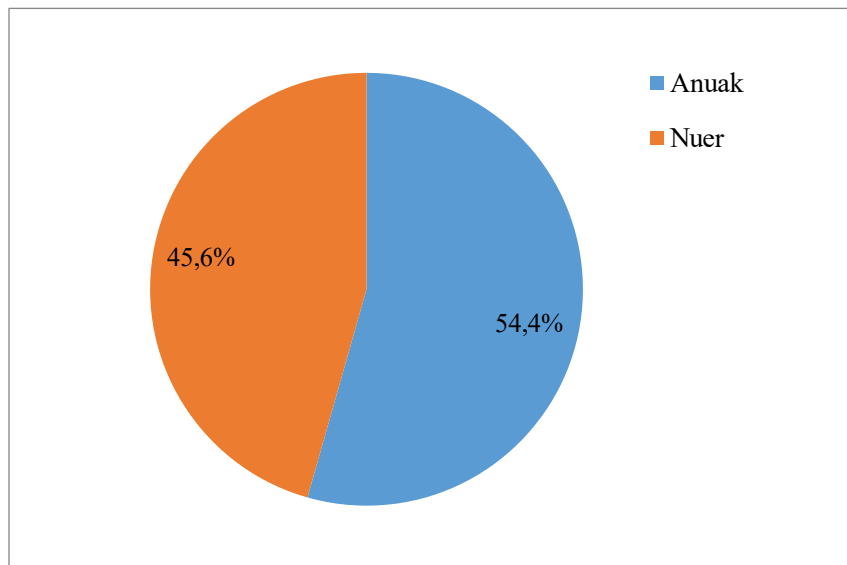


Figure 14: The Two Major Ethnic Groups in Potential Project Areas

Source: Survey data

The proposed project (water for food) may include water supply and sanitation, agricultural development, livelihood diversification, and environmental conservation should directly address community needs while ensuring both Anuak and Nuer households benefit equitably. Careful attention to cultural practices and equitable participation will also be necessary to strengthen cooperation and avoid social tensions between the two groups.

4.2.4. Disability condition

The findings (Table 4) show that while most respondents reported no functional difficulties, a considerable proportion indicated challenges related to hearing (18.1%), walking/climbing (16.2%), and vision (13.8%). Even though severe limitations (a lot of difficulty/cannot do at all) were relatively rare, their presence highlights the importance of inclusive planning and design.

Table 4: Disability Condition of Respondents

Functional Difficulty	No Difficulty (F, %)	Some Difficulty (F, %)	A Lot of Difficulty (F, %)	Cannot Do at All (F, %)	Prefer Not to Answer (F, %)
Do you have difficulty seeing, even if wearing glasses?	138 (86.3)	22 (13.8)	–	–	–
Do you have difficulty hearing, even if using a hearing aid?	131 (81.9)	29 (18.1)	–	–	–
Do you have difficulty walking or climbing steps?	134 (83.8)	25 (15.6)	1 (0.6)	–	–
Do you have difficulty remembering or concentrating?	142 (88.8)	16 (10.0)	1 (0.6)	1 (0.6)	–
Do you have difficulty with self-care (e.g., washing or dressing)?	147 (91.9)	11 (6.9)	1 (0.6)	–	1 (0.6)
Using your usual language, do you have difficulty communicating?	149 (93.1)	9 (5.6)	1 (0.6)	–	1 (0.6)

Source: Survey data

The project should therefore ensure accessibility in both infrastructure and communication, while also integrating disability inclusion in training, awareness, and grievance redress mechanisms. This helps to guarantee that persons with disabilities are not excluded from participation, decision-making, or project benefits. In turn, the project holds significant value for persons with disabilities by creating opportunities for livelihoods, improving access to services, and fostering a rights-based approach. Disability inclusion also strengthens community resilience and supports global commitments such as the Sustainable Development Goals. If not adequately addressed, however, persons with disabilities risk being excluded, and barriers in infrastructure or communication may reinforce existing inequalities, ultimately reducing the overall effectiveness of the project.

4.2.5. Livelihoods and Income

The survey results show that crop farming (99.4%) is the dominant livelihood, followed by livestock keeping (65%) and fishing (65%) (Table 5). This heavy dependence on climate-sensitive activities explains why 95% of households reported that their income sources have been affected by climate shocks such as floods, drought, and pests. With most households earning less than

10,000 birr per month (73.1%), vulnerability to shocks is compounded by low income and limited diversification. The interview and FGD results also support that agriculture remains the foundation of livelihoods in the area, with most households depending on crop production and livestock rearing. Maize and sorghum are the dominant staple crops, supplemented by groundnut, pulses, vegetables such as okra, pumpkin, tomato, and cabbage, and fruits like mango, papaya, and banana. In some villages, households cultivate crops in two cycles per year, with maize harvested twice and tomatoes once.

Table 5: Livelihoods and income status of Sample respondent households

Item		Response	
		Frequency	%
Household's main source of livelihoods	Crop farming	159	99.4
	Livestock keeping	104	65
	Fishing	104	65
	Casual labour	31	19.4
	Trade/business	33	20.6
Household's average monthly income from all sources	< 10,000	117	73.1
	10,000-30,000	36	22.5
	Prefer not to answer	7	4.4
	Total	160	100
Main income earner in the household	Young Man (18-35 years)	32	20
	Young Woman (18-35 years)	16	10
	Older Man (36-59 years)	64	40
	Older Woman (36-59 years)	42	26.2
	Elderly Man (60+ years)	6	3.8
	Total	160	100
Have your income sources been affected by climate shocks (e.g., floods, drought, pests)?	Yes	152	95
	No	8	5
	Total	160	100

The project has the potential to deliver significant benefits by introducing climate-smart agricultural practices, improving water management, and promoting livelihood diversification through trade, business, and value addition. These interventions could stabilize household incomes, reduce dependence on casual labor, and strengthen resilience against climate shocks. At the same time, attention must be given to inclusivity: since older men (40%) and older women

(26.2%) are the main income earners, while young men and women play smaller roles (20% and 10%), the project should create pathways for youth engagement and women’s economic empowerment. Otherwise, there is a risk that benefits may consolidate around existing earners, limiting opportunities for intergenerational and gender-equitable growth.

4.2.6. Food Security

The survey results, in Table 6, highlight critical challenges in household food security. Only 25% of households reported producing enough food from their farms to feed their families year-round, while 75% face seasonal food shortages. For many, these shortages extend for several months each year, leaving families dependent on coping strategies such as reducing the number of meals (61.9%), borrowing food or money (71.8%), selling assets or livestock (53.1%), and temporary migration for work (30%). Such strategies, while essential for survival, often undermine long-term resilience by depleting assets and disrupting household stability. Climate change is a major driver of this insecurity, with 45% of households reporting that their food production has been severely affected by climate shocks and 43.8% moderately affected (Table 6). This indicates that nearly nine in ten households are struggling with climate-induced reductions in agricultural productivity.

Table 6: Respondents’ main staple foods

Item	Response		
	Frequency	%	
Do you produce enough food from your own farm to feed your family year-round?	Yes	40	25
	No	120	75
	Total	160	100
What strategies does your household use to cope with food shortages?	Reduce number of meals	99	61.9
	Borrow food/money	115	71.8
	Sell assets/livestock	85	53.1
	Temporary migration for work	48	30
To what extent has climate change (e.g., drought, floods) affected your food production?	Severely	72	45
	Moderately	70	43.8
	Not much	18	11.2
	Total	160	100

Source: Survey data

The project has significant potential to improve food security by introducing climate-resilient crop varieties, promoting intercropping and organic soil fertility practices, supporting irrigation development, and integrating fisheries and agroforestry into farming systems. These measures

would increase year-round food availability, reduce dependence on harmful coping strategies, and help households shift from food deficit to self-sufficiency. However, the project must also anticipate risks: if implementation fails to adequately address climate adaptation or excludes vulnerable groups (e.g., women, youth, and land-poor farmers), food insecurity could persist or even worsen.

4.2.7. Water, Sanitation and Hygiene (WASH)

4.2.7.1. Main source of drinking water

The findings consistently indicate that households rely on a mix of water sources (Figure 15), with tube wells or boreholes (31.9%) and public taps (20%) being the most common, while surface water sources like rivers and ponds remain heavily used (18.8%) due to limited access to piped or protected water. FGDs and interviews also highlighted that existing water systems are often vulnerable to floods, technical failures, and lack of maintenance, while communities face challenges such as water contamination, shortages during dry seasons, and limited technical support for repairs. Women and girls are particularly affected, as they often bear the responsibility of fetching water, which can impact their time for education or income-generating activities.

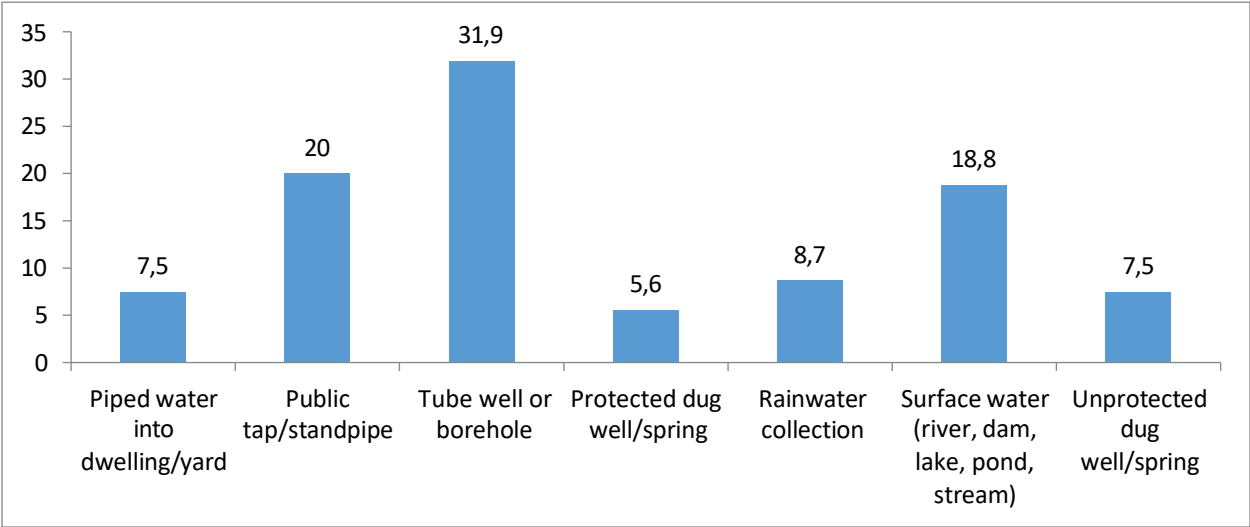


Figure 15: Source of drinking water (percentage)
Source: Survey data

The project’s interventions improving access to safe, resilient water sources such as boreholes, piped systems, and protected wells are expected to enhance household water security, reduce reliance on unsafe surface water, and lower incidences of waterborne diseases. By targeting

vulnerable groups and incorporating maintenance training and community engagement, the project also promotes equitable access, reduces labor burdens on women, and supports overall livelihood stability, particularly for households with large family sizes.

4.2.7.2. Water Treatment

The survey results show that just over half of households (55%) treat their drinking water at home, while 45% consume it untreated, exposing them to health risks. The most common treatment method is boiling (28.1%), followed by straining through cloth (20%), with minor use of bleach/chlorine (3.1%) and ceramic or sand filters (4.4%) (Table 7). FGDs highlighted that limited access to safe water sources and lack of knowledge about water treatment methods contribute to these practices, particularly in flood-prone areas where surface water contamination is common.

Table 7: Drinking water treatment practices

Item	Response		
	F	%	
Do you do anything to treat your water at home to make it safer to drink?	Yes	88	55
	No	72	45
If Yes, what method do you most often use?	Boiling	45	28.1
	Add bleach/chlorine	5	3.1
	Strain through a cloth	32	20.0
	Ceramic/sand filter	7	4.4
	Solar disinfection (SODIS)	0	0.0
	Other	10	6.3
	Prefer not to answer	13	8.1

Source: Survey data

The project’s water interventions, including installation of resilient boreholes, protected wells, and piped systems, coupled with community training on safe water handling and treatment, are expected to significantly reduce waterborne diseases, improve household health outcomes, and decrease the time and labor burden of water collection, especially for women and children. These improvements also enhance overall livelihood resilience, supporting productive activities and food security. Moreover, observation based survey findings indicate that water storage and access remains major challenges for households. Only 53.8% of households store water in clean, covered containers, while nearly one-quarter (25.7%) use unclean or uncovered containers, increasing the

risk of contamination (Table 8). Water availability is highly seasonal, with 66.9% of households reporting that their main water sources are not accessible year-round. Women bear the primary responsibility for fetching water, with 92.5% of households indicating that water collection is predominantly their task, adding to their labor burden.

Table 8: Water accessing and storage of the respondents

Item	Response		
	Frequency	%	
Water Storage Observation	Clean container, covered	86	53.8
	Clean container, uncovered	33	20.6
	Unclean container, covered	30	18.8
	Unclean container, uncovered	11	6.9
	Total	160	100
Is water from this source available year-round?	Yes	53	33.1
	No	107	66.9
	Total	160	100
Who is mainly responsible for fetching water in your household?	Men	1	0.6
	Women	148	92.5
	Shared Equally	11	6.9
	Total	160	100

Source: Survey data

The project’s interventions, including climate-resilient water points, protected storage solutions, and community awareness on safe storage practices, are expected to improve year-round water access, reduce contamination risks, and alleviate the workload on women and girls. This enhances overall household health, supports productive activities, and contributes to greater resilience against climate-related water shortages. Potential negative impacts may include the risk of over-reliance on new water infrastructure without proper maintenance, possible inequities in access if distribution is uneven, and disruption of existing local water-use practices. In addition, construction activities could temporarily disturb local ecosystems or water sources if not carefully managed.

4.2.7.3. Sanitation and Hygiene Facility

The observation data indicate that sanitation facilities are extremely limited in the surveyed communities. Only a very small proportion of households have flush/pour-flush toilets (1.3%) or improved pit latrines (0.6%), while 18.1% use basic pit latrines and 2.5% use composting toilets. The vast majority (69.4%) practice open defecation and 8.1% rely on shared facilities. Hand washing infrastructure is also inadequate: only 26.3% of households have a receptacle near the toilet, 16.3% have water available at the station, and soap or ash is observed at just 14.4% of stations. Reported hand washing behavior is inconsistent, with 12.5% always practicing it at critical times, 48.1% sometimes, and 38.8% never (Table 9).

Table 9: Sanitation facilities and hygiene practices of sampled households

Item	Response	Frequency	%
Type of sanitation facility observed	Flush/pour-flush to piped system/septic tank	2	1.3
	Improved pit latrine (with slab, VIP)	1	0.6
	Basic pit latrine	29	18.1
	Composting toilet	4	2.5
	No facility/bush/field (open defecation)	111	69.4
	Shared facility with other households	13	8.1
Is a receptacle for hand washing (e.g., jug, basin, tippy-tap) observed near the toilet?	Yes	42	26.3
	No	118	73.7
Is water observed at the hand washing station?	Yes	26	16.3
	No	134	83.7
How often do members of your household practice hand washing with soap at critical times (after defecation, before eating)?	Always	20	12.5
	Sometimes	77	48.1
	Never	62	38.8
	Prefer not to answer	1	0.6
Is soap or ash observed at the hand washing station?	Yes	23	14.4
	No	137	85.6
Total sample		160	100

Source: Survey data

The project's implementation of resilient water and sanitation infrastructure is expected to substantially improve hygiene and mitigate the contamination of water sources caused by open defecation during floods. Positive impacts include improved public health, reduced prevalence of diarrhea, cholera, and typhoid, enhanced dignity and safety—especially for women and children—

and increased school attendance and household productivity. Potential negative impacts may arise if facilities are poorly maintained, leading to blockages or contamination, or if social norms and behavior change are not adequately addressed, limiting consistent usage. Awareness creation and hygiene education will be essential to ensure sustained benefits, equitable adoption, and effective protection of community water systems.

4.2.8. Climate Change, Adaptation, and Vulnerability

Table 10 indicate that communities have observed significant climate changes over the past 10–20 years, including more frequent droughts and floods (81.9%), unpredictable rainfall patterns (68.8%), rising temperatures (36.9%), and increased pest and crop disease incidences (38.8%). Households have responded with adaptation strategies such as changing planting dates (38.1%), temporary migration (43.8%), crop diversification (30.6%), livestock destocking (30%), rainwater harvesting (26.9%), and soil and water conservation (20.6%). Despite these efforts, very few households use drought-tolerant seeds (7.5%), highlighting gaps in knowledge, access, or resources. Community discussions (FGD) and interviews further confirmed that climate shocks frequently disrupt livelihoods, reduce crop yields, and limit food security, especially in households relying on rain-fed agriculture.

Table 10: Observed climate change, adaptation strategies, and desired Support for Resilience

Item	Response	Frequency	%
Observed Climate Changes	Have you observed any significant climate changes in the past 10–20 years?	Yes	147
		No	13
Type of Changes Observed	Increased frequency of drought	131	81.9
	Increased frequency of floods	131	81.9
	More unpredictable rainfall patterns	110	68.8
	Higher average temperatures	59	36.9
	Increased pests/crop diseases	62	38.8
	Other	2	1.3
Adaptation Strategies	Crop diversification	49	30.6
	Using drought-tolerant seeds	12	7.5
	Changing planting dates	61	38.1
	Soil and water conservation	33	20.6
	Rainwater harvesting	43	26.9
	Livestock destocking	48	30.0
	Temporary migration	70	43.8

	None	1	0.6
Desired Support for Resilience	Training in climate-smart agriculture	111	69.4
	Access to improved seeds/inputs	110	68.8
	Improved water infrastructure (irrigation, storage)	66	41.3
	Early warning weather information	74	46.3
	Access to credit/savings groups	53	33.1
	Access to markets	38	23.8

Source: Survey data

The project can have a significant positive impact by supporting climate resilience initiatives that align with local adaptation needs. Enhancing access to improved seeds and inputs, providing training in climate-smart agriculture, improving water infrastructure for irrigation and storage, and offering early warning weather information will strengthen households' capacity to cope with climate variability. These interventions are expected to improve crop productivity, stabilize incomes, reduce forced migration, and enhance food security. Potential negative impacts could arise if interventions are not equitably distributed or if community engagement is insufficient. For example, households with limited land, labor, or financial resources might not benefit equally, potentially increasing existing inequalities. Besides, without proper technical support, new practices such as irrigation or soil conservation may be improperly implemented, leading to resource wastage or environmental stress. Effective awareness creation, participatory planning, and targeted support will be essential to maximize benefits and ensure sustainable climate adaptation outcomes as part of the project.

4.2.9. Gender, Social Inclusion, and Community Dynamics

As indicated in Table 11, women are moderately involved in household decision-making. Vulnerable groups such as children (83.8%), the elderly (85.6%), persons with disabilities (75%), and female-headed households (64.4%) are most affected by climate-related shocks like droughts and floods. Access to key resources is unequal for a significant proportion of households, leaving a large share of households disadvantaged. Interviews and FGDs supported these findings, highlighting that women and vulnerable groups often face barriers to fully participating in resource management and decision-making. FGDs noted that seasonal floods and droughts disproportionately affect children, the elderly, and households with limited labor capacity, reinforcing existing inequalities.

Table 11: Resource access, vulnerable Groups, and decision-making involvement

Item	Response	F	%
Decision-Making: Women involvement in household resource decisions	Always	30	18.8
	Sometimes	104	65.0
	Rarely	25	15.6
	Never	1	0.6
	Prefer not to answer	-	-
Vulnerable Groups to Climate Impacts	Female-headed households	103	64.4
	Children	134	83.8
	The elderly	137	85.6
	Persons with disabilities	120	75.0
	Landless households	30	18.8
	Internally Displaced Persons /returnees	32	20.0
Access to Resources	Water – Yes, equal	115	71.9
	Water – No, not equal	43	26.9
	Water – Prefer not to answer	2	1.3
	Agricultural land – Yes, equal	91	56.9
	Agricultural land – No, not equal	66	41.3
	Agricultural land – Prefer not to answer	3	1.9
	Seeds/fertilizers – Yes, equal	95	59.4
	Seeds/fertilizers – No, not equal	62	38.8
Seeds/fertilizers – Prefer not to answer	3	1.9	

Source: Survey data

The project has strong potential to enhance gender equity and resilience by promoting inclusive decision-making processes and ensuring equitable access to water, agricultural inputs, and land. Training programs, awareness campaigns, and participatory planning can empower women and vulnerable groups to contribute meaningfully to household and community resource management. Potential negative impacts may include resistance from traditional power structures, which could slow adoption of inclusive practices, and the risk that resources intended for equitable access may be captured by better-resourced households if monitoring is weak. Overall, the project can improve livelihood security, reduce climate vulnerability, and strengthen social cohesion by addressing both gender and resource-access inequalities.

4.2.9.1. Perceptions on Gender Norms and Menstrual Health

The perception result (Table 12) indicate that traditional gender norms persist, with women largely responsible for water fetching, child care, and managing latrines, though over half recognize the

importance of shared decision-making. Interviews and FGDs reveal that these norms concentrate labor on women, limiting their time for income-generating activities and community participation, while attitudes toward menstrual health are generally positive, suggesting room for targeted interventions.

Table 12: Perception of respondents in the study area

Item	Agree	Disagree	Do not know	Prefer not to answer
Fetching water is a woman's task, not a man's	114 (71.3%)	42 (26.3%)	4 (2.5%)	-
Cleaning children is a woman's task, not a man's	105 (65.6%)	51 (31.9%)	4 (2.5%)	-
Managing the household latrine is a woman's task	97 (60.6%)	57 (35.6%)	6 (3.8%)	-
Women and men should share decisions about water and sanitation equally	92 (57.5%)	62 (38.8%)	6 (3.8%)	-
Menstruation is a curse or something to be ashamed of	9 (5.6%)	137 (85.6%)	14 (8.8%)	-
Girls should be restricted from school or activities during menstruation	28 (17.5%)	111 (69.4%)	18 (11.3%)	3 (1.9%)

Source: Survey data

The project can positively impact gender equity by promoting shared responsibilities for water, sanitation, and hygiene tasks, and by integrating menstrual health education to reduce stigma. Improved water and sanitation infrastructure can also lessen women’s labor burden, freeing time for education, livelihoods, and community engagement. Potential challenges include resistance from households adhering to traditional norms and uneven adoption of gender-inclusive practices, which may require targeted awareness campaigns and community dialogue to ensure equitable benefits.

4.2.10. Nature and Impacts of Grievance

The nature of grievances in the community primarily revolves around land acquisition, environmental concerns, health and safety, and social issues, reflecting the multifaceted impacts of development activities. These grievances affect households, communities, and the natural environment, leading to financial losses, damage to property, disrupted livelihoods, and health

challenges. Understanding the scope and seriousness of these issues is essential for designing effective grievance management systems that ensure fair resolution, enhance community trust, and minimize potential conflicts.

Table 13: Grievances, affected parties, impact, and grievance resolution preferences

Item	Response	Frequency	%
Type of issue	Environmental (pollution, water, air, land, biodiversity)	85	44.7
	Social (community relations, cultural heritage, security)	34	21.3
	Land acquisition / resettlement	93	58.1
	Employment / labor / working conditions	47	29.4
	Health and safety	49	30.6
	Other	18	11.3
Who or what was affected	Myself / my household	97	60.6
	My community	128	80
	Natural environment	53	33.1
	No one / none	19	11.9
How has this issue affected you/your community?	Financial loss	6	37.5
	Damage to property/land	30	18.8
	Loss of livelihoods	65	40.6
	Health impact	34	21.3
	Disturbance/nuisance	9	5.6
	Not affected	18	11.3
How serious do you consider this issue?	Minor	29	18.1
	Moderate	84	52.5
	Major	47	29.4
Have you raised this grievance before?	Yes	52	32.5
	No	108	67.5
Was it resolved?	Yes	29	18.1
	No	131	81.9
How do you prefer your grievance to be handled?	Confidentially	100	62.5
	Publicly	60	37.5
How would you like to receive updates about your grievance?	Phone call	42	26.3
	Community meeting	118	73.7

Source: Survey data

Table 13 indicates that land acquisition (58.1%), environmental issues (44.7%), and health-related concerns (30.6%) are the most commonly reported grievances, affecting both households (60.6%) and the broader community (80%), with a substantial portion experiencing financial loss (37.5%), loss of livelihoods (40.6%), and damage to property/land (18.8%). Despite these impacts, the majority of grievances have not been formally raised (67.5%) or resolved (81.9%), highlighting gaps in communication and institutional responsiveness. The project has the potential to strengthen grievance management by establishing clear, confidential (62.5%) and community-accessible channels, while ensuring timely feedback through meetings (73.7%) or phone calls (26.3%). However, potential negative impacts include the risk of perceived bias if some grievances are prioritized over others, and possible community dissatisfaction if resolution timelines are delayed. Overall, effective grievance mechanisms can enhance trust, promote social cohesion, and support equitable participation in project benefits.

4.3. Climate Smart-Agriculture Practices

4.3.1. Agricultural Practices

Agriculture system in Gambella are predominantly focused on staple crops such as maize and sorghum, with supplementary cultivation of groundnut, beans, pumpkin, okra, sweet potato, rice and variety of vegetables. Fruit trees including mango, banana, papaya, and apple guava, play an important role in household nutrition and contribute to local market supply. Most household practice mixed farming, integrating crop cultivation with livestock rearing and, in some areas, small scale fish production. Survey results shows that intercropping is slightly more common (51.2%) than mono-cropping (48.8%), reflecting a gradual shift toward diversified systems that enhance soil fertility, buffer against climate shocks and support sustainable yields (Table 14).

FGDs and expert observations confirm that organic fertilizers primarily livestock manure and crop residues are widely used to maintain soil health. However, farming remains largely labor intensive, with limited access to mechanization and modern inputs. This leaves households vulnerable to climate variability, particularly floods and droughts, which frequently disrupt planting schedules and reduce productivity. Farmers consistently express the need for improved seed varieties, better tools, and access to irrigation and drainage infrastructure to stabilize production.

Perceptions of agricultural productivity over the past five years are mixed. While 51.3% of respondents reported improvements often linked to diversification and intercropping 29%

experienced declines, and 20% saw little change (Table 14). These variations reflect both the benefits of adaptive practices and the constraints posed by resource limitations and environmental stressors.

Positive impacts include improved household nutrition, enhanced food security, increased income opportunities, and better soil fertility through organic fertilization and intercropping. In communities where training and input support have been provided, farmers report greater confidence in managing their farms and experimenting with new techniques. Negative impacts include continued reliance on manual labor, low levels of mechanization, and restricted access to climate-resilient technologies. These limitations constrain productivity and hinder the potential for scaling up or diversifying production, especially in areas prone to flooding or prolonged dry spells.

Table 14: Distribution of farming practices and perceived changes in agricultural productivity over the past five years.

Item		Response	
		F	%
Do you practice intercropping or mono-cropping?	Intercropping	82	51.2
	Mono-cropping	78	48.8
	Total	160	100
How would you rate your current agricultural productivity compared to 5 years go?	Much lower	19	11.9
	Slightly lowers	27	16.9
	About the same	32	20.0
	Slightly higher	51	31.9
	Much higher	31	19.4
	Total	160	100

Source: Survey data

4.3.2. Flood Risk perceptions

Flooding is widely recognized as the most persistent and damaging threat to agricultural production in the region. Survey data show that 79.6% of farmers experienced flooding more than once in the past five years, with 41.9% affected over three times underscoring its recurrent nature (Figure 16). Communities report that overflows from rivers and lakes routinely destroy crops, delay planting, and shorten growing seasons. Heavy rains often render fields inaccessible, disrupting farming cycles and causing substantial yield losses. This is reflected in the disruption of key agricultural stages: harvesting is the most affected (81.5%), followed by planting (73.2%),

with storage (53.6%) and marketing (22.6%) less impacted highlighting how flooding disproportionately interferes with time-sensitive operations tied to crop establishment and collection (Figure 17).

The impacts are both severe and multifaceted. Flooding consistently reduces arable land, damages infrastructure, and contributes to food insecurity. Yet, communities demonstrate strong awareness of these risks and adopt coping strategies such as adjusting planting schedules, early sowing, and in some cases converting flood-prone areas into fish ponds to diversify livelihoods. While these efforts reflect resilience and innovation, they remain largely informal and insufficient in the absence of robust drainage systems and coordinated flood management. The data call for targeted interventions, including climate-resilient farming practices and infrastructure investments to safeguard agricultural productivity and long-term land stability.

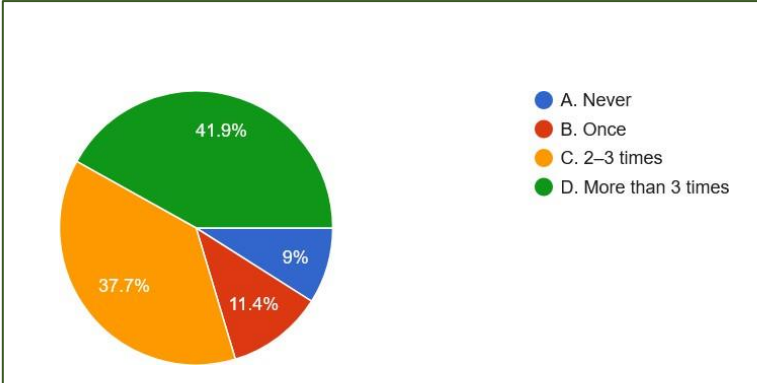


Figure 16: Frequency of farm flooding over the past five years
Source: Survey data

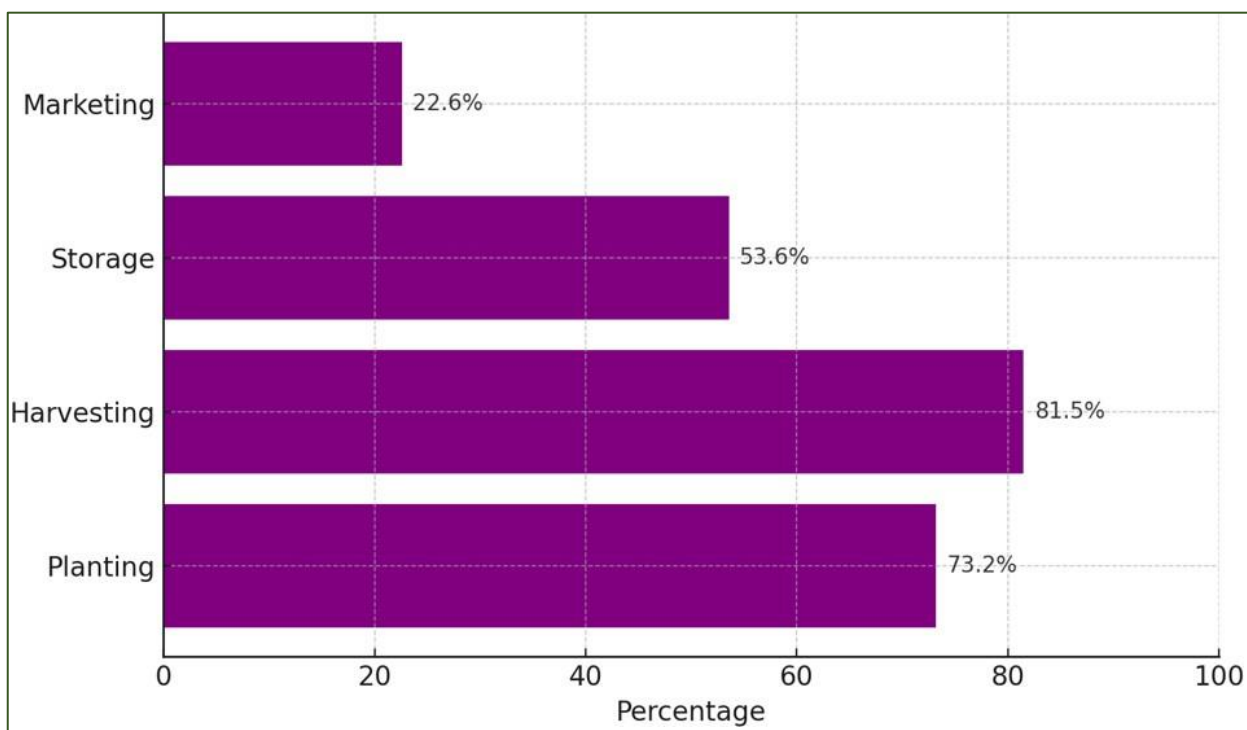


Figure 17: Agricultural activities most affected by flooding

Source: Survey data

4.3.3. Cropping Systems

Cropping systems in the region remain largely dominated by mono-cropping particularly maize, which offers short-term stability but limits resilience to climate variability. Although some intercropping practices exist, especially between cereals, pulses, and vegetables, overall crop diversity remains low, increasing vulnerability to climatic shocks, pest infestations, and income fluctuations. Seasonal adjustments are common: farmers may plant early to avoid peak flood periods, save seeds for winter cultivation, or use vegetable nurseries, such as for tomatoes to reduce exposure to flooding. These strategies reflect a degree of adaptability, yet they are not widely scaled or systematically supported.

Survey data provide deeper insights into farmers' responses to climate-related challenges. Despite the increasing frequency of floods and droughts, only 20% of respondents reported using flood or drought tolerant crop varieties, while a substantial 80% have not adopted these resilient cultivars (Table 15). This points to a significant gap in the uptake of climate-smart genetic resources, likely due to limited access, awareness, or institutional support. However, awareness of climate change impacts appears more widespread: 68.1% of respondents observed changes in cropping seasons,

reflecting firsthand experience with shifting rainfall patterns and temperature regimes (Table 15). This perception aligns with broader climate trends and suggests that farmers are attuned to environmental variability, even if their adaptive responses remain constrained.

When asked about the adoption of climate-smart agriculture (CSA) practices such as raised beds, mulching, or other soil and water conservation techniques only 31.3% reported trying such methods, while 68.7% had not (Table 15). This low adoption rate highlights the need for targeted extension services, practical training, and resource support to promote CSA practices that enhance resilience and productivity under changing climatic conditions. The data reveal a clear disconnect between climate awareness and practical adaptation, underscoring the urgency of strengthening institutional support, improving access to resilient technologies, and fostering farmer led innovation in cropping systems.

The impacts of current cropping strategies are both positive and negative. On the positive side, intercropping and seasonal adjustments help maintain soil fertility, reduce flood-related risks, and demonstrate farmer adaptability. These practices offer promising pathways toward more resilient cropping models. On the negative side, the dominance of maize mono-cropping and the limited adoption of CSA practices expose farmers to heightened risks from erratic rainfall, pests, and crop failure. Floods and droughts further disrupt consistency in cropping systems, discouraging experimentation and innovation. These findings emphasize the need for integrated interventions that promote crop diversification, scale up CSA adoption, and build institutional capacity to support climate-resilient agriculture.

Table 15: Farmer responses to climate-related cropping system adaptations

Item		Response	
		F	%
Do you use flood/drought-tolerant crop varieties?	Yes	32	20
	No	128	80
	Total	160	100
Have you observed changes in cropping seasons due to climate change?	Yes	109	68.1
	No	51	31.9
	Total	160	100
Have you tried new CSA-related cropping practices (e.g., raised beds, mulching)?	Yes	50	31.3
	No	110	68.7
	Total	160	100

Source: Survey data

4.3.4. Soil and Land Management

Soil and land management practices in the region reveal a concerning gap between awareness and implementation of sustainable strategies. Survey data show that only 25% of respondents currently use soil conservation techniques such as terracing, contour farming, or mulching, while 75% do not engage in such measures (Table 16). This limited uptake is echoed in FGDs and expert observations, which attribute the low adoption to inadequate technical support, limited access to inputs, and weak institutional outreach. The absence of widespread conservation practices increases vulnerability to erosion, reduces long-term productivity, and undermines resilience to climate shocks.

Despite these challenges, farmers' perceptions of soil fertility remain relatively optimistic. A combined 68.2% rated their farmland as "good" or "very good," while only 6.9% considered it "poor" or "very poor" (Table 16). FGDs suggest that this confidence may stem from localized improvements through organic inputs particularly livestock manure and crop residues which are widely used to sustain soil health. However, experts caution that such perceptions may mask underlying degradation, especially in areas lacking soil testing or long-term monitoring. Vegetation and tree cover on farms is another area of concern. While 43.8% of respondents reported less than 25% cover and 18.8% indicated no cover at all, only 10% have more than half of their land covered with vegetation or trees (Table 16). This limited coverage reduces the potential for erosion control, biodiversity enhancement, and microclimate regulation. FGDs and community feedback highlight broader ecological pressures, including deforestation and the disappearance of indigenous tree species, which further erode ecosystem services critical for farming.

Encouragingly, communities are beginning to explore alternative solutions. Intercropping where practiced has shown positive effects on soil fertility and pest management. Some households have expressed interest in composting, in-line cropping, and biogas technologies, viewing them as promising long-term strategies. However, adoption remains low due to financial constraints and lack of technical guidance. Experts emphasize that strengthening extension services, promoting agroforestry, and incentivizing CSA practices will be essential to bridge the gap between awareness and action.

While farmers increasingly recognize the importance of soil management, and many already use organic fertilizers such as manure and crop residues, broader adoption of sustainable technologies remains limited. Positively, interest in composting, biogas, and other resilience-building practices is growing, laying a foundation for future climate-smart agriculture. However, persistent flooding, land degradation, and deforestation continue to erode soil fertility and biodiversity, and these challenges are compounded by limited access to modern soil management tools and institutional support hindering widespread implementation of sustainable practices.

Table 16: Soil and land management practices and perceptions

Item		Response	
		F	%
Do you use soil conservation practices?	Yes	40	25
	No	120	75
	Total	160	100
How would you rate soil fertility in your farmland?	Very poor	4	2.5
	Poor	7	4.4
	Moderate	40	25.0
	Good	47	29.4
	Very good	62	38.8
	Total	160	100
What proportion of your farm has vegetation or tree cover?	None	30	18.8
	<25%	70	43.8
	25-50%	44	27.5
	>50%	16	10.0
	Total	160	100

Source: Survey data

4.3.5. Water Access and Use

Water access and use in the region remains a critical constraint to agricultural productivity and climate resilience. Survey data show that 91.9% of farmers rely primarily on rainfall for crop production, with only 5.6% using river water and a negligible proportion accessing boreholes (2.5%) or irrigation canals (0%) (Table 17). This overwhelming dependence on rain fed agriculture leaves communities highly vulnerable to erratic precipitation patterns, prolonged dry spells, and seasonal flooding challenges that are intensifying under climate change. Despite the presence of three perennial rivers; Baro, Akobo, and Gilo irrigation infrastructure remains severely underdeveloped. FGDs and expert observations confirm that most farmers attempt to divert water

manually through rudimentary channels, but these efforts are unsustainable and insufficient to meet growing demands.

Access to formal irrigation systems is virtually nonexistent, with only 1.2% of respondents reporting availability (Table 17). This lack of infrastructure constrains farmers’ ability to manage water during critical growth stages, reduce crop failure risks, and diversify production. It also limits opportunities for year-round cultivation and adaptation to shifting seasonal patterns. Water conservation practices are similarly underutilized: only 10.6% of respondents engage in techniques such as water harvesting or mulching, while 89.4% do not (Table 17). FGDs reveal that while awareness of water-saving strategies is growing, adoption remains low due to limited technical support, financial barriers, and lack of demonstration sites.

Perceptions of water sufficiency further underscore the challenge. Nearly half of respondents (48.2%) rated their water supply as “very insufficient” or “insufficient,” and only 23.8% considered it “sufficient” or “very sufficient” (Table 17) . These findings align with community feedback, which consistently identifies reliable irrigation systems, water harvesting technologies, and flood control structures as urgent needs. Receptively, farmers show initiative by constructing small drainage systems and expressing willingness to adopt improved water management practices. The region’s natural endowment of perennial rivers presents a significant opportunity for scaling CSA, but this potential remains largely untapped.

Positive impacts include growing community awareness of water management, widespread recognition of its importance, and grassroots efforts to divert water manually. The region’s river systems offer long-term potential for sustainable irrigation and CSA expansion. Negative impacts include continued reliance on rainfall, exposure to both droughts and floods, and the absence of functional irrigation infrastructure. Manual water diversion remains unsustainable, limiting scale, effectiveness, and resilience.

Table 17: Water access and use for farming

Item	Response		
	F	%	
What is your primary source of water for farming?	Rain	147	91.9
	River	9	5.6
	Irrigation canal	0	0.0

	Borehole	4	2.5
	Other	160	100
	Yes	2	1.3
Do you have access to irrigation facilities?	No	158	98.7
	Total	160	100
Do you practice water conservation techniques (e.g., water harvesting, mulching)?	Yes	17	10.6
	No	143	89.4
	Total	160	100
	Very insufficient	38	23.8
How sufficient is your water supply for farming needs?	Insufficient	39	24.4
	Moderate	45	28.1
	Sufficient	10	6.3
	Very sufficient	28	17.5
	Total	160	100

Source: Survey data

4.3.6. Institutional Support and Extension Services

Institutional support for agriculture in the region remains uneven and underdeveloped, particularly in the delivery and relevance of extension services. Survey results show that only 36.3% of farmers received any extension support in the past year, while 63.7% had no contact at all (Table 18). FGDs and expert observations confirm that this limited outreach undermines efforts to promote improved farming practices, especially in the face of climate variability and land degradation. Even among those who do receive support, the content is often misaligned with current needs: only 29.4% of respondents reported that extension services CSA, leaving 70.6% without guidance on adaptive techniques such as soil conservation, water harvesting, and resilient cropping systems.

Interaction with extension agents is sporadic. Nearly half of respondents (45.6%) reported never engaging with extension personnel, and 43.1% only interact occasionally. Weekly or monthly contact is rare, limiting the continuity of technical support and weakening the potential for sustained learning. Perceptions of usefulness are mixed: while 24.4% found extension services “extremely useful” and 16.9% rated them “very useful,” a combined 41.9% considered them only “slightly” or “not useful at all” (Table 18). This ambivalence reflects both the inconsistent delivery and the limited relevance of the support provided.

Access to farmer field schools and demonstration plots critical tools for hands on learning and peer exchange is also minimal. Only 13.1% of respondents reported access to such platforms, while 86.9% do not (Table 18). FGDs highlight that where these tools are available, they foster practical learning and community engagement, but their reach remains highly restricted. Experts and agricultural offices acknowledge the importance of resilience-building, yet face persistent resource shortages, limited machinery, and inadequate seed systems. Extension services vary widely across communities, with some receiving regular support and others none at all. Weak coordination between federal, regional, and local actors further impedes effective CSA implementation.

Despite these challenges, there are encouraging signs. The Transformation of Agriculture in Gambella (TAG) strategy, aligned with Ethiopia’s national 10-Year Agricultural Development Perspective Plan, provides a policy framework for CSA. Pilot projects and NGO-led initiatives have introduced CSA practices in select areas, raising awareness and demonstrating potential. Agricultural experts express openness to scaling CSA interventions and recognize their importance for long-term resilience. However, progress remains slow and fragmented, and without stronger institutional coordination, consistent technical support, and investment in farmer-led learning platforms, CSA uptake will remain limited.

Table 18: Institutional support and extension services

Item	Response		
	Frequency	%	
Have you received agricultural extension support in the last year?	Yes	58	36.3
	No	102	63.7
	Total	160	100
Do extension services cover CSA practices?	Yes	47	29.4
	No	113	70.6
	Total	160	100
How often do you interact with extension agents?	Weekly	13	8.1
	Monthly	5	3.1
	Occasionally	69	43.1
	Never	73	45.6
	Total	160	100
Do you find extension support useful?	Not useful at all	31	19.4
	Slightly useful	36	22.5

	Moderately useful	39	24.4
	Very useful	27	16.9
	Extremely useful	27	16.9
	Total	160	100
Do you have access to farmer field schools or demonstration plots?	Yes	21	13.1
	No	139	86.9
	Total	160	100

Source: Survey data

4.3.7. Gender and Inclusion

The data on gender and inclusion reveal both encouraging progress and persistent structural gaps in equitable participation across farming households and community institutions. A majority of respondents (53.8%) indicated that farming decisions are primarily made by male heads of household, while only 10.6% reported female-led decision-making (Table 19). However, the 35.6% of households that make decisions jointly suggest a growing shift toward shared responsibility and more inclusive intra-household dynamics. FGDs and expert observations confirm that while women contribute significantly to farming activities, their role in decision-making often remains informal and lacks structured follow-up, especially in the absence of targeted support.

Women’s participation in extension training is relatively strong, with 60% of respondents affirming equal involvement. Yet, the remaining 40% highlight persistent gaps in access, which can limit women’s ability to adopt CSA practices and contribute fully to farm innovation. In some communities where inclusive training has been implemented, women have successfully applied techniques such as multi-cropping to diversify production demonstrating high adoption rates and tangible benefits. Youth engagement is similarly promising, with 54.4% of respondents reporting active involvement in farming and CSA practices. This signals potential for generational continuity and a foundation for scaling CSA through youth-led initiatives (Table 19).

Access to credit and agricultural inputs appears moderately inclusive, with 62.5% of respondents stating that women and youth have equal access. However, 37.5% still report unequal access, pointing to ongoing structural barriers that hinder productivity and resilience, particularly for marginalized groups such as women, youth, and persons with disabilities (Table 19). FGDs reveal

that while some agricultural experts are responsive to community concerns, the absence of structured mechanisms for follow-up and support limits the effectiveness of these engagements. Community-level decision-making on resource management remains uneven. Only 11.9% of respondents described the process as “fully inclusive,” while 41.1% rated it as “not inclusive” or “slightly inclusive.” This underrepresentation of women and youth in local governance structures undermines the potential for equitable planning and climate resilience. Where deliberate inclusion has been practiced, however, communities report stronger participation in planning and implementation, reinforcing the importance of equity in achieving sustainable outcomes.

Positive impacts include growing awareness of equity among stakeholders, successful application of CSA techniques by women and youth, and improved decision-making where inclusive training has been implemented. Negative impacts include continued exclusion of women, youth, and persons with disabilities from CSA programs and technical support, informal roles in decision-making and limited access to resources all of which constrain household-level adoption and broader community resilience.

Table 19: Gender and inclusion in agricultural decision-making and CSA participation

Item		Response	
		Frequency	%
Who makes most farming decisions in your household?	Male head	86	53.8
	Female head	17	10.6
	Jointly	57	35.6
	Total	160	100
Are women equally involved in extension training?	Yes	96	60
	No	64	40
	Total	160	100
Are youth engaged in farming and CSA practices?	Yes	87	54.4
	No	73	45.6
	Total	160	100
Do women or youth have equal access to credit and inputs?	Yes	100	62.5
	No	60	37.5
	Total	160	100
How inclusive are community decisions on resource management?	Not inclusive at all	36	22.5
	Slightly inclusive	44	27.5
	Moderately inclusive	51	31.9
	Very inclusive	19	11.9

Fully inclusive	10	6.3
Total	160	100

Source: Survey data

4.3.8. Farmer Capacity and Practices

The data on farmer capacity and practices reveal a promising foundation for CSA uptake, yet also expose critical gaps in confidence, implementation, and resilience. An overwhelming 96.9% of respondents reported receiving CSA training, reflecting strong outreach efforts and growing awareness of climate-resilient techniques. However, confidence in applying these practices remains uneven: only 29.4% of farmers described themselves as “very” or “extremely confident,” while 45% reported low or slight confidence (Table 20). FGDs and expert observations suggest that this disconnect stems from limited follow-up support, resource constraints, and contextual challenges that hinder practical application.

Knowledge sharing among farmers is modest, with only 40.6% actively disseminating CSA insights to peers. Community feedback indicates that while informal exchanges do occur, structured farmer-to-farmer learning platforms are lacking. Strengthening local networks and promoting participatory learning could accelerate the diffusion of best practices and foster collective resilience.

Adoption of specific CSA techniques is varied. Water harvesting leads with 43.1% uptake, followed by improved seeds and crop diversification (each at 38.1%), raised beds (33.1%), and agroforestry (28.8%) (Table 20). FGDs highlight additional coping strategies such as early planting, seed saving, nursery establishment, and drainage construction. While these practices demonstrate adaptive capacity, they remain insufficient to withstand recurring floods, prolonged droughts, and pest outbreaks. Farmers consistently call for improved access to pest-resistant and drought-tolerant crop varieties, better agricultural technologies, and more tailored training in CSA methods.

Household capacity to cope with floods is mixed. While 25.6% rated their capacity as “very high” and 16.9% as “high,” the majority fell within the “moderate” (39.4%) or lower categories (18.1% combined for “low” and “very low”). Expert assessments confirm that inadequate infrastructure, limited early warning systems, and financial constraints continue to undermine resilience. Some

communities show strong willingness to adopt innovations especially where intercropping and composting have been introduced but others remain hesitant due to low awareness and lack of exposure.

Positive impacts include farmers’ demonstrated adaptability through practices like early planting, seed saving, and nursery establishment. Communities express readiness to adopt improved techniques when supported with training, inputs, and technologies. Negative impacts include persistently low farmer capacity due to weak extension services, limited resources, and inadequate access to CSA inputs. Pest outbreaks, droughts, and floods continue to overwhelm existing coping mechanisms, and reluctance to adopt new practices persists in underserved areas.

Table 20: Farmer capacity and CSA practices

Item	Response		
	Frequency	%	
Have you ever received training on CSA practices?	Yes	155	96.9
	No	5	3.1
	Total	160	100
How confident are you in applying CSA practices?	Not confident at all	35	21.9
	Slightly confident	54	33.8
	Moderately confident	37	23.1
	Very confident	24	15.0
	Extremely confident	10	6.3
	Total	160	100
Do you share CSA knowledge with other farmers?	Yes	65	40.6
	No	95	59.4
	Total	160	100
Which CSA practices have you adopted? (choose all that apply)	Raised beds	53	33.1
	Agroforestry	46	28.8
	Water harvesting	69	43.1
	Improved seeds	91	56.9
	Crop diversification	61	38.1
How do you rate your household’s capacity to cope with floods?	Very low	31	19.4
	Low	24	15.0
	Moderate	67	41.9
	High	15	9.4
	Very high	23	14.4
	Total	100	100

Source: Survey data

4.4. Hydrology

4.4.1. Community Perceptions about Flood Occurrences and Impacts

The survey shows that flooding is a widespread and recurring problem, with over 80% of respondents recognizing past flood events and more than 60% reporting annual floods. The main causes are heavy rainfall (60%) and river overflow (31.9%), while poor drainage (7.5%) and deforestation (0.6%) play smaller roles. Overall, the findings underscore the high frequency and severe impact of floods, highlighting the urgent need for improved drainage, river management, and community preparedness measures.

In summary, the community perceives floods as frequent and impactful, with heavy rainfall and river overflow being the main causes. These insights highlight the need for flood mitigation strategies, including improved drainage, river management, and community awareness programs, to reduce vulnerability and enhance resilience in the area.

4.4.2. Flood Resilience, Mitigation, and Infrastructure

The survey confirms that flooding has severe and recurring impacts on the community, with over 80% recognizing major damage to life, property, and livelihoods. However, mitigation and response efforts are seen as highly ineffective nearly all respondents reject their adequacy, and warning systems are limited and unreliable. Preparedness is also weak, as over half report insufficient community training. Local protective structures provide only partial and uncertain benefits, while flood control infrastructure is largely absent, poorly maintained, and ineffective.

Overall, the community remains highly vulnerable to floods due to the combination of severe impacts, weak preparedness, poor infrastructure, and ineffective systems. Addressing this requires urgent modern flood control infrastructure, reliable early warning systems, and community capacity-building programs, alongside sustainable mitigation strategies to strengthen resilience and reduce vulnerability.

The survey Key Findings & Analysis reveals that flooding poses a severe and recurring threat to the community, with most residents recognizing its high impacts on life, property, and livelihoods. However, mitigation and response efforts are overwhelmingly viewed as ineffective, and warning systems lack reliability. Community preparedness is also low, with more than half reporting inadequate training and awareness. At the same time, flood control infrastructure is largely absent

or in poor condition, leaving residents feeling unprotected. Local protective structures exist in some areas but are seen as unreliable and only partially effective. Overall, the findings highlight critical vulnerabilities and the urgent need for stronger infrastructure, effective early warning systems, and improved community capacity-building.

4.4.3. Historical Flood Explanation

Gambela (the lower Baro–Akobo sub-basin, often called the Gambela floodplain or Machar floodplain) is a low-lying, seasonally inundated floodplain that routinely floods every wet season. Large overbank floods have recurred in the past two decades (and earlier): the basin shows frequent seasonal inundation and periodic extreme events that cause displacement and damage (for example major events across the 2000s–2010s and large displacements reported in 2022). The main causes are strong seasonal rainfall, river-bank overflow of the Baro/Akobo/Alworo/Gilo Rivers, very low relief (flat floodplain geometry), wetland connectivity between channels, and land-use / climate variability that can increase severity (Figures 18-20). The downstream of the Baro Akob basin total flood plain as shown in figure 18.

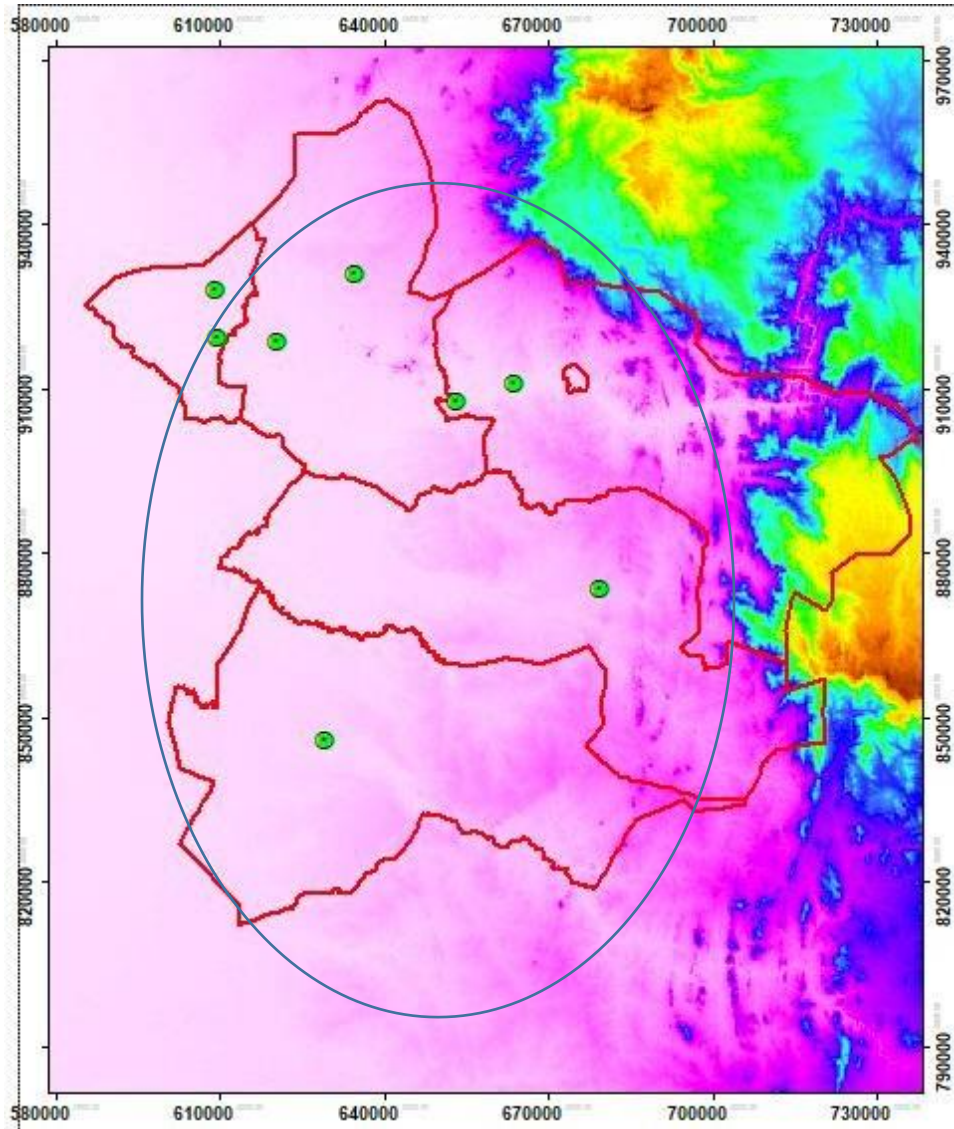


Figure 18: Flood plain

The spatial distribution analysis indicates that most of the kebeles are positioned near the floodplain, as shown in the subsequent image and figures in 19 below.

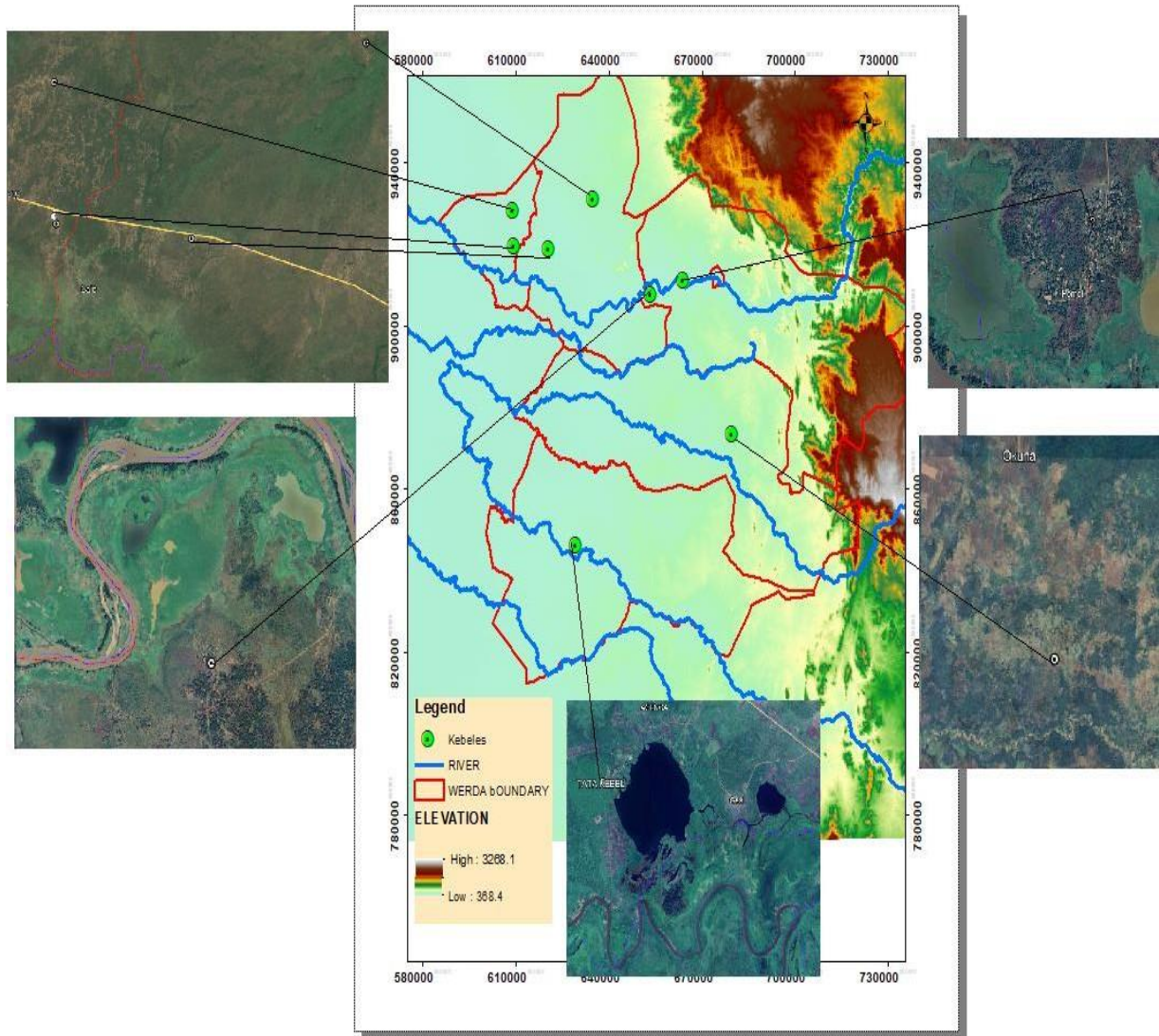


Figure 19: Existence of nearest floodplain at different kebeles

The elevation across the basin varies significantly: highlands and rolling topography in the east and northeast transition into broad, flat lowlands toward the west. The flood-prone kebeles (villages) are mostly situated at lower elevations (<500 m a.s.l.), where even moderate river overflows or backflows from tributaries inundate large areas. Conversely, the higher elevation zones act as catchments, feeding runoff into the major rivers. The Baro, Akobo, and Gilo Rivers are the dominant river systems. They collect runoff from the highland catchments and carry large volumes of water into the Gambela flood plains. Seasonal rainfall peaks (June–September) cause these rivers to swell, overflow their banks, and inundate surrounding villages and agricultural lands. Their meandering channels and frequent overbank flows shape the extent of flood plains.

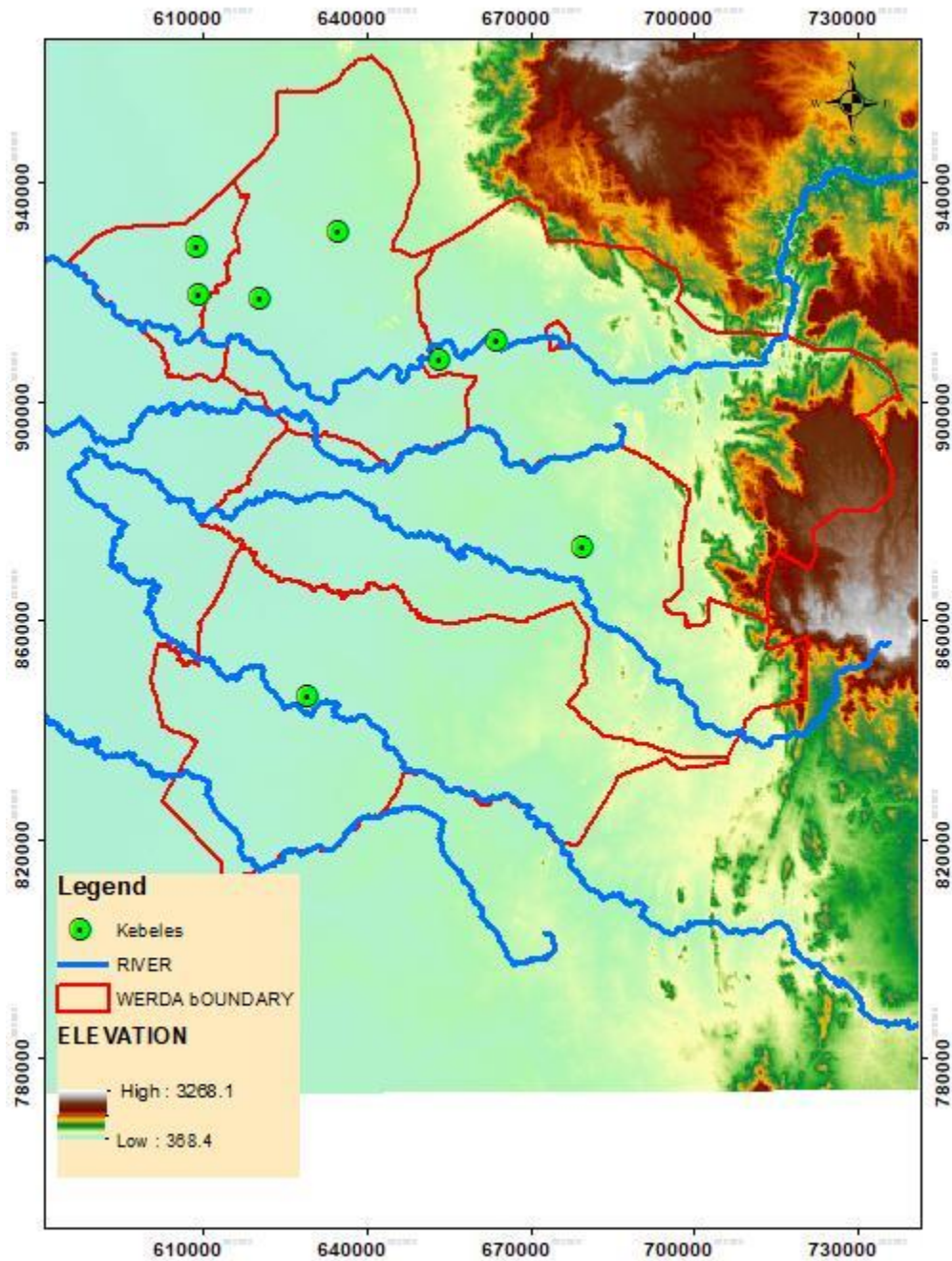


Figure 20: Downstream of the Baro–Akobo basin flood plain

The maps (Figures 19 and 20) highlight the strong potential for implementing a Water 4 Food project in the woreda, as the extensive river network, fertile lowlands, and floodplains create opportunities for irrigation-based agriculture and livestock watering. Kebeles located near rivers can directly benefit from small-scale irrigation schemes, water harvesting structures, and community-managed canals to improve year-round food production. At the same time,

floodplains, while posing risks of seasonal inundation, offer high agricultural potential if managed through controlled floodwater harvesting, diversion canals, and soil conservation practices. Through the integration of watershed management, irrigation development, and floodplain utilization, the project can enhance crop yields, support livestock production, and strengthen household food security while reducing vulnerability to floods and droughts.

4.5. Biological Baseline Conditions

4.5.1. Plant and Animal Species Conservation Risk

Household survey results show mixed perceptions of species conservation, with 36.3% disagreeing that species face low risk and 40.6% agreeing, reflecting uncertainty about threatened and endemic species. FGDs verify these concerns, reporting biodiversity declines over the past decade due to land clearing, drought, invasive species, and unsustainable harvesting. Communities in Drong and Pinkuwe Kebeles noted the disappearance of elephants, buffalo, lions, and shifts in plant distributions, indicating that survey skepticism aligns with observed ecological declines.

4.5.2. Protection of Critical Habitats

Over half of survey respondents (50.6%) believed critical habitats (Water bodies, wetland, forest and grassland) are inadequately protected. FGDs confirm this, noting degradation of wetlands, forests, grasslands, and bush lands due to agriculture, settlement growth, agricultural investment, and infrastructure development. Specific threats include invasive water hyacinth (*Eichhornia crassipes*), deforestation in Abobo, and habitat disruption from large-scale farms. Both data sources indicate urgent need for habitat conservation especially the expiation of invasive alien species (*Eichhornia crassipes*) its impacted the productivity of fish and other aquatic and semiaquatic biodiversity.

4.5.3. Project Impacts on Biodiversity

TH finding of house hold survey about the perceptions of the W4F project's impacts are divided: 41.8% doubt minimal negative effects, 29.4% express confidence, and 28.8% remain neutral. FGDs highlight that agricultural expansion and land clearing disrupt habitats, reduce species populations, and increase human-wildlife conflict. Some areas show predator population increases, posing safety risks. In general, the Potential Positive Impacts are illustrated in table 21.

Table 21: Potential positive impacts of W4F on biological environment

Potential Beneficial Impact	Ecosystem / Habitat	Mechanism of W4F Produces the Benefit
<i>Habitat Preservation and Restoration</i>	Wetlands, rivers, floodplains, forests	Sustainable water management and climate-smart agriculture reduce habitat degradation, maintain natural water levels, and restore riparian and forest areas.
<i>Enhanced Species Diversity</i>	Agroforestry fields, riparian zones, grasslands	Diversified cropping and agroforestry create microhabitats for birds, insects, small mammals, and native plants.
<i>Support for Threatened and Endangered Species</i>	Wetlands, savannas, forests	Reduced pressure from unsustainable land use and irrigation allows populations of species like Swayne’s hartebeest, Nile lechwe, and wetland birds to stabilize and recover.
<i>Improved Ecological Connectivity</i>	Forest patches, savannas, river corridors	Integrated land-use planning and reduced habitat fragmentation maintain wildlife corridors, enabling migration and gene flow.
<i>Soil and Aquatic Ecosystem Health</i>	Riverine and wetland ecosystems, agricultural lands	Reduced soil erosion and improved water use efficiency protect riverine ecosystems and support soil microorganisms, fish, amphibians, and aquatic plants.
<i>Promotion of Climate-Resilient Biodiversity</i>	Croplands, rangelands, natural vegetation areas	Use of drought-tolerant crops, native vegetation buffers, and climate-resilient farming supports ecosystem services like pollination, nutrient cycling, and resilience of native species.

Source: Field observation and assessment data

4.5.4. Effectiveness of Biodiversity Mitigation Measures

Nearly half of respondents (46.8%) believe mitigation measures support ecosystems, though 29.4% remain neutral. FGDs note tree planting, ecosystem rehabilitation and restoration, and agroforestry efforts, but also emphasize that biodiversity declines persist where human activities expand unchecked. Recognition of interventions exists, but doubts remain about their sufficiency without stronger enforcement. Regarding, the role of Community Involvement, Survey respondents strongly agree (61.3%) that community engagement is essential. FGDs also reflect this, identifying local land-use practices as both drivers of biodiversity loss and areas for community-led solutions. Balancing livelihoods with conservation is critical.

CHAPTER FIVE PROJECT ALTERNATIVES

To evaluate and compare potential development pathways, specifically, what happens if the project is NOT implemented “Without Project” versus if it IS implemented “With Project” or Selected Scenario. The goal is to demonstrate that the selected project scenario delivers greater environmental, social, economic, and climate resilience benefits while minimizing risks, making it the most viable and responsible option.

“WITHOUT PROJECT” SCENARIO

The project area is characterized by high vulnerability to flooding, which exacerbates the critical lack of safe drinking water and sanitation infrastructure. Widespread open defecation, combined with these conditions, leads to the contamination of water sources during runoff events, creating a persistent public health crisis.

Furthermore, agricultural practices are unsustainable and severely challenged by climate change. Erratic rainfall patterns and frequent droughts undermine crop production, while flooding damages harvests and erodes fertile soil. This combination of environmental and infrastructural deficits results in chronic food insecurity and malnutrition.

However, this alternative would forgo the area's potential socio-economic benefits, perpetuating its existing problems

The “With Project” scenario is selected as the Preferred Alternative because it offers a transformative, sustainable, and equitable pathway out of water and food insecurity. It directly addresses the root causes of vulnerability, water scarcity, climate shocks, and institutional weakness, while delivering measurable co-benefits in health, gender, environment, and local economy.

In implementing the project, design and technology choices play a critical role in ensuring long-term success and sustainability. Incorporating solar-powered pumping systems and smart irrigation technologies improves water-use efficiency and makes the project more climate-resilient. Nature-based solutions, such as rainwater harvesting structures, infiltration ponds, and constructed wetlands, complement these engineered systems by enhancing groundwater recharge and

improving sanitation outcomes. Furthermore, gender-responsive infrastructure design—which ensures women and girls have safe, private, and reliable access to water and sanitation—is essential for reducing their time burdens and health risks.

CHAPTER SIX

ANTICIPATED ENVIRONMENTAL AND SOCIAL IMPACTS AND MITIGATION MEASURES

6.1 General

A key part of the Environmental and Social Impact Assessment (ESIA) Study is the impact assessment analysis of how the project may interact (positively and negatively) with environmental and socioeconomic resources or receptors. This chapter identifies and evaluates the actual and potential environmental consequences of the proposed project activities, with the potential for mitigation of negative impacts and enhancement of positive impacts.

The assessment process involved looking at the environmental baseline features, uniqueness, potential vulnerabilities and the nature, location, and duration of construction activities, and project design features in effect throughout the operation. An understanding of the nature of the impacts, the proposed Water 4 Food (W4F) project at Gambela Region would have on the natural and human environment is vital to decision-making on the path of both the communities and the government.

6.2. Potential Beneficial Impacts of W4F Project

Table 22 indicates the construction and operation phase potential positive impacts of the climate proof water for food project in Gambella region.

Table 22: The potential positive impacts and associated enhancement measures of the W4F project

Phase	Title / Issue	Positive Impact	Enhancement Measures
Social Benefit during Construction Phase			
Construction Phase	Employment Opportunities	Provides short-term jobs and daily wages for local community members especially in high-unemployment or seasonal farming areas.	Offer training on CSA, WASH, fair wages, and prioritizes hiring local labor to maximize community benefits.
	Skill Development & Capacity Building	Local workers acquire transferable skills (masonry, plumbing, basic engineering) that improve future employability.	Establish formal training programs or certification to strengthen long-term job prospects.

	Community Engagement	Builds transparency, trust, and ownership through consultation and active involvement, ensuring long-term project sustainability.	Create regular feedback mechanisms and participatory monitoring to deepen engagement.
	Infrastructure Development	Improves access roads, utilities, and site facilities, leaving lasting benefits for connectivity and services.	Ensure infrastructure is durable, multipurpose, and accessible to the wider community.
	Local Economic Stimulus	Boosts local suppliers/vendors through material purchases and circulation of wages in local shops.	Support local businesses with fair contracts and encourage use of locally sourced materials.
Environmental Benefits during Operation Phase			
Operation Phase	Improved Soil Health & Carbon Sequestration	Increases soil fertility and captures atmospheric carbon, reducing climate change impacts.	Provide training on sustainable practices (composting, cover cropping) and monitoring soil health.
	Enhanced Biodiversity	Agroforestry and crop diversity strengthen ecosystems by providing habitats for birds, and microorganisms.	Promote native species planting and establish biodiversity monitoring systems.
	Optimized Water Use	Mulching and efficient practices reduce water evaporation, ensuring maximum use of available water.	Train farmers in water-saving technologies and expand irrigation efficiency methods.
	Increased Resilience	Drought-resistant crops and diversified planting reduce vulnerability to climate shocks.	Provide access to resilient seed varieties and create early warning/response systems.
	Reduced Pollution	Natural fertility and pest management reduce chemical use and water contamination	Encourage organic certification programs and educate farmers on safe alternatives.
	Environmental Sustainability	Agroforestry and soil cover protect ecosystems, enhance fertility, and store carbon	Integrate local conservation programs and promote reforestation drives.
Social Benefits during Operation Phase			
	Foundations for Health & Empowerment	Reliable water access improves health, reduces women/children's burden, and frees time for education or income	Build capacity for water management committees and ensure equitable access for all groups.

Operation Phase	Stakeholder Engagement & Social Dialogue	Promotes trust, cohesion, and long-term collaboration with communities and stakeholders	Establish inclusive platforms for ongoing dialogue and conflict resolution.
	Community Development	Corporate social responsibility (CSR) programs can improve education, healthcare, and amenities, raising quality of life	Align CSR initiatives with community priorities through participatory needs assessments.
	Economic Empowerment & Poverty Reduction	Higher yields and incomes improve livelihoods and food availability Reduced risk fosters investment	Provide access to markets, credit, and financial literacy to maximize income gains.
	Resilience & Food Security	Climate-smart practices stabilize harvests and strengthen household food supply.	Support farmer cooperatives and promote storage/processing facilities for surplus crops.
	Economic	Increases farm efficiency and profitability, diversifies crops, and opens new markets.	Facilitate access to value chains, training in agribusiness, and digital tools for farmers.
	Sanitation	Toilets reduce disease, protect water/soil, and ensure privacy, especially for vulnerable groups.	Provide hygiene education campaigns and ensure inclusive access (women, elderly, disabled).

Source: Based on findings from integrated tools

6.3. Impact Assessment Methodology

The purpose of the impact assessment is to identify and evaluate the significance of potential impacts on identified resources; to develop and describe mitigation measures that will be taken to avoid or minimize any potential adverse effects and enhance potential benefits, and to report the significance of the residual impacts that remain following mitigation.

6.3.1. Predicting the Magnitude of Impacts

The term ‘magnitude’ covers all the dimensions of the predicted impacts on the natural and social environment including:

- The nature of the change (what resource is affected and how);
- The spatial extent of the area impacted or the proportion of the population or community affected;
- Its temporal extent (*i.e.* duration, frequency, reversibility); and

- Where relevant, the probability of the impact occurring as a result of accidental or unplanned events.

6.3.2. Impact Significance Rating

Practicable management measures will be recommended that avoid, and if avoidance is not possible, then reduce, restore, compensate/offset negative impacts, enhance positive impacts and assist project design. Impact matrices for the site preparation, construction and operation phases were created utilizing the following criteria:

Table 23: Impact Characteristic Terminologies

Impact Magnitude	
Type	<p>Direct – impacts that result from a direct interaction between the project and resource/receptor.</p> <p>Indirect – impacts that follow from direct interactions between the project and its environment as a result of subsequent interactions.</p> <p>Induced – impacts that result from other activities that happen as a consequence of the project.</p>
Extent	<p>Local – Site-specific effects of a project, activity, or change that occur within the immediate area of influence.</p> <p>Regional – impacts that are experienced beyond the local areas to the wider region.</p> <p>International – impacts that are experienced at an international scale i.e. affecting another country.</p>
Duration	<p>Temporary – predicted to last less than the project duration.</p> <p>Short-term - predicted to last only for the duration of the construction activities (i.e. up to approximately one year).</p> <p>Medium-term - predicted to last from one year to the end of the project life</p> <p>Long-term - predicted to continue beyond the project life but will cease in time.</p> <p>Permanent – impacts that cause a permanent change in the affected resource that endures substantially beyond the project lifetime.</p>
Frequency	<p>Continuous – impacts that occur continuously or frequently.</p> <p>Intermittent – impacts that are occasional or occur only under specific circumstances</p>

Likelihood	<p>Unlikely – the event is unlikely but may occur during the project.</p> <p>Possible – the event is likely to occur at some point during the project.</p> <p>Likely – the event will occur during the project (i.e. it is inevitable).</p>
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6.3.3. Assessment of Impact Significance

All human activity imposes some level of change on the natural and social environment, because of physical interactions with natural systems or other human activities. To provide information to decision-makers and other stakeholders on the importance of different project impacts, the ESIA team evaluates the significance of each such change.

There is no statutory definition of significance. Therefore, in the ESIA, the evaluation of significance is inherently subjective. It is based on the professional judgment of the ESIA team, informed by legal standards, national and regional government policy, and the views of stakeholders. Where specific standards are either not available or provide insufficient information on their own to allow grading of significance, evaluation of significance will take into account the magnitude of the impact and the quality, importance or sensitivity of the affected resource.

Impact (Severity): The consequence on the environment, community, or project if the risk occurs.

- Catastrophic: Irreversible damage, major legal non-compliance, fatal accidents, significant community displacement.
- Major: Long-term environmental damage, regulatory fines, major injuries, major community conflict.
- Moderate: Reversible damage, temporary non-compliance, minor injuries, public complaints.
- Minor: Short-term nuisance, minimal environmental disturbance, easily corrected.
- Insignificant: Negligible impact, no discernible effect.

Probability (Likelihood): The chance of the risk event happening.

- Almost Certain: > 90% chance of occurrence. Expected.
- Likely: 60-90% chance. Will probably happen.
- Possible: 30-60% chance. Might occur.
- Unlikely: 10-30% chance. Could occur.
- Rare: <10% chance. Very unlikely.

Table 24: The Risk Matrix & Scoring

Impact → Probability ↓	Insignificant	(Minor)	Moderate	Major	Catastrophic
(Almost Certain)	Low	Medium	High	High	High
Likely	Low	Medium	Medium	High	High
Possible	Low	Medium	Medium	Medium	High
Unlikely	Low	Medium	Low	Medium	Medium
Rare	Low	Medium	Low	Low	Low

Table 25: Risk Response & Action Plan

Risk Level	Required Action & Monitoring
HIGH	Unacceptable. Must be mitigated immediately. Operations cannot proceed until risk is reduced. Requires a dedicated management plan, significant resources, and continuous or daily monitoring.
MEDIUM	Tolerable. Requires specific mitigation measures and standard procedures. Must be monitored regularly (e.g., weekly/monthly).
LOW	Acceptable. Managed by routine procedures. Requires periodic monitoring or audit (e.g., quarterly)

The first step in identifying impacts associated with the project is the development of an interaction matrix which shows the relationship/interaction between the project’s environmental components and planned project activities. The full list of project activities used in the interaction matrix has been summarized in four (4) phases; pre-construction, construction, operation and decommissioning. Based on these interactions, the identified negative impacts were rated as High, Medium and Low.

6.3.4. Mitigation Measures

One of the key objectives of this ESIA is to identify and define socially and environmentally acceptable, technically feasible and cost-effective mitigation measures. Mitigation measures are developed to avoid, reduce, remedy or compensate for the significant negative impacts identified during the ESIA process, and to create or enhance positive impacts such as environmental and social benefits. In this context, the term mitigation measures include operational controls as well as management actions. Where a significant impact is identified, a hierarchy of options for mitigation is explored.

Avoidance: Completely prevent the impact by not proceeding with the activity or by changing the project's design, location, or process.

Minimization (or Reduction): Reduce the intensity, extent, or duration of the unavoidable impact through modified design, technology, or operational practices.

Rectification (or Restoration): Repair, rehabilitate, or restore the affected environment after the impact has occurred.

Compensation (or Offset): Compensate for residual, unavoidable impacts by providing substitute resources or benefits to the affected environment or community. This is a last resort.

The priority in mitigation is to first apply mitigation measures to the source of the impact (i.e., to avoid or reduce the magnitude of the impact from the associated project activity).

Table 26: Environmental Impacts during Different Phases of the W4F Project

Project Activity	Potential Impact	Mitigation Measures	Impact	Probability	Risk
Pre-Construction and Construction Phase					
	Land acquisition and Ownership transfer	<ul style="list-style-type: none"> Engage local communities to understand their needs and concerns. Ensure a fair and transparent land acquisition process. Facilitate voluntary land transactions with clear terms. Explore options for fair benefit sharing with affected communities. Implement the recommended complaint resolution procedure (Grievance Mechanism) to ensure that any complaints regarding project related components are promptly and adequately investigated and resolved. 	Moderate	Likely	
	Road accident for local community	<ul style="list-style-type: none"> Ensure roads with gentle and sharp curves for safe movement of large vehicles in order to avoid accidents. 	Major	Possible	
	Vegetation clearing: Site clearance can destroy vegetation, displace small fauna, and reduce local biodiversity.	<ul style="list-style-type: none"> Minimize land-clearing areas and Avoid vegetation clearing by machinery along rights-of-ways. Involvement of local committees in tree planting at the village level is recommended for sustainability. Minimize land-clearing areas. Avoid vegetation clearing by machinery along rights-of-ways. Involvement of local committees in tree planting at the village level is recommended for sustainability. 	Moderate	Likely	

		<ul style="list-style-type: none"> Planting of trees and rehabilitating the construction site once construction is over. 			
	Excavated soil and dust emission	<ul style="list-style-type: none"> ensure construction site watering, limiting vehicles speed and cover transported excavated soil and other materials with tarpaulins to manage dust impacts. maximize re-use of all excavated soils and materials in the project construction works. dispose surplus materials only at designated sites. Dispose of surplus materials (“spoil”) only at designated sites approved by the responsible local authority and only by approved methods, the methods must consider topsoil conservation and quality, in all cases steps must be taken to prevent erosion and maintain the stability of the material after placement. 	Moderate	Possible	
	Soil Erosion & Sedimentation: Excavation and runoff may cause soil loss, silting of nearby water bodies, and habitat degradation	<ul style="list-style-type: none"> Implement erosion control (silt traps, bunds). Stabilize soil promptly. Vegetate disturbed areas. 	Moderate	Possible	
	Noise & Dust: Disruption to nearby communities and livestock from drilling, drilling noise may disturb wildlife, especially nesting birds and sensitive species.	<ul style="list-style-type: none"> Inform communities of schedule. Employ water spraying to suppress dust. Restrict drilling to daytime hours; Use noise-reduction equipment. 	Moderate	Likely	

	levels and excessive vibrations with the associated disturbance to communities	<ul style="list-style-type: none"> • Construction equipment and vehicles compliant with international best practices for noise emissions. • Prefer electrical power plant to mechanical alternatives, where feasible. • Enclosure of the main fixed sources of noise (power generators mainly). • Switch off equipment when not in use. • Minimal use of vehicle horns and heavy engine breaking in the area needs to be encouraged. • The number of equipment operating simultaneously should be reduced as far as practicable. 	Moderate	Likely	
Drilling wells	groundwater contamination and other related impacts	<ul style="list-style-type: none"> • Drain immediate surroundings of water wells to avoid infiltration of contaminated water. • Restore the site affected by drilling to its initial condition. • Dry drilling fluid of the site, mix with earth and spread over the site. • Construct properly designed and water tight well heads with proper pump sealing to well heads. • Pump and other equipment submerged into wells need initially disinfected and at each extraction. 	Major	Possible	
Waste management	Solid waste generation during reservoir construction, and during drilling	<ul style="list-style-type: none"> • Installation of proper solid waste management practice based on ‘three R’s – Reduce, Reuse and Recycle. • Segregate waste. • Dispose of drilling cuttings in a designated, safe area. • Remove all waste from the site. 	Moderate	Likely	
Workers Health and Safety	Occupational health and safety hazards (injuries, accidents)	<ul style="list-style-type: none"> • Provision of PPEs to all personnel working in potentially hazardous areas or with potentially hazardous equipment. • Inspect that workers are wearing PPEs and correctly. 	Moderate	Likely	

		<ul style="list-style-type: none"> • Maintain principle of No PPEs No work. • Conduct safety training for workers prior to beginning work. • Raising awareness and educating workers on risks from equipment and ensuring adequate training on the use of the equipment. 			
	Labor risks involving working conditions, management of worker relationships, child labor and minimum age, and labor grievance	<ul style="list-style-type: none"> • Introduce the GRM • Implement LMP 	Major	Possible	
	Gender-based violence, sexual exploitation and abuse, and sexual harassment (GBV/SEA/SH)	<ul style="list-style-type: none"> • Provide awareness training to all workers and community members on GBV/SEA/SH). • Educate workers and communities using posters, flyers in local languages about GBV/SEA/SH, during field days, public gatherings. • Provide training to workers on GBV/SEA/SH. • Prepare code of conduct for all project workers to read, understand and sign for taking responsibility in case of violations rules. • Put in place a functioning GRM for workplace complaints at the project site. • Address complaints in timely and appropriate manner using the GRM and legal channels. 	Major	Possible	
Operation Phase					
Supply of drinking	Waterborne and Water Related Health Impacts	<ul style="list-style-type: none"> • Promote waterborne and water related disease control and prevention. 	Moderate	Likely	

water for domestic use and animals		<ul style="list-style-type: none"> • Provide safe water supply for the intended communities to promote domestic uses and enable to keep personal hygiene. • Monitor and prevent releases and leakage of materials/pipeline with the potential to pollute water. • Protect the entrance of animals within fence on the water point, • Reduce the mobility of the user by shift arrangement. • strengthen and support capacity building of Woreda health workers, especially in creating conducive working environments in the disease control and prevention. 			
Water supply system	Water Logging	<ul style="list-style-type: none"> • Provision of surface or sub-surface drainage systems. • Avoid excess application of water by providing basic training on the utilization and management of water. • Regular maintenance of pipes and canals to control seepage losses is an important control measure. 	Moderate	Likely	
	Risk of social exclusion and vulnerability of the disadvantaged and vulnerable groups	<ul style="list-style-type: none"> • Ensure transparent and inclusive consultations during project identification, risk analysis and consultation processes. • Ensure project activity designs are considerate of vulnerable groups and underserved communities. • Ensure vulnerable groups and underserved communities are well identified, informed and included in project benefits. 	Major	Possible	
Improper water use	Impacts of overflow of water	<ul style="list-style-type: none"> • Form Water Users committee of the beneficiaries. • Maintain Economic Sustainability of the water • Maintain Technical Sustainability. • Maintain Institutional Sustainability. • Strengthen schemes operation monitoring and evaluation. • Maintain Information Exchange Sustainability through awareness creation 	Moderate	Likely	

Sustainability of the Groundwater	Lowering the ground water table	<ul style="list-style-type: none"> • Enhancing groundwater recharge by applying soil and water conservation works, tree planting. 	Major	Possible	
conflict on water source	Affect sustainable use of water for the community	<ul style="list-style-type: none"> • Community consultation on the water utilization, & management. • Implement the local conflict resolution mechanism at early stage by the elders and clan leaders. • Form stakeholders committee with responsibilities, in which any communal resource use among beneficiaries shall be guided by the committee. • Promote community awareness; harmonize any negative impacts of the planned development with the existing project area ecological, social and economic environmental conditions. 	Major	Possible	
Agricultural activity	Field ploughing will lead to excessive release of dust to the air.	<ul style="list-style-type: none"> • Wetting of field during field clearing. • Workers provided eye shields and masks. 	Moderate	Possible	
Agricultural activity	Oil and grease drops from the farm machinery will contaminate the soil and water bodies within the community	<ul style="list-style-type: none"> • Carry out periodic pre-mob of machinery. • Ensure that equipment and Machine are kept in good working condition • Oil, chemical, lubricants, and fuel leakage or spillage should be contained and cleaned up immediately if any events occur. 	Moderate	likely	
Decommission Phase					
	Groundwater Contamination	<ul style="list-style-type: none"> • Seal the borehole with cement-bentonite grout to isolate aquifers; 	Major	Possible	
	Loss of Water Access & Livelihood	<ul style="list-style-type: none"> • Develop a reliable alternative water source before decommissioning. 	Major	Possible	

	Land Degradation	Design project for self-reliance from the start; strengthen local institutions;	Major	Possible	
	Soil Erosion & Habitat Disruption (Excavation and machinery during decommissioning can disturb topsoil and local flora/fauna)	<ul style="list-style-type: none"> • Conduct pre-decommissioning assessments to identify risks and plan remediation. • Source native plant species, seeds, or sod in advance that are appropriate for the local ecology and soil type to use in restoration. • Brief all machinery operators emphasizing the importance of staying within demarcated zones and respecting environmental protections. 	Major	Unlikely	
	Loss of Carbon Sinks	<ul style="list-style-type: none"> • Secure legal agreements for community management of agroforestry systems. 	Moderate	Possible	
	Reversion to Food Insecurity	<ul style="list-style-type: none"> • Engage private sector for continuous input supply and output markets. 	Major	Possible	
	Reduced Hygiene & Health Risks (increase waterborne disease)	<ul style="list-style-type: none"> • Install temporary water points (e.g., water tanks, or rehabilitated nearby boreholes) during transition. • Collaborate with local health facilities to monitor spikes in waterborne disease cases. 	Major	Possible	
	Community Mistrust	Engage community in all decommissioning decisions from the beginning	Major	Possible	

CHAPTER SEVEN

ENVIRONMENTAL AND SOCIAL MANAGEMENT AND MONITORING PLAN

7.1. Environmental and Social Management Plan

On this section environmental management and monitoring plans for the significant negative impacts identified on the previous sections has been proposed. Efforts have been made to associate the impacts identified, mitigation measures proposed and associate costs including management and monitoring. The principal stakeholders responsible for implementation of the mitigation measures and monitoring are included in the activity schedule.

The purpose of the environmental management and monitoring plan is to identify actions to reduce created adverse impacts to acceptable levels or where possible to avoid them altogether. Environmental planning and management as a concept seeks to improve and protect environmental quality for both the project site and the neighborhood through segregation of activities that are environmentally incompatible. Environmental planning and management integrates land use structure, social systems, regulatory law, environmental awareness and ethics.

The Environmental and Social Management Plan (ESMP) links the identified impacts and mitigation measures proposed in the partial environmental and social impact assessment report and institutional responsibilities for the implementation and monitoring of the recommended measures. In addition, it provides running environmental cost estimates. The main environmental management measures to be taken during operation phase are provided in Table 27 below. The Table provides summaries of the mitigation plan per environmental issue, the implementing as well as monitoring bodies/organizations.

Table 27: Environmental and Social Management Plan

Project Activity	Potential Environmental impacts	Proposed Mitigation Measures	Institutional Responsibilities	Implementation schedule (Time frame)	Costs(in USD)	Key Performance Indicator
Pre-Construction Phase						
Land acquisition and Ownership transfer	Taking land permanent and temporary, restrict land use right of the owners	<ul style="list-style-type: none"> • Before the implementing the infrastructure consult the public on the land acquisition process. • Replace the same types of land use for the land owner • Provide adequate compensation for the property loses and damages 	Woreda and Kebele Administrations,	During pre-construction phase	In-kind compensation, Voluntary land provision	Public consultation minutes signed by community representatives and Land transfer agreements finalized before construction
Road safety and project traffic	Accidents for the local community, access to restrict road	<ul style="list-style-type: none"> • Ensure roads with gentle curves for safe movement of large vehicles in order to avoid accidents 	Contractor	Before commencement of construction	Part of construction	Zero community complaints related to design-induced access restrictions prior to start
Construction Phase						
Vegetation clearing	Vegetation clearing impacts	<ul style="list-style-type: none"> • Involvement of local committees in tree planting at the village level is recommended for sustainability after the contractor has left. • Landscaping of the site and project areas. • Planting of trees and rehabilitating the construction site once construction is over. • The design to consider protecting the old standing native trees as much as possible. 	Woreda agricultural and natural resource office, Community	Construction phase	20,000	No clearing of protected native trees; survival rate of planted vegetation after one year
Excavated soil and dust impacts	Dust emission	<ul style="list-style-type: none"> • Ensure construction site watering. • Limit vehicles speed. 	Contractor	Construction phase	4,000	Watering logbook maintained and verified daily
	Disperse excavated soil from quarry site	<ul style="list-style-type: none"> • Ensure proper handling and maximize re-use of all excavated soils and materials in the project construction works. • Dispose surplus materials at designated sites 	<ul style="list-style-type: none"> • Contractor • Kebele administration 	Construction Phase	3,000	Disposal sites approved by Kebele administration with no off-site dumping

Drilling of borehole and movement of heavy duty vehicle	Noise pollution and Vibration	<ul style="list-style-type: none"> • Maintain all its work equipment at optimal operating conditions. • Restrict all activities during day time. • Employ water spraying 	<ul style="list-style-type: none"> • Contractor • Woreda Water and Energy Bureau 	Construction Phase	3,000	nearest sensitive receptor within local standards
Drilling wells	groundwater contamination and other related impacts	<ul style="list-style-type: none"> • Drain immediate surroundings of water wells to avoid infiltration of contaminated water. • restore the site affected by drilling to its initial condition; • Dry drilling fluid of the site, mix with earth and spread over the site. • Construct properly designed and water tight well heads with proper pump sealing to well heads. • Pump and other equipment submerged into wells need initially disinfected and at each extraction. 	<ul style="list-style-type: none"> • Contractor 	Construction Phase	Project budget	Post-construction water quality test meets potable standards
Workers Health and Safety	Occupational health and safety hazards (injuries, accidents)	<ul style="list-style-type: none"> • Provision of PPEs to all personnel working in potentially hazardous areas or with potentially hazardous equipment. • Conduct safety training for workers prior to beginning work. 	<ul style="list-style-type: none"> • Contractor 	Construction Phase	2,500	100% of workers using appropriate PPE during random inspections; Safety training attendance records for 100% of workforce.
Waste management	Poor Waste Management and Pollution	<ul style="list-style-type: none"> • Manage the wastes based on the three Rs (reduce, re-use, recycle) • Providing training for all contractor's personnel • Minimize the production of waste that must be treated or eliminated • Control placement of all construction waste to disposal sites • Identify and demarcate equipment maintenance areas (>15m) 	<ul style="list-style-type: none"> • Contractor • Kebele administrator 	Construction Phase	Contractors' Overhead	Designated waste collection and disposal sites are clean and organized
Labor handling	Labor risks involving working conditions,	<ul style="list-style-type: none"> • Introduce the GRM • Implement LMP 	<ul style="list-style-type: none"> • Contractor • Woreda Social affair office 	Construction Phase	Part of project budget	GRM is operational and

	management of worker relationships, child labor and minimum age, and labor grievance		<ul style="list-style-type: none"> • Kebele administrator 			accessible to all workers; 100% of workers have signed contracts adhering to national labor laws
	Gender-based violence, sexual exploitation and abuse, and sexual harassment (GBV/SEA/SH)	<ul style="list-style-type: none"> • Put in place a functioning GRM for workplace complaints at the project site. • Address complaints in timely and appropriate manner using the GRM and legal channels. 	<ul style="list-style-type: none"> • Contractor • Woreda Women and Social Affair • Kebele administrator 	Construction Phase	Part of project budget	Confidential GBV/SEA/SH reporting procedure is displayed and communicated to all workers
Operation Phase						
Supply of drinking water for domestic use and animal	Waterborne and Water Related Health Impacts	<ul style="list-style-type: none"> • Promote waterborne and water related disease control and prevention. • Provide safe water supply for the intended communities to promote domestic uses and enable to keep personal hygiene. • Monitor and prevent releases and leakage of materials/pipeline with the potential to pollute water. • Protect the entrance of animals within fence on the water point, • Reduce the mobility of the user by shift arrangement. 	<ul style="list-style-type: none"> • Woreda water and energy office • Water users committee, • Kebele administration • Beneficiary. • Health personnel 	Operation phase	8,000	Regular water quality tests confirm safety for drinking; Fence around water point is functional and maintained
Water Supply system	Water logging	<ul style="list-style-type: none"> • Provision of surface or sub-surface drainage systems. • Avoid excess application of water by providing basic training on the utilization and management of water. • Regular maintenance of pipes and canals to control seepage losses is an important control measure. 	<ul style="list-style-type: none"> • Woreda water and energy office • Woreda health office • Water user committees 	During Operation phases	15,000	No observed water logging or ponding around infrastructure
Improper water use	Impacts of overflow of water	<ul style="list-style-type: none"> • Form Water Users committee of the beneficiaries. • Maintain Economic Sustainability of the water. 	<ul style="list-style-type: none"> • Water users committee, • Woreda water sector, 	Operation phase	10,000	Annual technical audit of the system confirms functionality

		<ul style="list-style-type: none"> • Maintain Technical Sustainability. • Maintain Institutional Sustainability. • Strengthen schemes operation monitoring and evaluation. 	<ul style="list-style-type: none"> • beneficiary 			
Sustainability of the Groundwater	Lowering the ground water table	<ul style="list-style-type: none"> • Enhancing groundwater recharge by applying soil and water conservation works, tree planting, and reduce contamination of water 	<ul style="list-style-type: none"> • Woreda water, mining and energy office, • Water User Committee 	Operation phase	22,000	Annual monitoring of groundwater levels shows stable or recovering trends
Conflict on water source	Affect sustainable use of water for the community	<ul style="list-style-type: none"> • Community consultation on the water utilization, and management • Implement the local conflict resolution mechanism at early stage by the elders and clan leaders, • Form stakeholders committee with responsibilities, in which any communal resource use among beneficiaries shall be guided by the committee; and • Promote community awareness; harmonize any negative impacts of the planned development with the existing project area ecological, social and economic environmental conditions 	<ul style="list-style-type: none"> • Woreda administration, • Woreda Water Resource Development Office, • Kebele development committee 	Operation phase	15,000	Zero unresolved conflicts reported to Woreda authorities per year
Agricultural activity	Dust emission during ploughing	<ul style="list-style-type: none"> • Wetting of field during field clearing, • workers provided eye shields and masks 	<ul style="list-style-type: none"> • Woreda Agriculture Office • Agriculture officer 	Operation phase	3,000	PPE is available and used by workers during dusty operations; No complaints from adjacent communities about agricultural dust
Agricultural activity	Oil and grease drops from the farm machinery will contaminate the soil and	<ul style="list-style-type: none"> • Carry out periodic pre-mob of machinery • Ensure that equipment and Machine are kept in good working condition 	<ul style="list-style-type: none"> • Woreda Agriculture Office • Driver 	Operation phase	3,000	Pre-operation checklists are maintained for all machinery.
Total Cost					108,500	

7.2. Environmental and Social Monitoring Plan

Supervision and monitoring are fundamental to the successful implementation of an ESMP. The number of mitigation measures which are recommended above, when implemented will eliminate or reduce to acceptable levels of the negative environmental impacts of the project. In order to assess their effectiveness, or to identify further corrective action and to detect any impacts in the construction as well as operation phase of the project, it is essential that an environmental monitoring plan is put in place and implemented. Internal environmental monitoring programs during the operation phases of the project should be majorly the responsibility of the proponent. He will be responsible for environmental management and implementation of mitigation measures as well as responding to any adverse impacts because of the project. Besides, external monitoring in the area will be basically conducted by regulatory body of the sub-city.

Environmental monitoring time depends on the nature of environmental parameter. It can be done regularly or intermittently. Monitoring is often divided into two basic category, compliance and effects. Compliance monitoring refers to whether agreed measures are being implemented on time and to adequate standards. Effects monitoring is to assess the impacts of the project on the receiving social and physical environment, and vice versa: information on these subjects assists project management to change or improve how things are being done. Methods such as observation, inspection, discussion, interview counting and or measurement could be used for monitoring purpose. The monitoring will be site specific or the whole project area, depending upon the nature and coverage of fore-mentioned parameters.

Besides, since it is not possible to monitor all recommended mitigation measures, monitoring should be made to those indicators that are most relevant to evaluation of environmental mitigation measures. So that the following monitoring plans are outlined in order to follow up the selected impacts and enforce implementation of the environmental management plans.

As part of environmental management plan, reports should be also produced at regular time interval. Hence, the internal monitoring activity reports should be produced at a regular time intervals throughout the project life. During operation period at least bi annual reports for the construction and operation phase should be prepared and submitted to the competent authority.

Table 28: Environmental and Social Monitoring Plan

Code	Parameter to Monitor	Sampling Method / Approach	Frequency / Cost	Responsibility	Reporting
EM-01	Air quality (dust, PM ₁₀ , PM _{2.5})	Field measurements using portable air quality meters; visual inspection of dust suppression measures	Monthly; budgeted under contractor's EOHS costs	Contractor, Regional EPA, PIU	Monthly site report; consolidated quarterly report to PIU/Authority
EM-02	Noise and vibration levels	Noise meters at sensitive receptors (schools, hospitals, communities)	Quarterly; included in contractor's site monitoring costs	Contractor, Regional EPA, PIU	Same as above
EM-03	Surface and ground water quality (pH, turbidity, oil/grease, BOD/COD, heavy metals)	Grab sampling; analysis in accredited laboratory	Quarterly; lab analysis costs in monitoring budget	Regional EPA, Independent laboratory; PIU verification	Lab certificates attached to reports
EM-04	Soil quality (contamination, erosion, compaction)	Soil sampling and laboratory analysis; visual inspection of erosion control	Semi-annual; moderate budget	Regional EPA, PIU	Semi-annual report
EM-05	Vegetation/land cover (reforestation success, offset programs)	Transect surveys; % survival rate of planted trees	Bi-annual; cost included in reforestation program budget	Community monitors; PIU, Regional and Woreda Agriculture Bureau	Annual reforestation monitoring report
EM-06	Wildlife/biodiversity (if relevant to project area)	Field observation, camera traps, local knowledge	Annual; external specialist budget	Regional EPA; Regional and Woreda Agriculture Bureau, PIU	Annual biodiversity report
EM-07	Occupational health & safety (accidents, incidents, PPE use)	Daily logbooks; incident reports; random inspections	Continuous; cost covered under EOHS	EPA, Regional and Woreda H&S officer, PIU	Weekly & monthly reports
EM-08	Community health & safety (traffic safety, communicable disease awareness, GBV/SEA complaints)	Surveys, health statistics from local clinics, grievance redress log	Quarterly; included in RAP/GBV program costs	Regional and Woreda Social affair bureau, PIU	Quarterly monitoring reports

CHAPTER EIGHT

GRIEVANCE REDRESS MECHANISM (GRM)

The Grievance Redress Mechanism provides a clear description of the formal process whereby stakeholders can submit a grievance or report an incident regarding the Water 4 Food (W4F) project, through a defined process within a predictable timeframe and receive a response and resolution (where possible) to the grievance. This process should be adhered to by the W4F Project Coordination Unit (PCU) and Project Implementation Unit (PIU) and contractors executing W4F projects upon receipt of a complaint.

8.1. Objectives of Grievance Redress Mechanism

This grievance management system provides a formal way to register stakeholders' concerns to be addressed in good faith and through a transparent and impartial process. This mechanism aims to:

- Establish a systematic approach to handle grievances related to the W4F Project activities.
- Provide a clear and accessible process for stakeholders to report grievances.
- Ensure that incidents, complaints, and grievances are logged and managed consistently to build trust in the legitimacy and efficiency of the procedure and system;
- Assist in the resolution of grievances between and among stakeholders, such as the various government Ministries, Regional Bureau, Woreda Offices, Kebele, communities.
- Ensure that unwanted events with negative impacts on external stakeholders are dealt with swiftly and appropriately;
- Ensure that vulnerable people can log grievances in a non-threatening and accessible way;
- Allow the implementer to identify and correct problems before they recur or escalate into more serious problems;
- Allow the implementer to monitor and track stakeholder concerns, issues, and provide feedback;
- Provide an efficient and low-cost means of resolving disputes and providing control measures where appropriate.

8.2. Grievance Redress Mechanism of the Project

The following table indicates the Responsible Grievance Redress Committee, Composition of Committee, and Grievance Redress Committee Task.

Table 29: Grievance Redress Mechanism

Structure	Responsible Grievance Redress Committee	Composition of Committee	Grievance Redress Committee Task	Location of the Committee
Level I – Kebele Level	Local Grievance Redress Committee (Local GRC)	Kebele head, the village development committee chairperson, the youth representative, the religious leader, the women representative	<ul style="list-style-type: none"> • Receive and register a grievance/complaint at the site. • Investigate and internally review the grievance/complaint. • Propose a resolution for the grievance/complaint. • Report the grievance/complaint and proposed resolution to the Woreda level 	Kebele (Lower administration)
Level II- Woreda Level	Woreda Grievance Redress Committee (Woreda GRC)	Woreda Administrator, Water and Energy Office Head, Agriculture Office Head, Women and Social Affair Office Head	<ul style="list-style-type: none"> • Establish a procedure for receiving and logging complaints. • Resolve disputes and verify grievances and their merits. • Communicate decisions to complainant and provide necessary documentation. • Implement and monitor redress actions. • Record grievances, categorize them, and prioritize those to be resolved by the Committee • Maintain records, including registers, meeting minutes, and correspondence, for reference and inspection. • Document all received complaints and the progress of remediation for future reference. • Report to the Regional Level where grievances cannot be handled at the Woreda level. 	Woreda
Level III: Regional Level	Regional Grievance Redress Committee (Regional GRC)	Regional Focal Person, Regional Water Bureau Water and energy head, Regional Agriculture Head, Regional Women and Social Affair Head, Regional	<ul style="list-style-type: none"> • Records, categorizes, and prioritizes all grievances, focusing on those requiring immediate resolution. • Resolve disputes and verify grievances and their merits. • Communicate decisions to complainant and provide necessary documentation. 	Region

		Environmental Protection Authority Head	<ul style="list-style-type: none"> • Maintains comprehensive records—including registers, meeting minutes, and correspondence—to ensure transparency and accountability. • All received complaints and the progress of their remediation are documented for future reference. • Escalating complaints it cannot resolve at the regional level to Federal Level. 	
Level IV: Federal Level	Federal Grievance Redress Committee (Federal GRC)	Ministry of Water and Energy, Ministry of Agriculture, and Federal Environmental Protection Authority (EPA), Ministry of Women and Social Affairs	<ul style="list-style-type: none"> • Records, categorizes, and prioritizes all grievances, focusing on those requiring immediate resolution. • Resolve disputes and verify grievances and their merits. • Communicate decisions to complainant and provide necessary documentation. • Maintains comprehensive records—including registers, meeting minutes, and correspondence—to ensure transparency and accountability. • All received complaints and the progress of their remediation are documented for future reference. 	Federal

CHAPTER NINE

ESMP IMPLEMENTATION ARRANGEMENTS

The effective implementation of the Environmental and Social Management Plan (ESMP) is critical to achieving the project's environmental and social sustainability objectives. This table outlines the fundamental implementation arrangements, defining the institutional arrangements, roles, and responsibilities necessary to translate mitigation measures from plan into practice.

Table 30: ESMP Implementation Arrangements

Level/ Responsible Party	Roles and Responsibilities
Federal Level (MoWE, MoA)	<ul style="list-style-type: none"> ❖ Provide support, oversight, and quality control to the PIUs staff, RPCU, and WPCU staff working on environmental and social risk management. ❖ Collect, review, and provide quality assurance and approval to screening reports and ESMPs as relevant. Keep documentation of all project activity progress. ❖ Oversee overall implementation of the Environmental and Social Risk Management (ESRM) instruments and monitor the environmental and social mitigation measures and management activities, compile progress reports from PIUs, and report to the AfDB and Plan International on a quarterly basis. ❖ Train the key implementing partners' staff at federal and regional levels, Woreda level staff, and some contractors who will be responsible for implementing the ESMP and other instruments during project implementation. ❖ If contracting is managed at federal level, ensure that all bidding and contract documents include all relevant E&S management provisions. ❖ Support the regional and Woreda level experts in organizing capacity building programs. ❖ Disclose this ESIA, and other instruments to the public/stakeholders. ❖ Facilitate and provide training for sector office experts and E&S experts at regional and woreda levels.
Federal EPA (FEPA)	<ul style="list-style-type: none"> ❖ Reviewing and provide approval of ESMP related to the W4F. ❖ Facilitate and provide training for the staff of Implementing Agencies, and E&S experts at federal and regional levels.
Regional Bureaus (Water and Energy Bureau, Agriculture Bureau)	<ul style="list-style-type: none"> ❖ Coordinate and facilitate the execution of project activities, oversee the monitoring of environmental and social risk mitigation measures, and provide monthly progress and performance reports to the respective PIUs/TCs as relevant. ❖ When managing contracting at the regional level, make sure that all bidding and contract documents contain all necessary E&S risk management provisions. ❖ Offer training to contractors on pertinent environmental and social risk mitigation measures in consultation with Regional Environmental Protection Authority (REPA).

Regional EPA (REPA)	<ul style="list-style-type: none"> ❖ Review and clear screening reports submitted by implementing sector bureaus. ❖ Review the preparation of ESMPs by consultants where required, review and clear ToR, review and clear ESMPs and participate on public consultation activities. ❖ Oversee the execution of environmental and social risk mitigation measures by the sector offices at the regional level and local contractors. ❖ Deliver capacity-building training and additional technical assistance, as required, to regional and woreda level experts and E&S safeguard focal persons.
Woreda Offices (Water and Energy Office, Agriculture Office)	<ul style="list-style-type: none"> ❖ Oversee day-to-day implementation and monitoring of environmental and social risk and impact mitigation measures, and reports progress and performance to the RPCU on a monthly basis. ❖ Oversee implementation of this ESMP and other project specific environmental and social instruments at Woreda level.
Local contractors	<ul style="list-style-type: none"> ❖ Adhere to the environmental and social mitigation and management measures outlined in the ESMPs, and contract documents of the project, in addition to complying with relevant national and local laws. ❖ Implement all essential measures to safeguard the health and safety of workers and community members, and prevent, reduce, or address any environmental damage arising from project operations. ❖ Ensure complete adherence to AfDB Operational Safeguards.

9.1. Estimated Budget

The E&S management mechanism is crucial to prevent adverse impacts and potential risks to society and the environment that emanate from the implementation of project activities. Hence, the E&S management instruments serve to ensure sustainability of project interventions. This indicative budget includes cost for the following activities of the environmental and social measures.

- ✓ Management, implementation, monitoring (staffing and operation).
- ✓ Training and capacity building.
- ✓ E&S auditing.

Table 31: Estimated budget for ESMP implementation

No	Activity	Estimated Cost (USD)
	Management, implementation and monitoring	
1	Preparation of site-specific ESMPs and other site-specific plans	20,000
2	Supervision and monitoring of the implementation of site-specific ESMPs and other site-specific plans	30,000
3	Cost of obtaining clearances or permits	3,000
	Total	53,000
	Training and Capacity Building	
1	Training of Federal level experts and stakeholders (2 per year)	40,000

2	Trainings for stakeholder and Regional staff (2 per year)	20,000
3	Trainings for Woreda (3 per year)	30,000
4	Biannual Environmental and Social workshop organized by MoWE and MoA	18,000
5	Training materials preparation	3,000
	Total Cost	111,000
	E&S Audit	
1	Environmental and Social Audit (E&S safeguard staff)	15,000
2	E&S audit by external consultants	40,000
	Total Cost	55,000
Grant Total		219,000

CHAPTER TEN

CONCLUSIONS AND RECOMMENDATIONS

10.1. Conclusion

The baseline assessment reveals that the Gambela project area faces significant socio-economic and environmental vulnerabilities. High prevalence of female-headed households, large family sizes, and persons with disabilities reflect social inequalities, while livelihoods remain heavily dependent on subsistence agriculture, leading to food insecurity and low income. WASH access is inadequate, exposing communities, particularly women and children, to health risks. Climate shocks such as floods and droughts are frequent, but adaptive capacity is limited by insufficient access to drought-tolerant seeds, irrigation, credit, and extension services. Ecological resources are under pressure from deforestation, invasive species, and unsustainable land use, with weak conservation measures and grievance systems heightening conflict risks.

The Water 4 Food (W4F) Project presents substantial potential for positive impacts, including improved water access, soil fertility, biodiversity, employment, community empowerment, and climate resilience. However, potential negative impacts, such as soil erosion, pollution, vegetation loss, water conflicts, and labor-related risks, require careful management. The Environmental and Social Management Plan (ESMP) provides a feasible, socially acceptable, and environmentally sound framework to mitigate these risks and ensure net benefits.

10.2. Recommendation

In order to have minimal and acceptable residual environmental and social impacts of the projects, it is advisable to adhere to the following recommendations and implement during pre-construction, construction and operation phases of the proposed climate proof W4F project.

- Mainstream gender, youth, and disability considerations across all project interventions, ensuring their representation in decision-making, extension services, and benefit-sharing mechanisms.
- Promote climate-smart agriculture, income diversification through value-added agriculture and micro-enterprises, and nutrition-sensitive programs with targeted safety nets for food-insecure households.

- Invest in resilient water, sanitation, and hygiene infrastructure with community-led maintenance.
- Strengthen climate change adaptation and flood risk reduction through early warning systems, ecosystem restoration, and engineered interventions.
- Protect biodiversity through land-use planning, invasive species control, and community-based conservation.
- Enhance institutional capacity by improving coordination among governance levels, expanding farmer field schools, and establishing transparent grievance mechanisms.
- Environmental clauses must be incorporated in contract agreement with the project contractor to ensure implementations of the recommended Environmental Management Plans during project construction and operation phases;
- Discuss and come on an agreement with the local community or land ownership by the local administration to replace the same land use types for the land provider of the projects based voluntary model.
- Environmental Management bodies of the project must monitor unforeseen environmental issues and take timely remedial measures during the project construction and operation phases;
- The recommended environmental management plans for the identified potential adverse impacts of the project need be effectively implemented in time.
- The recommended environmental management and monitoring plans for the identified potential adverse impacts of the project need be effectively implemented in time.

11. STAFF COMPOSITION AND RESPONSIBILITIES

Name of the Consultant	Qualification	Responsibility
Dr. Temesgen Eliku	Dr. Temesgen Eliku holds a BSc degree in Chemistry from Dilla University, an MSc degree in Environmental Science from Addis Ababa University, and a PhD degree in Environmental Science from Addis Ababa University. He is registered as a Senior Environmental Pollution and Environmental Health Analyst by the Environmental Protection Authority.	<ul style="list-style-type: none"> • Team leader • Prepare and organize the inception report and send to Plan International • Carry out site visits and collect baseline environmental and social information. • Conducting interviews with key stakeholders and FGDs with local communities • Organize collected data, prepare the first draft report, and submit it to Plan International.
Dr. Mekonnen Amberber	Dr. Mekonnen Amberber holds a BSc degree in Biology from Addis Ababa University, an MSc degree in Environmental Science from Addis Ababa University, and a PhD degree in Environmental Science from Addis Ababa University. He is registered as a Senior Senior Biodiversity/Ecosystem & Environmental Health Expert	<ul style="list-style-type: none"> • Prepare the inception report • Carry out site visits and collect baseline environmental and social information • Conducting interviews with key stakeholders and FGDs with local communities • Prepare the first draft report
Dr. Yitayal Addis	Dr. Yitayal Addis holds a B.Ed degree in Biology from Jimma University, an MSc degree in Environmental Science from Addis Ababa University, and a PhD degree in Environmental Science from Addis Ababa University. He is registered as a Senior Senior Biodiversity/Ecosystem & Environmental Health Expert	<ul style="list-style-type: none"> • Prepare the inception report • Carry out site visits and collect baseline environmental and social information • Conducting interviews with key stakeholders and FGDs with local communities • Prepare the first draft report

<p>Sintayehu Fetene (PhD Candidate)</p>	<p>Mr. Sintayehu is currently awaiting public defense of his PhD in Climate Smart Agriculture and Biodiversity Conservation at Haramaya University, holds MSc. In Water Science and Engineering (Hydrology and Water Resource) from In IHE Delft Institute for Water Education, The Netherlands, MSc. Integrated Pest Managemet (IPM) from Haramaya University, MSc. Environmental science (Environmental Resource Management) from Madda Walabu University, BSc in Agriculture (Crop Production and Protection) from Haramaya University, BA Degree in Theology from The Holy Trinity Theological University, Addis Ababa</p>	<ul style="list-style-type: none"> • Prepare the inception report • Carry out site visits and collect baseline environmental and social information • Conducting interviews with key stakeholders and FGDs with local communities • Prepare the first draft ESIA report
<p>Bewket Dagne (PhD Candidate)</p>	<p>Mr. Bewket holds a BSc Degree in Water Resources and Irrigation, Mekelle University and MSc Degree in Civil Engineering (Hydraulic engineering) from Addis Ababa science and Technology.</p>	<ul style="list-style-type: none"> • Prepare the inception report • Carry out site visits and collect baseline environmental and social information • Conducting interviews with key stakeholders and FGDs with local communities • Prepare the first draft ESIA report
<p>Gebrie Tsegaye</p>	<p>Mr. Gebrie earned his BA in Geography and Environmental Studies from Adama University. He also holds two MA degrees from Addis Ababa University: one in Development Studies (Specialized on Livelihoods and development) and another in GIS, Remote Sensing, and Digital Cartography.</p>	<ul style="list-style-type: none"> • Responsible for conducting livelihood and socio-economic assessments, which included managing all phases of digital data collection, thorough data cleaning and organization, and drafting socio-economic assessment report.

Mesele Safay	Mr. Mesele holds BSc Degree in Economics from East Africa College. He has experience in WASH project, work as experts in water supply office.	<ul style="list-style-type: none">• Responsible for socio-economic data collection and GRM data collection.
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Annexes

Modified Survey Questionnaire

Project: Environmental and Social Impact Assessment (ESIA) for the Water 4 Food Program

Questionnaire Type: Household Socio-Economic Survey

Introduction:

"Good day. My name is (Enumerator Name). We are conducting a survey on behalf of Plan International. The purpose of this survey is to understand the current situation of households in this area regarding livelihoods, water access, and social dynamics. This information will help ensure the program is designed to meet community needs and minimize any potential negative impacts. Your participation is voluntary, and all your answers will be kept confidential and used only for the purposes of this assessment. The interview will take approximately 25 minutes. May we begin?"

Date of Interview: _____ **Enumerator Name:** _____

Start Time: _____ **End Time:** _____

SECTION A: HOUSEHOLD DEMOGRAPHICS AND IDENTIFICATION

Item	Response & Codes
A.1. Zone	
A.2. Woreda	
A.3. Kebele	
A.4. Village	
A.5. Household ID (optional)	
A.6. Name of Household Head (optional)	
A.7. Gender of Household Head	1 Male 2 Female
A.8. Household Size	Number of Males: _____ Number of Females: _____ Number of Children (<18 years): _____
A.9. Ethnic Group/Community (optional)	

"I would now like to ask you some questions about difficulties you may have doing certain activities because of a disability."

Functional Difficulty	No Difficulty	Some Difficulty	A Lot of Difficulty	Cannot Do at All	Prefer Not to Answer
A.10. Do you have difficulty seeing, even if wearing glasses?					
A.11. Do you have difficulty hearing, even if using a hearing aid?					
A.12. Do you have difficulty walking or climbing steps?					
A.13. Do you have difficulty remembering or concentrating?					
A.14. Do you have difficulty with self-care (e.g., washing or dressing)?					
A.15. Using your usual language, do you have difficulty communicating?					

SECTION B: LIVELIHOODS AND INCOME

Item	Response & Codes
B.1. What are your household's main sources of livelihood? (<i>Read options, select all that apply</i>)	<ol style="list-style-type: none"> 1. Crop farming 2. Livestock keeping 3. Fishing 4. Casual labor 5. Trade/business

Item	Response & Codes
	6. Other (specify): _____
B.2. What is your household's average monthly income from all sources?	1. < 5,000 ETB 2. 5,000 – 10,000 ETB 3. 10,000-15,000 ETB 4. 15,000-20,000 ETB 5. 20,000-25,000 ETB 6. 25,000-30,000 ETB 7. > 30,000 ETB 8. Prefer not to answer
B.3. Who is the main income earner in your household?	1. Young Man (18-35 yrs) 2. Young Woman (18-35 yrs) 3. Older Man (36-59 yrs) 4. Older Woman (36-59 yrs) 5. Elderly Man (60+ yrs) 6. Elderly Woman (60+ yrs) 7. Child Male (10-17 yrs) 8. Child Female (10-17 yrs)
B.4. Have your income sources been affected by climate shocks (e.g., floods, drought, pests)?	1 Yes 2 No

SECTION C: FOOD SECURITY

Item	Response & Codes
C.1. What are your household's main staple foods?	1. _____ 2. _____ 3. _____
C.2. Do you produce enough food from your own farm to feed your family year-round?	1 Yes 2 No
C.3. If no, how many months per year do you experience food shortage?	_____ months

Item	Response & Codes
<p>C.4. What strategies does your household use to cope with food shortages? <i>(Select all that apply)</i></p>	<ol style="list-style-type: none"> 1. Reduce number of meals 2. Borrow food/money 3. Sell assets/livestock 4. Temporary migration for work 5. Other (specify): _____
<p>C.5. To what extent has climate change (e.g., drought, floods) affected your food production?</p>	<ol style="list-style-type: none"> 1. Severely 2. Moderately 3. Not much

SECTION D: WATER, SANITATION, AND HYGIENE (WASH)

D.1. Main Source of Drinking Water

What is the main source of drinking water for members of your household?

1. Piped water into dwelling/yard
2. Public tap/standpipe
3. Tube well or borehole
4. Protected dug well/spring
5. Rainwater collection
6. Cart with small tank/drum
7. Tanker-truck
8. Surface water (river, dam, lake, pond, stream)
9. Unprotected dug well/spring
10. Prefer not to answer

D.2. Water Treatment

Do you do anything to treat your water at home to make it safer to drink?

1 Yes 2 No

D.2a. If Yes, what method do you most often use?

1. Boiling
2. Add bleach/chlorine
3. Strain through a cloth
4. Ceramic/sand filter
5. Solar disinfection (SODIS)
6. Other (specify): _____
7. Prefer not to answer

Enumerator: Now ask: "Could you please show me where you store your drinking water?" Observe and record.

D.3. Water Storage Observation

1. Clean container, covered
2. Clean container, uncovered
3. Unclean container, covered
4. Unclean container, uncovered
5. Other: _____

D.4. Distance to Water Source

On average, how long does it take to go to your main water source, get water, and return home?
(Two way): _____ minutes

D.5. Water Availability

Is water from this source available year-round?

- 1 Yes 2 No
- 2 *If No, which months is it scarce?* _____

D.6. affordability of water

Is the current cost of water in your area affordable for your household?

1. Yes 2. No

If No

Have you ever reduced water use or used alternative sources due to high cost? (Yes/No)

D.7. Willingness to pay water supply

Are you willing to pay for improved water supply in your area?

1. Yes 2. No

If No

Please explain the main reason why you are not willing to pay for improved water supply.

D.8. Water Fetching Responsibility

Who is mainly responsible for fetching water in your household?

1. Women
2. Men
3. Girls
4. Boys

5. Shared equally

Enumerator: Now say: "For our records, could you please show me the sanitation facility that members of your household most often use?" Observe and record the following.

D.9. Sanitation Facility Observation

what type of sanitation facility is observed?

1. Flush/pour-flush to piped system/septic tank
2. Improved pit latrine (with slab, VIP)
3. Basic pit latrine
4. Composting toilet
5. No facility/bush/field (open defecation)
6. Shared facility with other households
7. Prefer not to answer/show

D.10. Hand washing Facility Observation

Is a receptacle for hand washing (e.g., jug, basin, tippy-tap) observed near the toilet?

1 Yes 2 No

D.11. Water at Hand washing Station Observation

Is water observed at the hand washing station?

1 Yes 2 No

D.12. Soap at Hand washing Station Observation

Is soap or ash observed at the hand washing station?

1 Yes 2 No

D.13. Hand washing Practice

How often do members of your household practice hand washing with soap at critical times (after defecation, before eating)?

1. Always
2. Sometimes
3. Never
4. Prefer not to answer

SECTION E: CLIMATE CHANGE, ADAPTATION, AND VULNERABILITY

E.1. Observed Climate Changes

In the past 10-20 years, have you observed any significant changes in the climate here?

1 Yes 2 No

E.2. Type of Changes Observed *(If Yes to E.1, select all that apply)*

1. Increased frequency of drought
2. Increased frequency of floods
3. More unpredictable rainfall patterns
4. Higher average temperatures
5. Increased pests/crop diseases
6. Other (specify): _____

E.3. Adaptation Strategies

What measures, if any, has your household taken to adapt to these changes? *(Select all that apply)*

1. Crop diversification
2. Using drought-tolerant seeds
3. Changing planting dates
4. Soil and water conservation
5. Rainwater harvesting
6. Livestock destocking
7. Temporary migration
8. None: _____
9. Other (specify): _____

E.4. Desired Support for Resilience

What kind of support would most help your household cope with these climate challenges? *(Select all that apply)*

1. Training in climate-smart agriculture
2. Access to improved seeds/inputs
3. Improved water infrastructure (irrigation, storage)
4. Early warning weather information
5. Access to credit/savings groups
6. Access to markets
7. Other (specify): _____

SECTION F: GENDER, SOCIAL INCLUSION, AND COMMUNITY DYNAMICS

F.1. Decision-Making

In your household, how often are women involved in decisions about using resources (e.g., income, agricultural produce)?

1. Always
2. Sometimes

3. Rarely
4. Never
5. Prefer not to answer

F2. Vulnerable Groups

In your community, which groups are most vulnerable to climate impacts like droughts or floods? *(Select all that apply)*

1. Female-headed households
2. Children
3. The elderly
4. Persons with disabilities
5. Landless households
6. Internally Displaced Persons (IDPs)/returnees
7. Other (specify): _____

F3. Access to Resources

In your opinion, do women and men in this community have equal access to the following resources?

Resource	Yes, Equal	No, Not Equal	Don't Know / Prefer not to answer
a. Water			
b. Agricultural land			
c. Seeds/fertilizers (inputs)			
<i>If not equal for any, please explain briefly:</i>			

Enumerator Introduction for Sensitive Questions:

"Now I will read some statements that people sometimes make. There is no right or wrong answers. I am just interested in your opinion about what is generally accepted in this community."

F4. Perceptions on Gender Norms and Menstrual Health

Please indicate whether you Agree or Disagree with the following statements as they reflect common views in your community.

Statement	Agree	Disagree	Do Not Know	Prefer Not to Answer
a. Fetching water is a woman's task, not a man's.				
b. Cleaning children is a woman's task, not a man's.				
c. Managing the household latrine is a woman's task.				
d. Women and men should share decisions about water and sanitation equally.				
e. Menstruation is a curse or something to be ashamed of.				
f. Girls should be restricted from school or activities during menstruation.				

F5. Resource-Based Conflicts

Have there been any conflicts in your community related to access to natural resources (water, land, grazing areas) in the last year?

1 Yes 2 No

F.5a. If Yes, please describe the nature of these conflicts briefly:

F.6. Conflict Resolution

How are such disputes most commonly resolved?

1. Traditional/community leaders
2. Local government administrations
3. Formal court systems
4. No formal resolution

Other (specify): _____.

F.7. Climate and Conflict

Have climate stresses like droughts or floods increased conflict in your area?

1 Yes 2 No 3 Don't know.

SECTION G: COMMUNITY PRIORITIES AND PROJECT FEEDBACK

G.1. Priority Needs

What are the three most important needs in your community to improve food and water security?

1. _____
2. _____
3. _____

G.2. Potential Project Risks

What potential problems or risks should we be aware of if a new water for food project is introduced here?

G.3. Recommendations for Success

What advice or recommendations do you have to ensure the project is successful and benefits everyone in the community?

SECTION H. SOCIO-ECONOMIC FGD LEADING QUESTIONS

H.1. Livelihoods and Income Sources

- What are the main sources of livelihood in your community?
- What factors affect the stability of household income here?

H.2. Social Services and Infrastructure

- How would you describe access to clean water, sanitation, health, and education in your area?
- What challenges do you face in accessing these services?
- How do roads and market linkages affect your daily life and livelihoods?

H.3. Gender and Social Inclusion

- How are women, men, and youth involved in decision-making in the household and community?
- What roles do women and girls play in household and community economies?

H.4. Community Organization and Participation

- Are there active community-based organizations, cooperatives, or user committees here?
- How effective are they in addressing local needs?
- How do you usually engage with government or NGOs in development projects?

H.5. Health, Safety, and Wellbeing

- What are the most common health issues in your community?
- Are there risks related to waste, environmental pollution, or unsafe practices?

H.6. Perceptions of the Project

- What opportunities do you see from the proposed project (jobs, services, and infrastructure)?
- What concerns do you have about possible negative impacts (land loss, disruption of livelihoods)?
- What recommendations would you give to ensure the project benefits your community?

H.7. Conflict, Grievances, and Coping Mechanisms

- How disputes (land, water, or social) are usually resolved in your community?
- How should grievances related to this project be addressed?

Section 2: Nature of the Grievance

H.8. what is your grievance/complaint/concern? (Please describe in detail)

Type of issue (check all that apply):

- Environmental (pollution, water, air, land, biodiversity)
- Social (community relations, cultural heritage, security)
- Land acquisition / resettlement
- Employment / labor / working conditions
- Health and safety
- Other (please specify): _____

H.9. When did the issue occur? (date/time if known): _____

H.10. where did the issue occur? (Specific location/site): _____

H.11. Who or what was affected?

- Myself / my household
- My community

- Natural environment
- Other (please specify): _____

Section 3: Grievance Impact

H.12. How has this issue affected you/your community?

- Financial loss
- Damage to property/land
- Loss of livelihood
- Health impacts
- Disturbance / nuisance
- Other (please specify): _____

H.13. How serious do you consider this issue?

- Minor (no significant harm)
- Moderate (temporary or reversible harm)
- Major (serious or permanent harm)

Section 4: Resolution Preferences

H.14. Have you raised this grievance before? Yes No

If yes, when and to whom? _____

H.15. Was it resolved? Yes No

H.16. What action or solution would you like to see taken?

H.17. Do you prefer your grievance to be handled:

- Confidentially (my identity should not be disclosed)
- Publicly (I allow disclosure for resolution purposes)

Section 5: Follow-up

H.18. How would you like to receive updates about your grievance?

Phone call

Community meeting

Other: _____

Section I: QUESTIONNAIRE TYPE: CLIMATE SMART AGRICULTURE (CSA)

I.1. Agricultural Practices

1. How many hectares of land do you cultivate? _____ ha
2. Do you practice intercropping or mono-cropping?
A. Intercropping B. Mono-cropping
3. How would you rate your current agricultural productivity compared to 5 years ago?
A. Much lower B. Slightly lowers C. About the same D. Slightly higher E. Much higher

I.2. Flood Risk Perceptions

4. How often has your farm been affected by flooding in the past 5 years?
A. Never B. Once C. 2–3 times D. More than 3 times
5. Which farming activities are most affected by floods? (choose all that apply)
A. Planting B. Harvesting C. Storage D. Marketing

I.3. Cropping Systems

6. Do you use flood/drought-tolerant crop varieties? A. Yes B. No
7. Have you observed changes in cropping seasons due to climate change? A. Yes
B. No
8. Have you tried new CSA-related cropping practices (e.g., raised beds, mulching)? A. Yes
B. No

I.4. Soil and Land Management

9. Do you use soil conservation practices? A. Yes B. No
10. How would you rate soil fertility in your farmland?
A. Very poor B. Poor C. Moderate D. Good E. Very good
11. What proportion of your farm has vegetation or tree cover?
A. None B. <25% C. 25–50% D. >50%

I.5. Water Access and Use

12. What is your primary source of water for farming?
A. Rainfed B. River C. Irrigation canal D. Borehole E. Other
13. Do you have access to irrigation facilities? A. Yes B. No
14. Do you practice water conservation techniques (e.g., water harvesting, mulching)? A. Yes B. No
15. How sufficient is your water supply for farming needs?
A. Very insufficient B. Insufficient C. Moderate D. Sufficient E. Very sufficient

I.6. Institutional Support & Extension Services

16. Have you received agricultural extension support in the last year? A. Yes B. No
17. Do extension services cover CSA practices? A. Yes B. No
18. How often do you interact with extension agents?
A. Weekly B. Monthly C. Occasionally D. Never
19. Do you find extension support useful?
A. Not useful at all B. Slightly useful C. Moderately useful D. Very useful E. Extremely useful
20. Do you have access to farmer field schools or demonstration plots? A. Yes B. No

I.7. Gender and Inclusion

21. Who makes most farming decisions in your household?
A. Male head B. Female head C. Jointly D. Other
22. Are women equally involved in extension training? A. Yes B. No
23. Are youth engaged in farming and CSA practices? A. Yes B. No
24. Do women or youth have equal access to credit and inputs? A. Yes B. No
25. How inclusive are community decisions on resource management?
A. Not inclusive at all B. Slightly inclusive C. Moderately inclusive D. Very inclusive E. Fully inclusive

I.8. Farmer Capacity and Practices

26. Have you ever received training on CSA practices? A. Yes B. No
27. How confident are you in applying CSA practices?
A. Not confident at all B. Slightly confident C. Moderately confident D. Very confident E. Extremely confident
28. Do you share CSA knowledge with other farmers? A. Yes B. No
29. Which CSA practices have you adopted? (choose all that apply) A. Raised beds
B. Agroforestry C. Water harvesting D. Improved seeds E. Crop diversification
30. How do you rate your household's capacity to cope with floods?
A. Very low B. Low C. Moderate D. High E. Very high

SECTION J. INTERVIEW GUIDE (CSA)

For Key Informant Interviews (KIIs) with Agricultural Officers, Extension Agents, and Cooperative Leaders

1. Can you briefly describe your role and responsibilities in agricultural support in this woreda?
2. What is your institution's mandate regarding climate-smart agriculture (CSA) or climate resilience?
3. What is your staffing situation for agricultural extension? Is it sufficient?
4. What types of support are currently provided to farmers (training, inputs, irrigation support, pest control, etc.)?
5. Are there specific programs targeting flood-affected farmers?
6. Have you or your institution promoted CSA practices before? Which ones?
7. How have farmers responded to CSA training or demonstration plots?
8. What challenges do you face in promoting CSA in flood-prone areas?
9. How do you coordinate with NGOs, farmer cooperatives, and other government departments?
10. Are there local seed banks, farmer field schools, or community demonstration farms?
11. What are the main constraints to providing adequate agricultural support in this woreda?
12. What opportunities exist to strengthen CSA adoption here?
13. What specific institutional or technical support would help farmers adapt to flooding and climate change?

SECTION K. FGD GUIDE (CSA)

1. What are the main crops grown in your community?
2. How do floods affect planting, harvesting, and yields?
3. Which areas are most affected by floods?
4. What have you done in the past to reduce crop losses during floods?
5. Are there CSA practices you already use? Which ones work best?
6. What kind of support have you received from government, NGOs, or cooperatives?
7. Are CSA-related trainings accessible to everyone? (Women, youth, persons with disabilities)
8. What would help farmers here prepare better for future floods?
9. How can women and youth be more involved in CSA decision-making?
10. If you could ask the project to do one thing for your farming community, what would it be?

SECTION L. INTERVIEW GUIDE HYDROLOGY

For Key Informant Interviews (KIIs) with Community

Section	Key Questions / Information	Response Options / Details
1. General Information	Location (Village/City, GPS, Distance to river, Elevation)	_____
2. Flood History	Past floods experienced?	<input type="checkbox"/> Yes <input type="checkbox"/> No
	Last flood details	Year: _____, Duration: _____, Depth: _____
	Flood frequency	<input type="checkbox"/> Annually <input type="checkbox"/> Every few years <input type="checkbox"/> Rarely
	Main cause of flooding	<input type="checkbox"/> Heavy rainfall <input type="checkbox"/> River overflow <input type="checkbox"/> Poor drainage <input type="checkbox"/> Deforestation <input type="checkbox"/> Other: _____
3. Flood Impacts	Major impacts	<input type="checkbox"/> Loss of life <input type="checkbox"/> Infrastructure damage <input type="checkbox"/> Crop loss <input type="checkbox"/> Displacement <input type="checkbox"/> Livestock loss <input type="checkbox"/> Water contamination <input type="checkbox"/> Other: _____
	Household affected (# people, injuries/deaths)	_____
	Economic/property loss (estimated value)	_____
	Mitigation/response measures used?	<input type="checkbox"/> Yes <input type="checkbox"/> No → If yes, specify: _____
4. Community Preparedness	Flood warning systems in place?	<input type="checkbox"/> Yes <input type="checkbox"/> No → Effectiveness: <input type="checkbox"/> Very <input type="checkbox"/> Moderate <input type="checkbox"/> Not effective
	Community training/awareness	<input type="checkbox"/> Yes <input type="checkbox"/> No → When/where: _____
	Immediate community needs	<input type="checkbox"/> Shelters <input type="checkbox"/> Drainage <input type="checkbox"/> Early warning <input type="checkbox"/> Financial support <input type="checkbox"/> Agricultural protection <input type="checkbox"/> Other: _____
5. Flood Resilience	Household flood protection measures	_____
	Local structures reducing risk	<input type="checkbox"/> Yes <input type="checkbox"/> No → Specify: _____
	Community attitude toward flood risk	<input type="checkbox"/> Very concerned <input type="checkbox"/> Moderate <input type="checkbox"/> Not concerned
	Willingness to invest in risk reduction	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unsure
	Support needed for resilience	<input type="checkbox"/> Infrastructure <input type="checkbox"/> Community programs <input type="checkbox"/> Financial aid <input type="checkbox"/> Early warning/training <input type="checkbox"/> Other: _____
6. Mitigation & Infrastructure	Nearby flood control infrastructure (dams, levees, reservoirs)?	<input type="checkbox"/> Yes <input type="checkbox"/> No
	Condition	<input type="checkbox"/> Good <input type="checkbox"/> Moderate <input type="checkbox"/> Poor
	Effectiveness	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Partial
	Most needed infrastructure	<input type="checkbox"/> Protection walls <input type="checkbox"/> Shelters <input type="checkbox"/> Embankments <input type="checkbox"/> Drainage <input type="checkbox"/> Barriers <input type="checkbox"/> Other: _____
	Suggestions for improvement	_____

SECTION M: BIOLOGICAL ENVIRONMENT FOR HH

1. Which populations or species (including threatened, rare, or endemic) have been observed in the area, and how would you assess the level of conservation risk they face?
 - A. Increasing populations, low conservation risk
 - B. Mostly increasing with minor concerns
 - C. Stable and sustainable populations, moderate risk
 - D. Signs of decline, high risk
 - E. Rapid decline, severe conservation risk
2. Are there habitats classified as “critical” that support endangered species, unique ecosystems, or areas of high biodiversity value? If so, how are they affected by seasonal or migratory patterns, and how urgent is the need for their protection?
 - A. No critical habitats identified, no concern
 - B. Habitats present but minimally affected, low urgency
 - C. Habitats moderately affected, moderate urgency for protection
 - D. Habitats negatively affected, high urgency for protection
 - E. Habitats severely degraded or threatened, very high/urgent protection needed
3. What potential impacts might the W4F project have on biodiversity and ecosystems, and what mitigation or biodiversity enhancement measures would you suggest? In your view, how significant are the potential biodiversity risks associated with the project?
 - A. No observable impact, negligible risk
 - B. Minor impacts, low risk and easily mitigated
 - C. Moderate impacts, manageable with mitigation measures
 - D. Significant impacts, high risk requiring strong mitigation
 - E. Severe impacts, very high risk with potential irreversible damage
4. What strategies or recommendations would you propose to ensure the project is successfully implemented and generates positive outcomes for the entire community? Who should be responsible for implementing these strategies?
 - A. Not important / unlikely to be effective
 - B. Slightly important / limited effectiveness
 - C. Moderately important / somewhat effective
 - D. Very important / likely to be effective
 - E. Critically important / highly effective

SECTION N: FGD QUESTIONS – BIODIVERSITY / BIOLOGICAL ENVIRONMENT

Plant and Animal Populations

1. What types of plants (including rare, endemic, or threatened species) have you observed in this area? Have their abundance or distribution changed over time?

2. What types of animals (wildlife, birds, fish, insects, livestock) are common here? Which species seem to be increasing, stable, or declining?
3. In your opinion, what are the main reasons for these changes in plant and animal populations?

Habitats and Critical Ecosystems

1. Which habitats in this area are most important for plants and animals (e.g., wetlands, forests, grasslands, migratory routes)?
2. How are these habitats being affected by human activities, climate change, or seasonal variations?
3. How urgent do you think it is to protect these habitats, and why?

Project Impacts on Biodiversity, Ecosystems, and Sensitive Areas

1. How do you think the Water for Food project may affect local plant and animal populations and their habitats?
2. Do you expect the project to have more positive or negative impacts on biodiversity? Why?
3. Is the project area located near any conservation area, protected zone, or ecologically fragile habitat? If yes, what risks or challenges do you foresee?
4. What special measures should the project take to avoid negative impacts and support conservation goals in these sensitive areas?
5. What opportunities exist for the project to enhance biodiversity and ecosystem protection (e.g., habitat restoration, conservation partnerships)?

Strategies and Responsibilities

1. What strategies would you suggest for protecting and improving plant and animal biodiversity while the project is implemented?
2. Who should take the main responsibility for these strategies (e.g., federal/regional government, local authorities, community members, NGOs, other stakeholders)?
3. How can the local community be more involved in protecting biodiversity (plants and animals)?

Sample Photos during FGDs at different Kebeles



Sample Photos during KIIs at Regional and Woreda Offices





Sample photo discussion with experts at Plan International Gambela Office



EPA (Environmental Protection Authority) Endorsement Letter of the ESIA for the Water4Food Project in Ethiopia

