BURQAA Phase II Annual Report

Annual Report 2024-2025

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Executive summary

This report summarizes the activities conducted by Acacia Water for the BURQAA Phase II project from January 2024 to April 2025. Key activities include a baseline study, field visits to collect data, select new monitoring locations, repair loggers where needed, and the development of the Catchment Management Guideline (CMG).

In 2024, Acacia Water began the project with a biophysical baseline assessment, focusing on topography, climate, land use, soil properties, and hydrology to inform future interventions. Afterward, a field missions to Bedele and Harar were carried out in June and July 2024, where the team maintained and reinstalled damaged water level loggers, downloaded data, and selected new monitoring sites for water levels, soil moisture, and discharge.

The CMG, developed to support local stakeholders in water management, land restoration, and livelihood enhancement, was shared with Heineken Ethiopia and World Vision Ethiopia in December 2024 and presented at a workshop in January 2025. A short version in Afaan Oromo was created to improve accessibility for local communities.

Colophon

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3R	Recharge, Retention, and Reuse
BI	BURQAA Initiative
CBO	Community-Based Organization
CMG	Catchment Management Guideline
HG	Hakim Gara
IWRM	Integrated Water Resources Management
NDVI	Normalized Difference Vegetation Index
SWC	Soil and Water Conservation
UDC	Upper Dabena Catchment
WVE	World Vision Ethiopia

1 Introduction

BURQAA Phase II project builds on the success of the BURQAA Initiative (BI) Phase I, which addressed significant challenges of water scarcity, land degradation, and climate change in Ethiopia. Phase I, implemented from July 2020 to June 2023, focused on balancing water use in the Upper Dabena and Hakim Gara sub-watersheds by compensating for the water consumption of the Bedele and Harar Breweries. This was achieved through soil and water conservation measures, resulting in the restoration of degraded lands and improved water retention. The project met and even exceeded its water-saving targets in both regions.

Phase II expands these efforts, introducing practical, community-driven solutions for sustainable catchment management. A key component of this phase is the development of a Catchment Management Guideline (CMG), designed for small-scale, localized implementation. The guideline aims to provide local stakeholders with simple, actionable tools to manage water and land resources effectively, focusing on water management, landscape restoration, and soil conservation. By continuing to engage local communities and strengthening collaboration with stakeholders, BURQAA Phase II will further enhance the resilience and sustainability of the Upper Dabena and Hakim Gara sub-watersheds.

This report provides an annual overview of activities carried out from February 2024 to April 2025. It highlights key project milestones, including the development and validation of the Catchment Management Guideline (CMG), biophysical baseline assessments, field visits, and stakeholder workshops. The report is structured into 5 sections, each addressing different aspects of the project’s progress.

Section 1 is the introduction, while in Section 2, we present the summary of the biophysical baseline study, which provided insights into the environmental conditions of the target catchments, including land use, erosion vulnerability, and hydrological features. Section 3 discusses the field visit conducted in June and July 2024, with the objective of data collection, identification of new sites for data collection, identification of experts to conduct future manual data collection, and maintaining damaged loggers where needed. Section 4 covers the validation workshop for the CMG, which was developed to support community-led, low-cost catchment management practices at the woreda and kebele levels. The report concludes with Section 5, offering recommendations for future activities, particularly around monitoring, evaluation, and the continued implementation of the project’s goals.

2 Summary of Bio-Physical Assessment

The baseline assessments aimed to provide a comprehensive understanding of the environmental conditions within the Upper Dabena Catchment at Bedele and the Hakim Gara plateau. These assessments focused on key biophysical factors, including topography, climate, land use, soil properties, hydrology, and geology, in order to create an integrated overview of the challenges and opportunities in each catchment. The data collected during this phase will be utilized to monitor and evaluate the effectiveness of interventions that will be implemented in this project and determine their impact on addressing specific environmental challenges.

2.1 Characteristics of Project Areas

Bedele

The target area in Bedele is characterized by high rainfall, placing it in a moist agro-climatic zone. Despite this, the region is highly vulnerable to soil erosion, particularly in the highland areas. This has resulted in significant soil fertility loss, and visible erosion, including large gullies, is prevalent. Recommended interventions for Bedele include the installation of gully plugs, soil bunds, and gabion check dams to mitigate erosion. Furthermore, promoting sustainable agricultural practices will aid in landscape restoration and improve agricultural productivity.

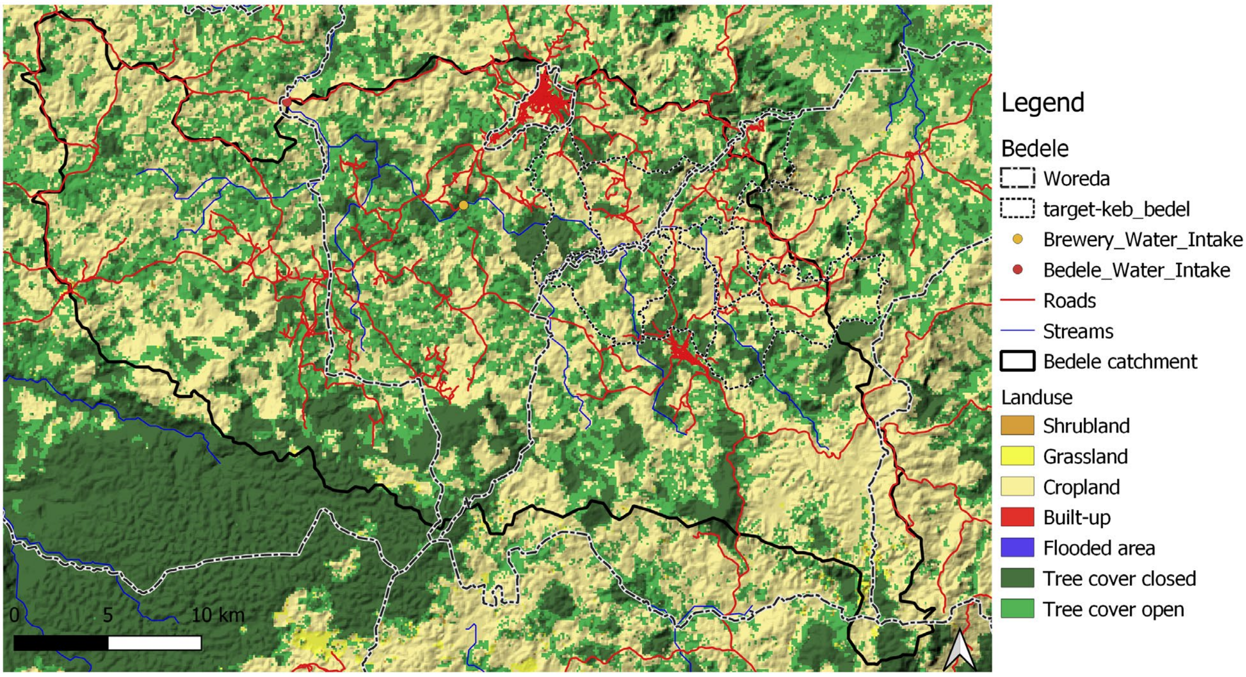

Figure 1 Bedele Upper Dabena catchment land use/ land cover map

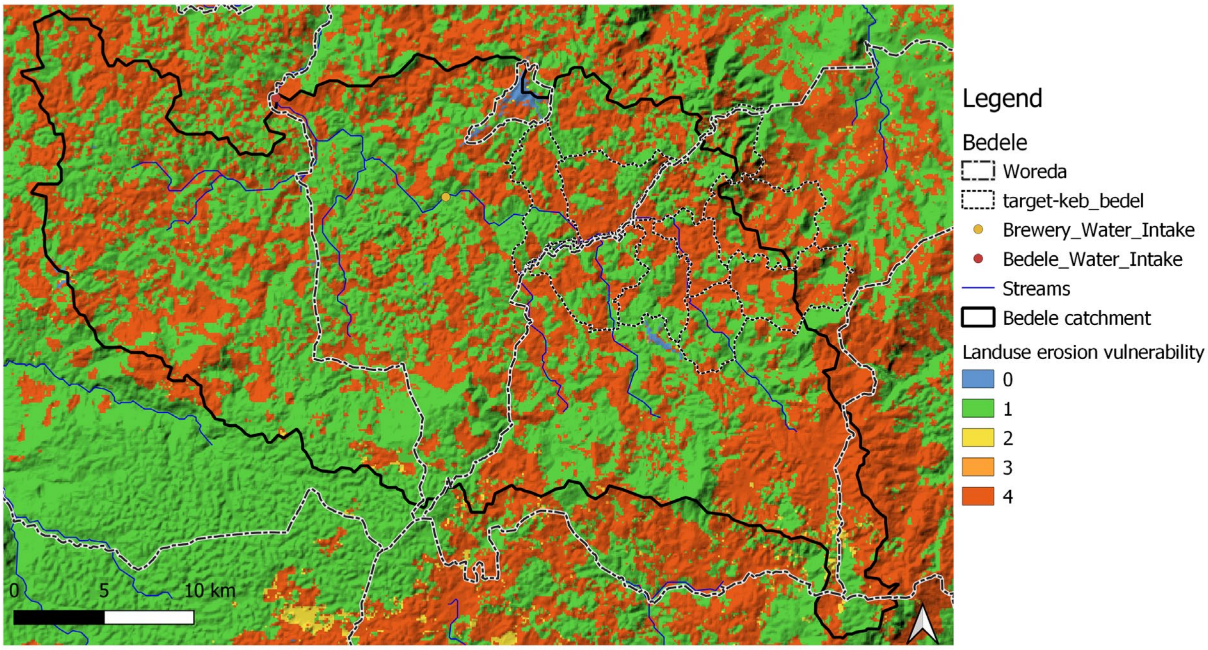

Figure 2 Bedele Upper Dabena catchment land use/land cover erosion vulnerability map.

Harar

The target area in Harar is located in a dry agro-climatic zone, with lower rainfall compared to Bedele. The land use in this region includes croplands and rangelands, with the potential for income-generating activities such as beekeeping. The recommended interventions for Harar include implementing SWC measures in areas vulnerable to erosion, such as the plateau ridges, along with water harvesting and spring protection to address water scarcity. Planting economically valuable trees in rangelands is also recommended to improve local livelihoods and contribute to environmental restoration.

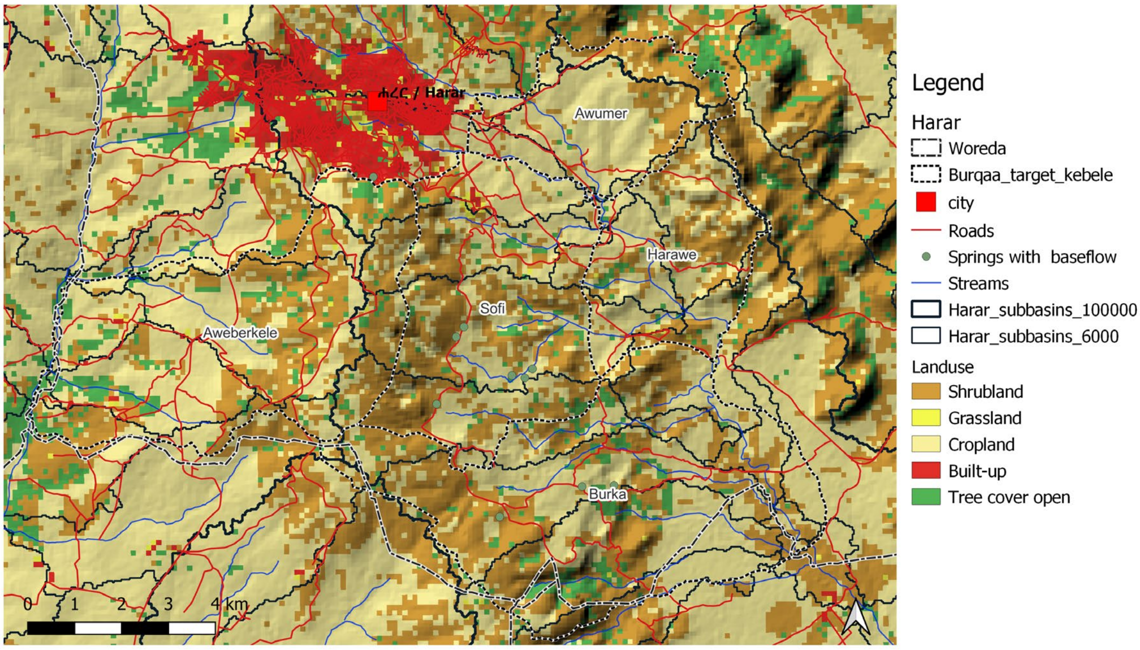

Figure 3 Harar Hakim Gara catchment land use/ land cover map.

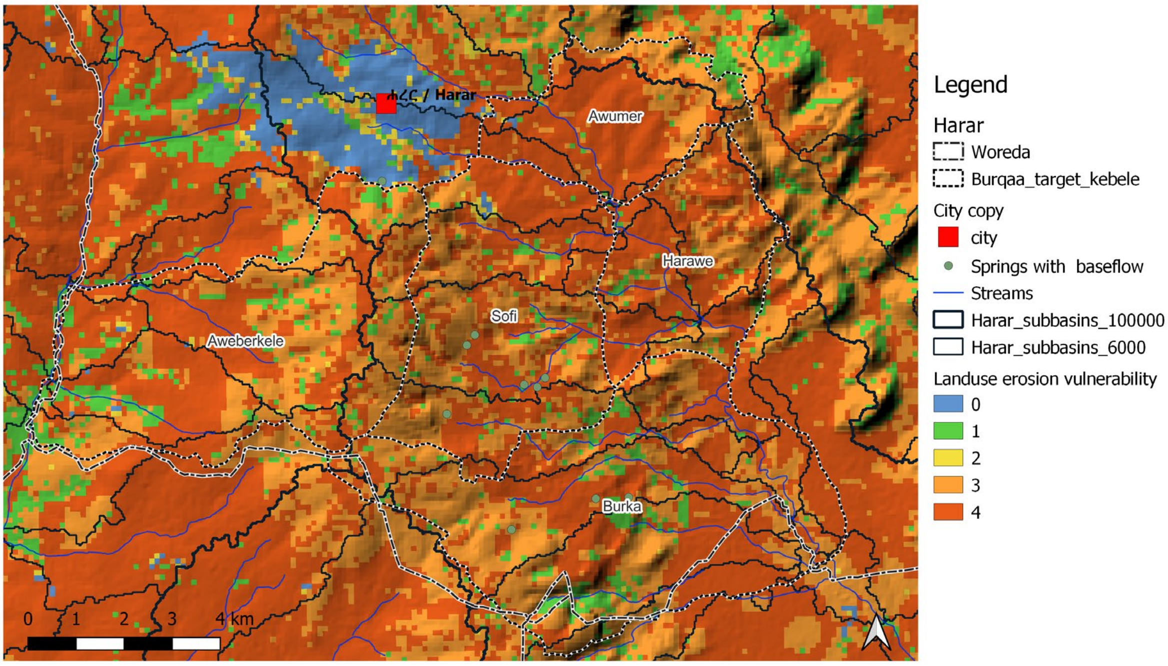

Figure 4 Harar Hakim Gara catchment land use/ land cover erosion vulnerability map.

2.2 Main Biophysical Recommendations:

The biophysical baseline assessment identified key environmental factors that influence the sustainability of the project areas. The following recommendations emerged from the assessment:

- Erosion Vulnerability and Landscape Restoration: The assessment highlighted areas particularly susceptible to erosion, especially in highland regions. Landscape restoration through reforestation and soil and water conservation (SWC) measures was recommended as a strategy to counteract land degradation and improve soil fertility.

- Soil and Water Conservation (SWC) Potential: Erosion vulnerability and SWC potential maps were generated to identify areas in need of intervention. The implementation of SWC measures, such as soil bunds, check dams, and other erosion control techniques, was recommended to protect soil quality and prevent further land degradation.

- Water Availability and Conservation: The assessment identified regions with limited water resources, where the adoption of water conservation strategies would improve water availability. Prioritizing methods for water retention and optimizing water management practices will be crucial to supporting sustainable water use in these areas.

2.3 Short-listed Interventions

Drawing on the biophysical data, several practical and cost-effective interventions were proposed. These interventions are designed to be easily implemented, with minimal costs, and are intended to be managed by local communities with limited oversight. The key proposed interventions include:

- Sustainable Agricultural Practices: Promoting water-efficient agricultural practices that improve productivity while minimizing environmental impact. Practices such as mulching, crop rotation, and the use of drought-resistant crops were recommended to support food security, particularly in regions with unreliable rainfall.

- Reforestation with Economic Trees: The reforestation of degraded areas with locally adapted, economically viable tree species was recommended. This strategy will contribute to food security, provide income-generating opportunities, and improve soil health. Furthermore, these trees will support carbon sequestration, offering an additional benefit in the fight against climate change.
- Soil and Water Conservation (SWC) Measures: The implementation of specific SWC techniques, such as the construction of check dams and the establishment of soil bunds, was recommended to address erosion and control runoff. These measures will contribute to the restoration of degraded lands and maintain soil fertility for agricultural use.
- Water Harvesting and Spring Protection: For areas with limited water resources, such as Harar, water harvesting methods—including the construction of artificial ponds and rooftop rainwater collection systems—were recommended. Additionally, protecting natural water sources, such as springs, is crucial to ensuring a sustainable water supply for local communities.

3 Hydrological Monitoring: Inventory of Existing Equipment and Site Selection in New Kebele

Following the baseline assessment, the Acacia Water team traveled to Bedele from the 17th to the 22nd of June 2024, and to Harar from the 2nd to the 5th of July 2024.

The field mission had three main objectives. The first one was an inventory of existing monitoring sites. Here, we checked the status of monitoring equipment, and repairs were necessary. Data were downloaded from the data loggers, and hydrological measurements (water level, discharge, and soil moisture) were collected.

The second goal of the mission was to identify potential monitoring locations in the new kebeles and select strategic measurement locations for Hydrological location (water level, discharge, and soil moisture), a secure suitable location to install new water level monitoring loggers, as well as collect Hydrological data. These new sites were selected in discussion with World Vision Ethiopia experts (Mr. Tadesse and Mr. Mebratu in Harar and Mr. Daniel in Bedele). In Bedele, two water level monitoring locations have been selected: one at a hand-dug well in Yabela kebele and another at a spring in Emboro kebele. In Harar, one hand-dug well in Awamer kebele has been chosen for installing a water level data logger, and a new logger will also be installed at Abaewayni Spring. Regarding discharge measurements, three new locations have been identified in Bedele: two in Emboro kebele and one in Yabela kebele. However, in Harar, a suitable surface water location for discharge measurement could not be found. This means that a total of two surface water and two groundwater level data loggers will be installed during the next field mission.

The third objective was to meet with kebele/ woreda experts who are involved in the project implementation. The team met with the kebele experts and worked together in the kebeles. The last objective of the field mission was to find suitable experts to collect manual measurements. The team has met with potential candidates in both project locations. The next chapters describe in detail the activities and actions in each project area.

3.1 Itinerary

This visit focuses on selecting new monitoring sites, collecting hydrological data, discussing with WVE about the planning of SWC interventions implementation, meeting with governmental officials from the woreda and kebele, and meeting with potential candidates to collect manual measurements.

Table 1 Field mission program of Bedele..

Date	Time	Activities
Day 1-Mon.17th June	AM	Travel time – Domestic flight Addis (ADD) >> Jimma (JIM)
	PM	Travel time – Car drive Jimma >> Bedele

Day 2 – Tue. 18th June	AM	> Visit WVE to get information about stakeholders and contact information, >Visit to Mattu University > Meeting with local authorities/government officials
	PM	Inventory of existing monitoring sites @ Brewery intake and Dabena gagging station. > Check the status of monitoring equipment, *If necessary, repair of damaged equipment* > Field measurements (water level) > Meeting and brief discussions with local stakeholders
Day 3 – Wed. 19th June	AM	> Water discharge measurement @ Upper Dabena, and Gauging station > Meeting with local authorities/government officials
	PM	> Water discharge measurement @ Upper Dabena and Gauging station > Meeting and brief discussions with local stakeholders
Day 4 – Thu. 20th June	AM	> Inventory of existing monitoring sites @ Gechi mini > Soil moisture measurement @ ILIKE KARARO, JIISA, GOLE KORA (1,2,3)
	PM	> Inventory of existing monitoring sites > Check the status of monitoring equipment, *and If necessary, repair of damaged equipment* (Kalkidan) @ Gechi mini kebele Faris >Soil moisture measurement (Segni and Jeanne) @ GOLE MAYA (1,2,3), GOLE SEKA, KOBA KELA
Day 5 – Fri. 21st June	AM	Inventory of potential new monitoring sites @ Emboro, Elke Kerero, Yabala, Mine > Field inspection > Field measurements
	PM	Inventory of potential new monitoring sites @ Emboro, Elke Kerero, Yabala, Mine > Field inspection > Field measurements
Day 6– Sat. 22nd June	AM	Travel time – Car drive Bedele >> Jimma
	PM	Travel time – Domestic flight Jimma (JIM) >> Addis (ADD)

Table 2. Field mission program of Harar.

Date	Time	Activities
Day 1 – Mon. 1st July	AM	Travel time – Domestic flight Addis (ADD) >> Dire Dawa (DIR) Travel time – Car drive Dire Dawa >> Harar
	PM	>Visits to WVE to get data about stakeholders and contact information >Visit Haramaya University
Day 2 – Tue. 2nd July	AM	> Soil moisture, Water level, and discharge measurement in existing sites
	PM	>Soil moisture, Water level, and discharge measurement in existing sites
Day 3 – Wed. 3rd July	AM	Inventory of potential new monitoring sites > Field inspection > Field measurements > Interview of local stakeholders
	PM	Inventory of potential new monitoring sites @ Awumer and Harawe
Day 4 – Thu. 4th July	AM	Meeting with local authorities / government officials
	PM	Travel time – Car drive Harar >> Dire Dawa Travel time – Domestic flight Dire Dawa (DIR) >> Addis (ADD)

3.2 Bedele

3.2.1 Existing Monitoring Sites Data Collection

Water Level Loggers

All water level data loggers have been checked for damage, and the loggers at the brewery intake and Gechi Faris were reinstalled. Manual measurements were taken, and data were downloaded from the loggers.

Brewery intake

The logger at the brewery intake has been collecting data without any problems. During this visit, the team noticed the wooden pole used to install the logger was rotting and broken. The logger was reinstalled. The sensor was placed at 1.93 m. equal to that at the last installation, from the top of the reference point. In addition, one-year worth of data were downloaded, and batteries were changed. The downloaded data will be post-processed.

Figure 5 Water level logger at the Brewery Intake: on the left side before reinstallation, and right side after reinstallation.

Table 3. Manual water level measurements and depth of installation at the Brewery intake.

Date and Time	Depth of installment [m below reference]	Reference [m above ground level]	Manual water level measurement ref to surface water [m below ref]	Water level above sensor [m]	Remark
18,06,2024 09:40	1.93	0.3	0.809	1.121	The reference is top of the filtering case

Gauging station

The logger at the gauging station was working properly, and a year's worth of data have been downloaded (see the post-processed data below). However, the logger is currently not sending data because of a SIM card activation issue, the SIM card will be changed during the next visit. During this visit, data were downloaded, and batteries were changed. The downloaded data will be post-processed as part of the Impact analysis once more data is collected.

Figure 6 Water level logger at the Gauging station.

Gechi

The Gechi logger has been removed from the borehole for over a year, and the batteries have been taken out. The logger is reinstalled during this field visit using the same reference and sensor depth as it was in May 2022. New batteries have been inserted, and the logger is currently recording data; however, due to an issue with the SIM card, the data is not being sent to the server. During the next visit, the batteries will be replaced with new rechargeable ones, and a new SIM card will be added.

Figure 7 Gechi Faris data logger reinstallation, June 20, 2024.

Table 4. Manual water level measurements and depth of installation at Gechi Faris.

Date and Time	**Depth of installment [m below reference]**	**Top of piezometer to GL [m]**	**Manual WL measurement ref to SWL [m below ref]**	**Bottom of well to top of piezometer [m]**	**Remark**
20,06,2024 17:40	13.66	1.7	7.6	15.02m	The reference is the top of the piezometer. The depth of the well is 14.45 meters from the top of the casing

Discharge

The existing discharge measurement locations in Bedele are at the Dabena River (Named Upper Dabena and Gauging Station). During this visit, measurements were not taken since the river was too full to go inside to take measurements.


Figure 8 Discharge measurement site: Upper Dabena.

Soil Moisture

There are 15 existing soil moisture collection locations established during Phase I. The Acacia water team, together with the potential candidates for monitoring officers, went to the field and measured soil moisture in a specified location. These monitoring officers/ data collectors are expected to collect data every two weeks from all the existing and newly selected soil moisture sites once an agreement is reached. The soil moisture data collected during this field mission can be found in the Table 5 below.

Table 5 Soil moisture data at the existing locations (Bedele)

No	Location	Sample code	Date	Long(y)	Lat(x)	SM in m³/m³	T in ˚C	EC in bulk ds/m
1	Gole Kora	SM1	19/06/24	8.4065138	36.4199838	0.354	24.2	0.06
2		SM2	19/06/24	8.4076511	36.4215844	0.368	22.4	0.12
3		SM3	19/06/24	8.4073105	36.4226821	0.348	23.2	0.06
4	Gole Maya	SM1	19/06/24	8.381344	36.465121	0.368	23.5	0.06
5		SM2	19/06/24	8.380502	36.466421	0.37	25.1	0.06
6		SM3	19/06/24	8.3851099	36.4671961	0.334	22.8	0.09
7		SM4	19/06/24	8.3853352	36.4668528	0.443	20.4	0.24
8	Gole Seka	SM1	19/06/24	8.3668160	36.4577664	0.387	23.8	0.09
9		SM2	19/06/24	8.3667255	36.4571257	0.411	23.3	0.24
10	Koba Kela	SM1	20/06/24	8.377586	36.433760	0.355	30.5	0.06
11		SM2	20/06/24	8.3776737	36.4329912	0.381	28.5	0.11
12		SM3	20/06/24	8.3771483	36.4327337	0.354	29.2	0.05

3.2.2 New Monitoring Sites Selection

The new kebele's in Bedele are 4 (Yabala, Emboro, Elke Kerero and Mine). The Acacia Water team identified suitable locations for soil moisture, discharge, and water level measurements. In the sections below, each identified location for different measurements can be found.

Water level

The Acacia Water team identified the following locations as suitable sites to install water level data loggers. The main criteria used to select these locations are the representatives of the site to the SWC interventions, accessibility, security regarding the safety of the equipment(s) to be installed, and network connection. In Bedele, two additional monitoring loggers will be installed, one for surface water in Emboro Kebele and one for groundwater monitoring in Yabala Kebele. The table below contains detailed information on the selected locations.

Table 6. New selected water level data logger installation locations.

Site	Location	Lat(y) Decimal degrees	Long(x) decimal degrees	Internet	Ref	Depth of well/surface water from ref(meter)	WL from Ref(meter)	Remark
Yabela	Megersa village, Mr. Sira Tadesse Compound	8.3993011	36.3869675	Good	Top of casing	9.41	3.25	Hand-dug well /Ground water in the compound of Mr. Sira Tadesse. The owner is willing to let us install the

								equipment. Groundwater level logger
Emboro	Bishan Kelile Hussen	8.3315240	36.4317611	good	Top of the gully	1.20	1.17	It is a spring inside a privately owned farm (Mr. Kelile Hussen). The owner is willing to let us install the equipment. Surface water level data logger

Discharge

The Acacia Water team identified the following locations to collect discharge measurements. In Megersa Village, Haro Stream, and Bishan Kelile Hussen, the spring was too low at the time of the measurements to use the OTT31 propeller. The float method was used to measure the time of travel of the leaf over a fixed distance, and the average time is used to calculate the average velocity at the surface level. In the third location (Chancho stream, Emboro kebele), the measurement was performed using an OTT31 propeller since the depth and flow of the water were suitable to perform the velocity measurement at different depths. The estimated total discharges of the three channels are given below in Table 7.

Table 7. Discharge measurements, Haro stream, Bishan Kelile Hussen, Chancho river.

Site	Location	Date and Time	Lat(y) Decimal degrees	Long(x) decimal degrees	Depth of water from Surface water (m)	Max V (m/sec)	Q (m3/sec)	Remark
Yabela	Megersa village, Haro Stream	21/06/2024, 9:20	18.3993011	36.3869675	0.42	0.039	0.0291	This stream is a seasonal tributary of the Dabena River
Emboro	Bishan Kelile Hussen	21/06/2024, 12:38	8.3315240	36.4317611	0.03	0.041	0.0003	The same spring as the selected WL logger installation location inside a privately owned farm (Mr. Kelile Hussen). Velocity is measured using the floating method.
Emboro	Chancho River	21/06/2024, 13:14	8.3340360	36.4323864	-	0.674	0.045	The measurement is taken using a propeller

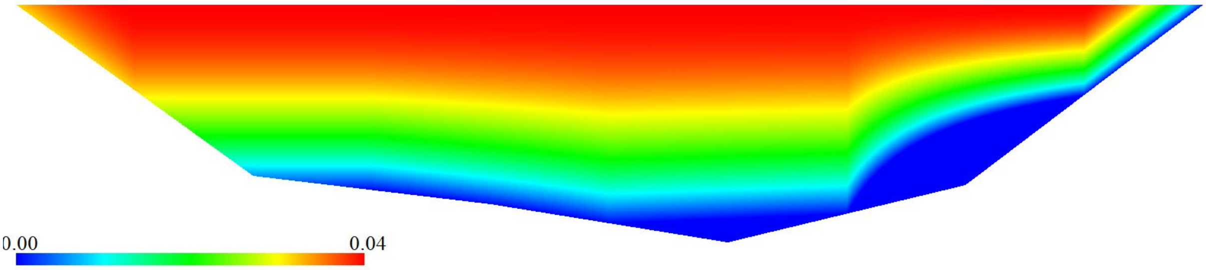

Figure 9 Soil moisture data at the existing locations (Bedele)

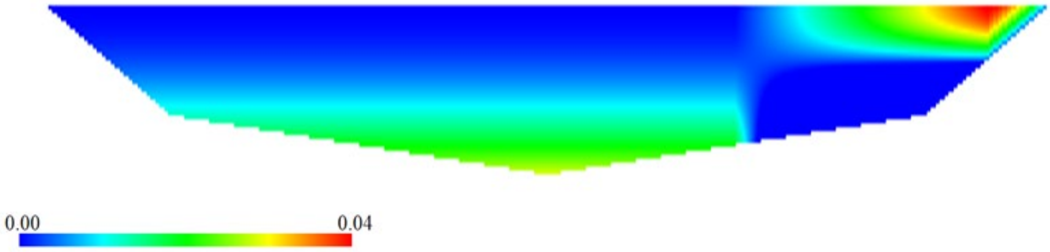

Figure 10 Soil moisture data at the existing locations (Bedele)

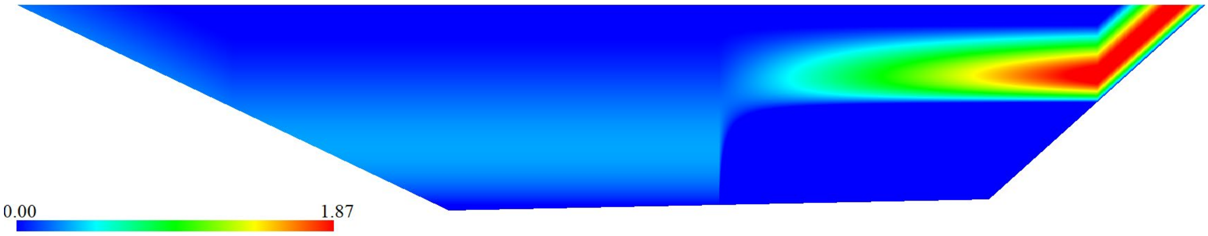

Figure 11 Flow profile of Emboro Chancho River. red: fast, blue: slow.

Figure 12 Newly added discharge measurement sites: top left corner Emboro, Chanco river right top corner Bishan Kelile Hussen Spring, and bottom, Haro Stream, Yabela Kebele.

Soil Moisture

The soil moisture data were collected using the PRO Check sensor. The sensor was calibrated before setting up the equipment for the data collection. TEROS -12 sensor are used for soil moisture (m^3/m^3, temperature (^0C), and electric conductivity (ds/m) data collection.

The following locations are selected for soil moisture data collection.

Figure 13 New soil moisture data collection site (Reference)

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Table 8. Bedele new soil moisture monitoring locations.

No	Location	Sample code	Date	Long(y)	Lat(x)	SM in m^3/m^3	T in ˚C	EC in bulk ds/m
1	Yabala	YabalaSM1 (Reference)	20/06/24	36.383992	8.3976265	0.389	26.2	0.08
2		YabalaSM2	20/06/24	36.3842287	8.3979611	0.403	27.1	0.02
3		YabalaSM3	20/06/24	36.384528	8.3976265	0.393	27.1	0.04
4		YabalaSM4	20/06/24	36.3846162	8.3949355	0.365	27.5	0.15
5		YabalaSM5	20/06/24	36.3853491	8.3945385	0.373	27.4	0.5
6		YabalaSM6	20/06/24	36.3858038	8.39664	0.39	26.8	0.06
7		YabalaSM7	20/06/24	36.3861592	8.3971044	0.39	27.2	0.04
8	Mine	MineSM1 (Ref)	21/06/24	36.4148786	8.3903885	0.358	28.4	0.06
9		MineSM2	21/06/24	36.41469121	8.3911178	0.379	29.1	0.17
10		MineSM3	21/06/24	36.4150583	8.3912654	0.385	30.2	0.04
11		Mine SM4	21/06/24	36.4158006	8.3906429	0.392	29.4	0.101
12		Mine SM 5	21/06/24	36.4160276	8.3908356	0.394	29.1	0.1
13		Mine SM 6	21/06/24	36.4140776	8.3906989	0.348	29.1	0.12
14		Mine SM 7	21/06/24	36.4136786	8.3910588	0.34	30.1	0.05
15	Emboro	EmboroSM1 (Ref)	21/06/24	36.4308693	8.3312427	0.36	31.8	0.26
16		EmboroSM2	21/06/24	36.4320447	8.3323159	0.338	29	0.01
17		EmboroSM3	21/06/24	36.4322617	8.3322505	0.353	30.1	0.11
18		EmboroSM4	21/06/24	36.4334878	8.3327306	0.323	28	0.05
19		EmboroSM5	21/06/24	36.4332886	8.3325674	0.358	27	0.08
20	Ilke Kerero	Ilke Kerero SM1(Ref)	21/06/24	36.3622473	8.4043239	0.39	26.7	0.41
21		Ilke Kerero SM2	21/06/24	36.360468	8.4012766	0.418	31.1	0.24
22		Ilke Kerero SM3	21/06/24	36.3602977	8.4013549	0.388	31.5	0.38
23		Ilke Kerero SM4	21/06/24	36.3640879	8.3997127	0.362	28.5	0.29
24		Ilke Kerero SM5	21/06/24	36.361165	8.4007028	0.366	29.1	0.52

3.3 Harar

3.3.1 Existing Monitoring Sites Data Collection

Water Level Loggers

Genila spring

All water level data loggers, except for the one at Geneila Spring, have been demolished by the community. Although the Geneila Spring logger is operational, it hasn't transmitted data for the past year due to a non-functional SIM card and batteries. During this field mission, a new SIM card was inserted, and the batteries were revived by rubbing them with sandpaper. The logger is currently sending data, but it requires new rechargeable batteries. Additionally, the Agriculture Office of Harari has planned to plant trees in the brewery compound surrounding the loggers. The team has contacted Mr. Misganawu, the manager of Harar Brewery, to discuss the possibility of relocating the tree planting to prevent interference with precipitation measurements. Mr. Misganawu has confirmed that he will ensure the locations will be changed accordingly.

Figure 14 Genila spring data logger.

In the other locations (Sofi, Burqa, and Abawayini), the water level measurements are taken manually, and discharge measurements are made using the floating method.

Table 9. Manual water level measurements in Harar.

Site	Date and Time	Water level from Logger [m]	Manual WL measurement from ref to SWL [m below ref]
Genelia spring	03-07-2024, 10:45	0.174	-> 1.52
Sofi Spring	03-07-2024, 2:47	-	-> 3.04 meters from the top of the concrete to SW -> 3.25 from the concrete to the bed of the spring
Abawayni spring	03-07-2024, 3:20	-	-> 2.07 meters from the top of the concrete to SW -> 2.14 from the concrete to the bed of the spring
Burqaa Spring	04-07-2024, 2:35	-	-> 1.46 meters from the top of the concrete to SW -> 1.66 from the concrete to bed of the spring

Discharge

Flow measurements are taken using a float method in Sofi, Abawayini, and Burqaa springs. The float method was used to measure the time of travel of the leaf over a fixed distance, and the average time is used to calculate the average velocity at the surface level. The discharges of the three channels are given below in Table 10.


Figure 15 Flow measurements using a float method in Sofi, Abawayini, and Burqaa springs.

Table 10. Discharge measurement of Sofi, Abawayini, and Burqa

Site	Date and Time	Depth of water from Surface water (m)	V Max (m/sec)	Q(m3/sec)
Sofi	03,07,2024, 2:47	0.075	0.022	0.0003
Abawayni	03,07, 2024, 3:20	0.080	0.038	0.0012
Burqa	04, 07, 2024, 2:35	0.088	0.088	0.00186

Soil Moisture

There are two existing soil moisture collection locations established during Phase I. Those sites were located at the Sofi and Abawayini plateaus, where the interventions are implemented. Previously collected soil moisture data are available and refer to the Acacia Water Burqaa phase I report.
The Acacia water team, together with the potential candidates monitoring officers, went to the field and measured soil moisture in all locations. These monitoring officers/data collectors will collect data every two weeks from all the existing locations and newly selected sites once an agreement is reached. The soil moisture data collected during this field mission can be found in Table 11

Table 11. Collected soil moisture data at existing locations in Harar.

No	Location	Sample code	Date	Long(y)	Lat(x)	SM in m^3/m^3	T in ˚C	EC in bulk ds/m	Remark
1	Awuberke	SM1	3/7/2024	9.289856	42.12456				
3	le	SM2	3/7/2024	9.292467	42.12414				
4	Sofi	SM1	3/7/2024	9.268432	42.13903	0.085	27.8	-	The location is inside the

									previous interventions
5		SM2	3/7/2024	9.269737	42.13919	0.081	29.9	-	>>
6		SM3	3/7/2024	9.270284	42.14063	0.092	29.4	-	>>
7		SM4	3/7/2024	9.280783	42.14186	0.081	29.9	-	Newly maintained SWC activities

3.3.2 New Monitoring Sites Selection

In Harar, two new kebeles were added for this project (Awumer and Harawe). The Acacia Water team identified suitable locations for soil moisture and water level measurements. In the sections below, each identified location for different measurements can be found.

Water level measurements

In Harar, the same criteria as Bedele were used to select suitable water level measurement locations. It was challenging to find surface or groundwater for measuring water levels in the new kebeles due to water scarcity in Harar. However, in Awamer kebele, a suitable hand-dug well was found for installing a logger, considering factors such as security, network coverage, and representativeness of the interventions. This hand-dug well requires additional maintenance to facilitate logger installation. One aspect is constructing a concrete structure around the borehole to support the installation pole, and another is installing a protective fence around the borehole. The estimated cost for constructing the concrete structure and fence is 60,000 - 100,000 birr. The owner of the borehole, Mr. Adem Abdi Yesuf, has expressed willingness to undertake the construction himself.

Figure 16 Newly selected water level data logger installation site, Harar.

In addition to the new water level monitoring site, a new logger will be installed at Abawayni Spring, as the loggers at Burqa, Sofi, and Abawayni have been demolished. A protective fence will also be installed around this logger. Table 20 contains detailed information on the selected location in Awamer Kebele.

Table 12. Newly selected water level data logger installation location, Harar.

Site	Location	Lat(y) Decimal degrees	Long(x) decimal degrees	Internet	Ref	Depth of well/surface water from ref(meter)	WL from Ref(meter)	Remark
Awamer	Adem abdi yesuf	9.299920	42.179818	Good	Ground	16	14.70	Groundwater level logger. We need to build a concrete structure around the well to install the equipment. It might take up to 60,000, including the fencing cost

Discharge Harar

At the newly selected sites of Harar, particularly Harawe and Awumer, there is no surface water available. Therefore, new locations were not selected for discharge.

Soil Moisture measurements

The soil moisture data were collected from July 2, 2024, to July 5, 2024. The Hakim Gara catchment receives low rainfall, and its soil moisture data value is low compared to the upper Dabena catchment. The following locations listed in Table 13 were selected for soil moisture data collection.

Table 13. Harar new soil moisture monitoring locations.

No	Location	Sample code	Date	Long(y)	Lat(x)	SM in m^3/m^3	T in ˚C	Remark
1	Awumer	AWu SM1	3/7/2024	9.2979878	42.1796106	0.048	29.9	Reference near to roadside
2		AWu SM2	3/7/2024	9.299833	42.182028	0.107	22.8	Ploughing land (Sorghum)
3		AWu SM3	3/7/2024	9.301563	42.183935	0.048	25.1	No SWC practices yet. There is a plan to be done. Bare land with bushes.
4		AWu SM4	3/7/2024	9.3010126	42.1809380	0.053	26.6	Soil bund. Groundnut intercropped with Sorghum and fruit-bearing plants are available. Eg. Mango
5	Harawe	Har SM1	3/7/2024	9.265738	42.180288	0.055	36.3	Grazing land, open space, and possibility for SWC
6		Har SM2	3/7/2024	9.265208	42.181828	0.063	31	Soil bunds, pits for tree plantation @ upstream.
7		Har SM3	3/7/2024	9.264958	42.181425	0.055	33	soil bunds and pits for trees (U/S)
8		Har SM4	3/7/2024	9.264782	42.180860	0.049	35.1	soil bunds and pits for trees (U/S), sandy loose soil.
9		Har SM5	3/7/2024	9.264963	42.180763	0.069	33.8	Sandy loose soil

4 Development and Validation of a Catchment Management Guideline

In the year 2024, one of the main activities undertaken by Acacia Water was the development of the Catchment Management Guideline (CMG), as outlined under Objective 2: Increasing Water Balance Activity Interventions. Specifically, under Activity 2.3, this involved translating the 'Water Balancing Suitability Assessment' and developing maps into the joint development of practical catchment management strategies for each catchment.

The guideline is designed to be user-friendly, providing local government, community groups, and private stakeholders with practical tools to restore degraded land, manage water resources, and support local livelihoods. While not a comprehensive management plan, it serves as a focused resource for implementing immediate, practical actions. To make it more accessible to local stakeholders, a three-page version of the guideline was developed in Afaan Oromo (Oromifa), making it easier for community members and experts to use.

The full CMG was shared with Heineken Ethiopia and World Vision Ethiopia (WVE) on December 6, 2024. However, no feedback or comments were received. On January 24, 2025, the CMG was presented at a workshop facilitated by WVE, where it was well received by the participants. No additional feedback was provided during or after the session. Consequently, the final version of the CMG was shared again with Heineken Ethiopia and WVE on January 30, 2025.

In this section, the key components of the CMG and the Validation workshop/Training are discussed.

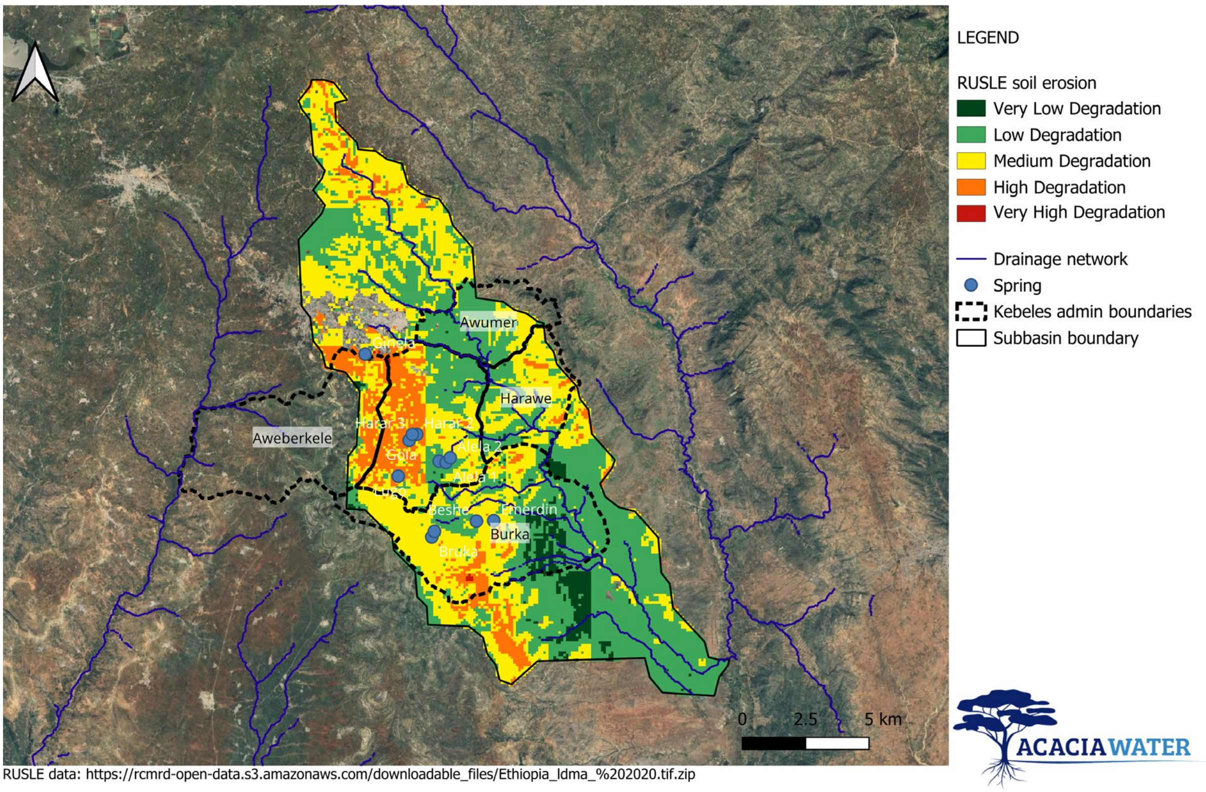
4.1 Key Components of the Catchment Management Guideline

The CMG was designed to support small-scale, community-led catchment management efforts. Unlike complex regional plans, this guideline is tailored for local implementation by woreda and kebele-level actors, focusing on low-cost, community-driven interventions that can be quickly adopted.

It provides a clear, step-by-step framework for managing land and water resources within the Upper Dabena and Hakim Gara sub-watersheds. The guideline emphasizes:

- Practical Water Management Interventions: Simple techniques for enhancing water retention and availability, designed to be implemented with limited resources.
- Soil and Water Conservation: Low-cost measures such as tree planting, check dam construction, and soil bunds, which can be easily adopted by communities.
- Community Participation: Emphasis on involving residents in planning and implementing catchment management activities, ensuring ownership and sustainability.
- Monitoring and Reporting: Basic tools and methods for tracking progress and ensuring accountability, accessible to woreda and kebele-level experts.

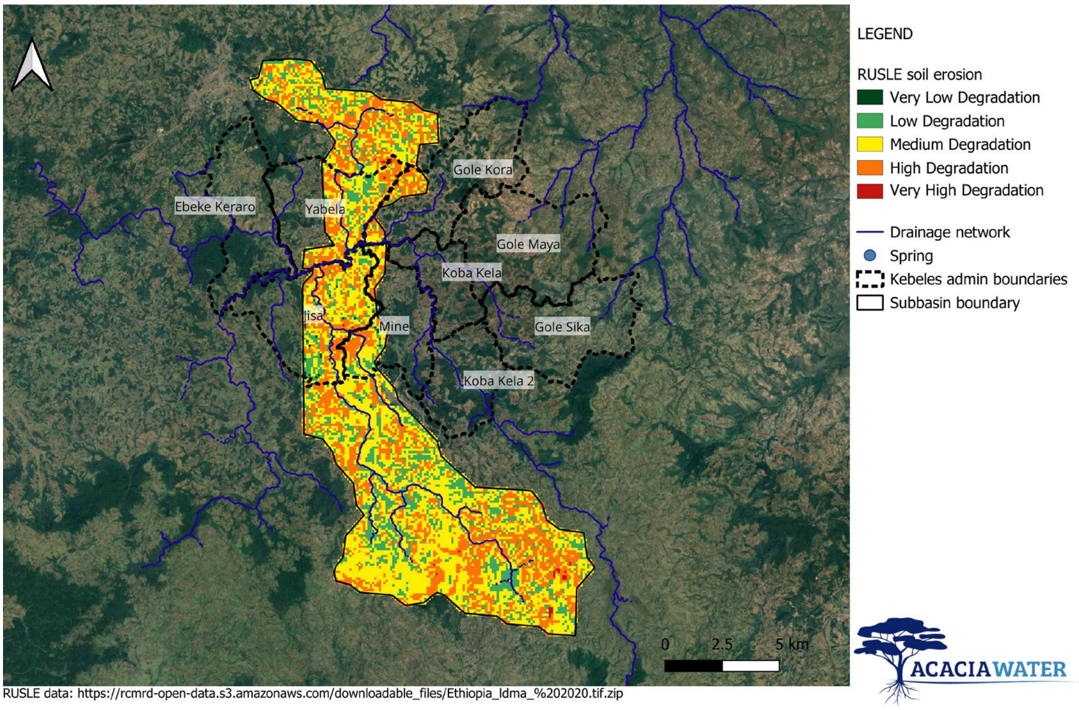
Catchment: Harrar
Map displaying the classification of the Revised Universal Soil Loss Equation for subbasin H4.



RUSLE data: https://rcmrd-open-data.s3.amazonaws.com/downloadable_files/Ethiopia_ldma_%202020.tif.zip

Figure 17 Delineated map of the Hakim Gara catchment with soil erosion vulnerability.

Catchment: Bedele
Map displaying the classification of the Revised Universal Soil Loss Equation for subbasin B4.



RUSLE data: https://rcmrd-open-data.s3.amazonaws.com/downloadable_files/Ethiopia_ldma_%202020.tif.zip

Figure 18 Hakim Gara catchment soil erosion vulnerability map and erosion hotspots.

4.1.1 Identified Monitoring Criteria and Indicators

Effective water resource management depends on specific criteria and indicators that support sustainability and catchment health. Key areas include water availability, quality, soil erosion, agricultural productivity, and the performance of local water committees and intersectoral collaboration. These are measured through indicators such as water storage, baseflow, contaminant levels, erosion rates, crop yields, and committee activities, helping to evaluate interventions and guide future planning.

Table 14. Criteria and indicators for monitoring: summary table.

Criterion	Indicator	Description
More Water Availability During Dry Seasons	Water Storage Levels	Monitor levels in reservoirs, ponds, and wells to assess water availability during dry periods.
	Baseflow Measurements	Observe baseflow recession in streams and rivers to gauge groundwater recharge status and sustained water flow.
	Water Usage Efficiency	Measure water used per unit of agricultural production to evaluate water use practices.
Improved Water Quality and Reduced Pollution	Chemical Contaminant Levels	Measure harmful chemicals (e.g., nitrates, phosphates, fluoride) in water bodies to assess pollution control.
	Microbial Contaminants	Test for pathogens and bacteria to ensure water safety and reduce health risks.
	Sediment Load	Assess sediment concentrations and turbidity to evaluate sediment control measures. Create sediment rating curves from simultaneous discharge – sediment concentration measurements.
Reduced Soil Erosion and Sedimentation	Erosion Rates	Measure soil loss rates with erosion pins or sediment traps to evaluate erosion control practices.
	Sediment Accumulation	Observe sediment build-up in water bodies and reservoirs to assess sediment control efforts.
	Soil Stability	Evaluate soil stability and monitor for gully formation to determine erosion control effectiveness.
Increased Agricultural Production	Crop Yields	Measure the quantity and quality of crops to assess the impact of water and soil management.
	Food Security	Evaluate local food security and reduced reliance on external sources to reflect agricultural success.
	Income Levels	Monitor changes in agricultural income to assess economic benefits of improved management practices.

Functioning of Local Water Management Committees	Committee Activity	Track meeting frequency and decision-making to evaluate committee effectiveness and engagement.
	Community Engagement	Assess community involvement and feedback to evaluate local governance effectiveness.
	Capacity Building	Monitor training sessions and workshops for committee members to gauge capacity building efforts.
Effective Collaboration Between Agriculture, Water, and Environmental Offices	Joint Initiatives	Track collaborative projects and initiatives to assess integrated management efforts.
	Information Sharing	Evaluate the frequency and quality of information exchange between sectors for cooperation.
	Policy Alignment	Review the alignment of policies across sectors to assess coherence and effectiveness.

4.1.2 Proposed Action Plan for Catchment Management

In both Upper Dabena and Hakim Gara, catchment management is carried out through participatory approaches at the kebele level. The planning process follows six steps that help tailor actions to local conditions and community involvement.

Step 1: Biophysical Characterization
This step involves understanding land use types such as forest, farmland, grazing areas, and bare land. In Upper Dabena, the highlands are covered with bushes, and the lowlands with coffee farms. Although the area receives a lot of rain, land degradation has increased runoff and reduced water infiltration. In Hakim Gara, the terrain is hilly and rugged, with chat farming in the lowlands. Rainfall is low, and farming practices need support through better soil and water conservation.

Step 2: Socio-Economic and Livelihood Assessment
Both catchments depend heavily on agriculture for income, making water availability a major concern. Assessments include population, income, access to services, and infrastructure. The plan promotes active participation from all groups, especially women and youth.

Step 3: Situation Analysis
A baseline report is prepared to describe current conditions related to land degradation, water supply, and ecosystem health. This includes biophysical maps and socio-economic data. The findings are shared with local stakeholders to support informed planning and build shared understanding through community committees.

Step 4: Building the Planning Team
A team is formed with both community members and technical staff. It includes kebele leaders, development agents, respected elders, and representatives from different groups, including women and youth. Technical experts from woreda offices also support the process.

Step 5: Catchment Area Identification
Catchments are divided into smaller, community-based units for easier planning and coordination.

The team helps organize activities, provide guidance, and work with communities to manage challenges and resolve disagreements.

Step 6: Action Plan Development
The final step is to outline the key actions and how they will be carried out. To support this, a 3R (Recharge, Retention, Reuse) suitability map can be used to evaluate and compare different options.

Table 15. Schematic Overview of Catchment Management Action Plan.

Indicator	Criteria	Strategy	Action check list: in Hakim Gara catchment
Water availability During dry seasons	Water level increased after intervention to rehabilitate springs / Enhanced base flow.	Stakeholder participation, preparation of action plan, study, campaigning, resource mobilization, preparation, design and implementation plan, monitoring and operation strategy	Applying soil and water conservation practices, water harvesting structures at the proposed upstream sites. Gully rehabilitation, check dams, infiltration ponds (High priority).
	Water Usage Efficiency improved.	Providing technical training on detection and reduction of water losses, efficient irrigation water application.	Construction of flood water harvesting structures (artificial ponds).
Improved soil moisture	Increased soil moisture	stakeholder consultation, preparation of intervention plan, resource mobilization	Implementation of contour bunds, micro basins (half-moon), mulching, area closure, grass strips (Very high priority).
Degraded land rehabilitation	Erosion / sediment transport reduced	Recommendations of 3R interventions, design, planning, stakeholder involvement, cooperation and implementation techniques.	Applying soil and water conservation practices, Gully rehabilitation, check dams.
Improved vegetation cover	Increase Normalized difference vegetation index (NDVI).	Planning, identification of plant types, recommendations of fruit bearing trees, stakeholder participation, collaboration, mobilizing resources and plantation campaign.	Area closure, fruit bearing plantation establishment, improved grass cover or regreening, development of nursery sites.
Level of institutionalization and sustainability	Functionality of CBOs	Stakeholder mapping, documentation of institutionalization, planning,	CBOs working in action, Decision

	Interactions and engagement, water management and governance	communication, responsibilities and involvement	making, legal policies and regulations

4.2 Validation Workshop and Training

World Vision Ethiopia's Burqaa Initiative program organized a three-day training focused on Watershed Management and the internalization of the catchment management guidelines for the Hakim Gara (HG) and Upper Dabena Catchments (UDC). The training was divided into two main parts:

- Watershed Management Training (2 days): Delivered by guest lecturers from Haramaya University.
- Catchment Management Guideline Internalization (1 day): Presented by Acacia Water.

Participants included WVE staff, government representatives, community members, and teams from the Resilient-WE project, a sister initiative to the Burqaa program.

The training began with an opening speech by WVE's focal person and a round of introductions. Acacia Water delivered a theoretical session on the basics of CMG, followed by a practical, step-by-step framework for effective catchment management at the community level. The group was split into two teams (Harar and Bedelle) to develop practical catchment management strategies.

Figure 19. Picture of the workshop during the CMG presentation.

4.2.1 Training Objectives

The primary objective of the training was to strengthen the capacity of stakeholders in catchment management planning (CMG), specifically for Upper Dabena and Hakim Gara. The specific objectives included:

- Applying Integrated Water Resources Management (IWRM) principles.
- Involving stakeholders in the planning process.
- Developing action plans.
- Incorporating legal frameworks and institutions into the planning.
- Designing and implementing effective catchment management systems.

4.2.2 Training Content

Key topics discussed during the training included:

- Catchment Assessment and Analysis: This covered the baseline study, which included both primary and secondary data collection methods such as interviews, focus group discussions, and satellite data (NDVI and QGIS).
- Hydrological Analysis: Focused on rainfall patterns, infiltration analysis, and the relationship between discharge and sediment.
- Socio-Economic Analysis: Covered water harvesting practices, spring restoration, and the impact of improved agricultural practices on productivity and income.
- One of the key themes was community involvement. Participants learned the importance of engaging local communities in water management activities, empowerment, and ownership. The community's role in restoration activities and decision-making was identified as a factor for the success of the program.

In Annex 2, the PPT of the training is attached.

4.2.3 Discussions AND Feedback from Participants

During the training, participants raised several questions and provided feedback:

1. Participants appreciated the new approach to catchment management, especially its practical framework for biophysical characterization and intervention strategies.
2. Some participants suggested that the training could include a stronger focus on agriculture and natural resource management, especially since many work in these sectors.
3. A participant highlighted the value of a joint agenda for water security, recognizing the need for better coordination between sectors.
4. Although Bedele has no immediate water scarcity issues, participants noted concerns about soil erosion and soil fertility, especially due to high rainfall intensity. There was also mention of a termite problem in Koba Kella kebele.
5. Participants noted that while community mobilization and awareness were more advanced in Hakim Gara, Upper Dabena was lagging in these efforts.
6. The participants expressed support for linking water bureaus with agricultural efforts to promote water harvesting, soil retention, and groundwater recharge.
7. The importance of sustainability was emphasized, with participants expressing satisfaction that the project included design, operation, and maintenance strategies to enhance long-term impact.

5 Conclusion and Way Forward

This section summarizes the key findings and outcomes of the project activities from February 2024 to April 2025. The Conclusion highlights the overall achievements, challenges, and impact of the project during this period. The Way Forward outlines the next steps to continue achieving the project objectives, increasing community engagement, and supporting future progress.

5.1 Conclusion

In 2024, Acacia Water began the Burqaa Phase II project with a baseline assessment to understand the environmental conditions of the project areas. This assessment focused on key biophysical factors such as topography, climate, land use, soil properties, and hydrology, and will be used to evaluate the impacts of the interventions planned under the project.

Following the baseline assessment, Acacia Water conducted field missions in Bedele and Harar in June and July 2024. In Bedele, the team reinstalled water level loggers at the brewery intake and Gechi faris, downloaded data from all three water level loggers and selected new monitoring sites, including a spring in Emboro kebele and a hand-dug well in Yabela kebele. Additionally, 24 new soil moisture monitoring sites were chosen across four kebeles in Bedele. In Harar, three monitoring loggers were damaged, limiting data collection to the Geneila Spring water level logger. New monitoring sites were selected in Harar's newly added kebeles, but challenges in identifying discharge measurement locations arose due to limited surface water availability.

Equipment for data collection was selected, and manual data collection officers were identified in both areas. However, due to delays in budget approval, the purchase and installation of data loggers were postponed, preventing the start of manual data collection. Furthermore, the data dashboard, which had been hosted by Acacia Water since the end of Phase I, was temporarily taken offline due to budget constraints.

Catchment Management Guideline (CMG), which aims to provide practical tools for local government, community groups, and stakeholders involved in water resource management, land restoration, and livelihood support, was developed. While not a comprehensive management plan, the CMG serves as a resource for immediate interventions. A version in Afaan Oromo was also created for better accessibility for the community and kebele experts. The CMG was shared with Heineken Ethiopia and World Vision Ethiopia (WVE) in December 2024 and presented at a workshop in January 2025, where it was well received, though no further feedback was provided.

5.2 Challenges

Budget Delays and Unclear Contractual Conditions:

Delays in budget approval and unclear contractual conditions for monitoring equipment and data collection have caused setbacks in the timely purchase and installation of necessary tools. This has delayed manual data collection and disrupted the hosting of the data dashboard, which impacts the ability to monitor the effectiveness of the Soil and Water Conservation (SWC) interventions implemented by the project.

Non-Functioning Data Loggers in Harar:

Despite the installation of four data loggers in Harar during Phase I, none of them are currently working, which affects data collection and the ability to monitor environmental changes and SWC interventions in the region.

Technical Issues with Monitoring Equipment:

Damage to data loggers, especially in Harar, has disrupted data collection, affecting the accuracy and completeness of project monitoring. Additionally, some new monitoring sites require extra infrastructure, leading to delays.

5.3 Ways Forward

Expedited Budget Approval and Clearer Contracts:

The budget approval process should be sped up, and clear contracts for monitoring and data collection should be established. This will help with the timely purchase of equipment and ongoing monitoring of the SWC interventions.

Resolution of Data Logger Issues in Harar:

Immediate action should be taken to replace the non-functioning data loggers in Harar to restore full monitoring capacity. In the meantime, alternative data collection methods should be explored.

Improved Equipment Maintenance and Site Installation:

A routine maintenance schedule for monitoring equipment should be implemented, with backup systems in place to avoid disruptions. Additionally, more thorough planning for site protection and installation will minimize delays.

Alternative Data Collection Methods for Water-Scarce Areas:

In areas with limited surface water, alternative data collection methods, such as soil moisture monitoring and/or satellite data, will be explored to continue data collection.

Annex

Annex 1: Project Area Look-up Table, 3R and Erosion Vulnerability Maps

Table 16. Look up interventions – Bedele target areas – Burqaa Phase II.

Biophysical controlling factors				Recommended water balancing,Agro-forestry, and livelihood improvement interventions			
Land cover	Agro-Climate	Slope class	Legend	Water balancing interventions		Improved Agriculture/ Agroforestry	Livelihood improvement interventions
				Soil and Water conservation measures (SWC)	Water harvesting/recharging interventions		
Open forest	Dry	Flat (<5%)		-Micro basins (Half moons) - tie ridges/ grass strips - Zai pits,	-Sand dams (On-stream) -Harvesting surface run off Retention ditches	-Reforestation/ -- Agro-forestry practice -Seedlings - Nursery sites	-Bee hives Plantation of drought resistant fruit trees; that adaptable to Agro-ecological zone
		Low slope (5-15%)					
		Medium slope (15-30%)		-Gabion check dams (on-stream) -Soil /stone bunds - Bench terraces	-Runoff retention basin - Infiltration ponds		
		High slope (>30%)		Area closure Bench terraces	-		-
	Moist	Flat (<5%)		Micro basins (half-moons)	-Sand dams (On-stream)		- Bee hives

			Grass strips	-Harvesting surface run off -Roof top water harvesting	-Reforestation/ --Agro-forestry practice -Seedlings - Nursery sites	- Plantation of fruit trees; that adaptable to Agro- ecological zone -Bee hives
		Low slope (5-15%)	Fanya Juu Stone/soil bunds			
		Medium slope (15-30%)	Check dams			
		High slope (>30%)	Area closure Bench terraces			-
Crop lands and mixed farming	Dry	Flat (<5%)	Pre-season ploughing Water conservation tillage Mulching Field bunds Fanya Juu Stone/soil bunds	-Roof top water harvesting -Construction of artificial pond (Off -stream) -Sand dams (On-stream) -Water retention ponds	- Crop rotation - Low tillage Compost/ organic manure - seedlings , providing drought resistant crops	- Production of vegetables and crops - Poultry farming - Bee hives
		Low slope (5-15%)				
		Medium slope (15-30%)			-	Bee hives
		High slope (>30%)	Area closure Bench terraces		-	Bee hives
	Moist	Flat (<5%)	Field bunds Grass strips Tie ridges	Construction of artificial water retention ponds - Roof top water harvesting	- Improved varietes for seedlings, nursery sites, - Improved and hybrid breedings	-Fish farm - Bee hives - vegetables and food crops - Poulty farming - Pig farming
		Low slope (5-15%)				
		Medium slope (15-30%)	Fanya Juu Stone/soil bunds			

							- cow fattening/ Dairy farm
		High slope (>30%)		Gabion check dams Area closure			-
Range lands	Dry	Flat (<5%)		Grass strips Zai pits Micro basins	- Sand dams - Infiltration ponds	-	- Cow fattening and dairy farm - Bee hives - Poultry farming
		Low slope (5-15%)					
	Moist	Flat (<5%)		Micro basins Stone /soil bunds Gabion check dams	Sand dams Infiltration ponds	-	- Fish farming - Cow fattening - Dairy farming - Poultry farming
		Low slope (5-15%)					
		High slope (>30%) & Leptosols	-	Bench terraces Area closure			
Urban area/homesteads				Roof top water harvesting			
Permanent water/ Wetlands							
Wurch (elevation > 3,700 m asl)			-	Area closure and forestation			

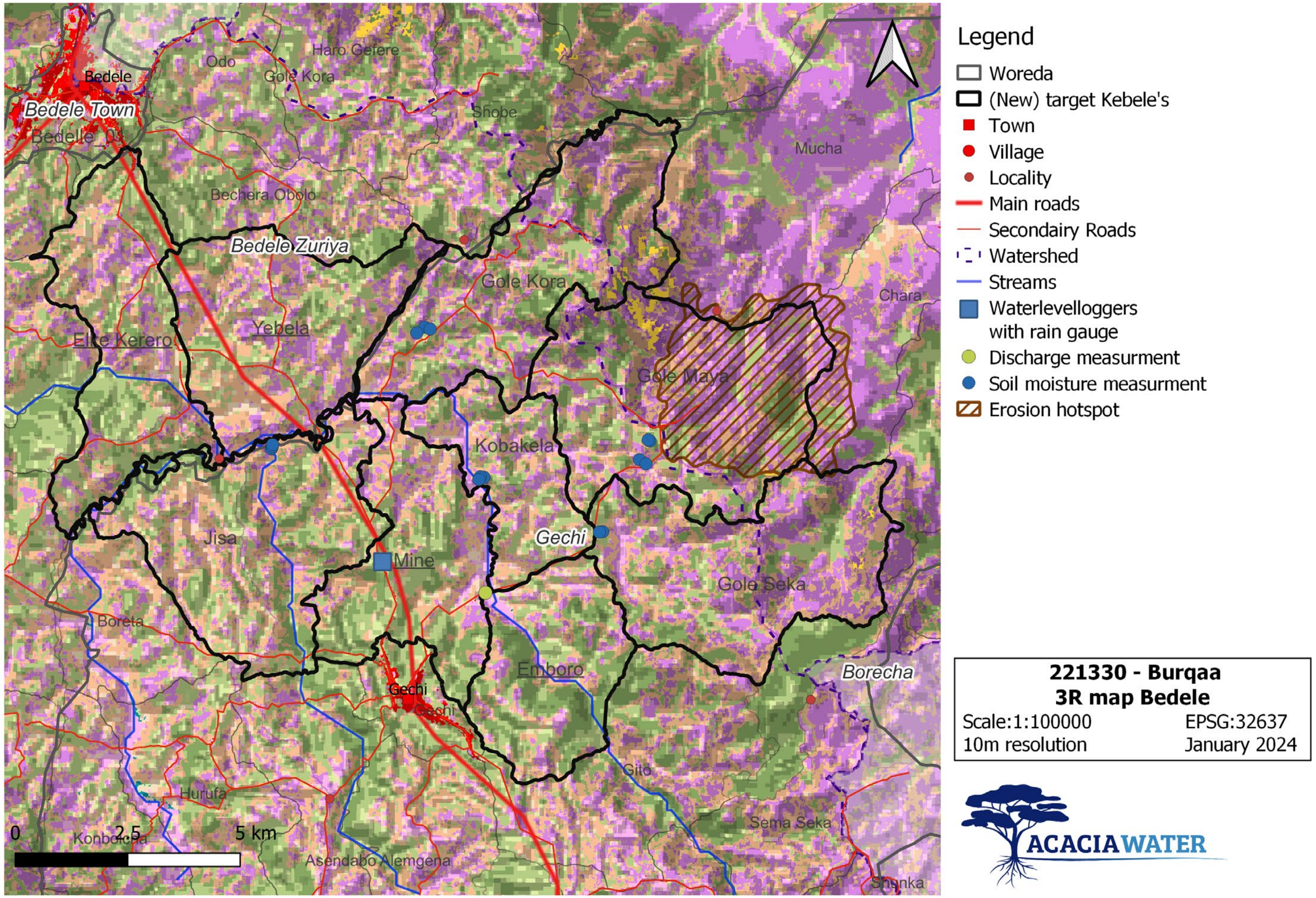


Figure 20. 3R map of Bedele Upper Dabena catchment.

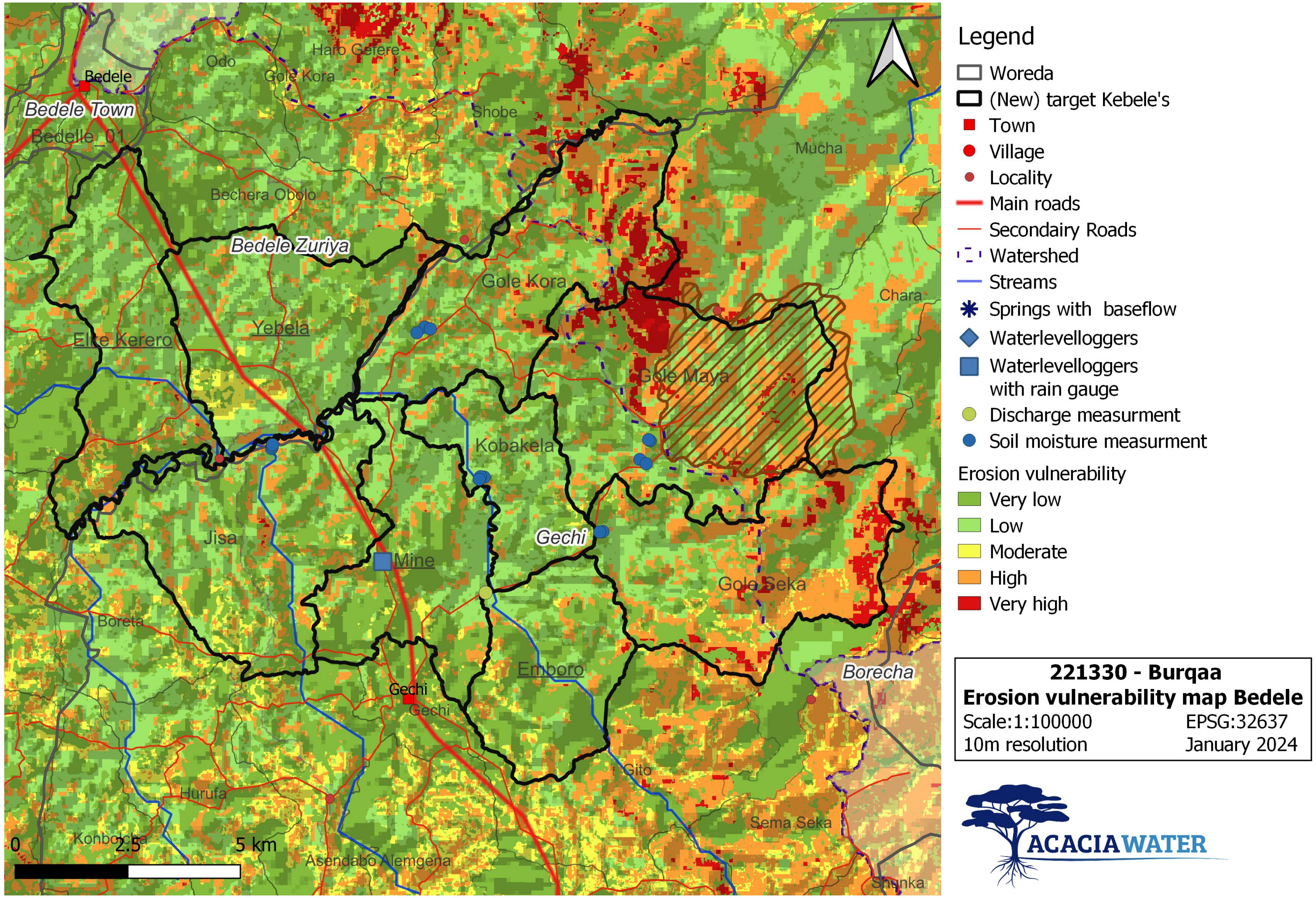


Figure 21. Bedele Upper Dabena catchment erosion vulnerability map.

Table 17.Look up interventions – Harar target areas – Burqaa phase II.

Biophysical controlling factors				Recommended water balancing,Agro-forestry, and livelihood improvement interventions			
				Water balancing interventions		Improved Agriculture/ Agroforestry	Livelihood improvement interventions
Land cover	Agro-Climate	Slope class	Legend	Soil and Water conservation measures (SWC)	Water harvesting/recharging interventions		
Open forest	Dry	Flat (<5%)		-Micro basins (Half moons) - tie ridges/ grass strips - Zai pits,	-Sand dams (On-stream) -Harvesting surface run off Retention ditches	-Reforestation/ -- Agro-forestry practice -Seedlings - Nursery sites	-Bee hives Plantation of drought resistant fruit trees; that adaptable to Agro-ecological zone
		Low slope (5-15%)					
		Medium slope (15-30%)		-Gabion check dams (on-stream) -Soil /stone bunds - Bench terraces	-Runoff retention basin - Infiltration ponds		
		High slope (>30%)		Area closure Bench terraces	-		-
	Moist	Flat (<5%)		Micro basins (half-moons) Grass strips	-Sand dams (On- stream) -Harvesting surface run off -Roof top water harvesting	-Reforestation/ -- Agro-forestry practice -Seedlings - Nursery sites	- Bee hives - Plantation of fruit trees; that adaptable to Agro- ecological zone -Bee hives
		Low slope (5-15%)		Fanya Juu Stone/soil bunds			
		Medium slope (15-30%)		Check dams			

		High slope (>30%)		Area closure Bench terraces			-
Crop lands and mixed farming	Dry	Flat (<5%)		Pre-season ploughing Water conservation tillage Mulching Field bunds Fanya Juu Stone/soil bunds	-Roof top water harvesting -Construction of artificial pond (Off -stream) -Sand dams (On-stream) -Water retention ponds	- Crop rotation - Low tillage Compost/ organic manure - seedlings , providing drought resistant crops	- Production of vegetables and crops - Poultry farming - Bee hives
		Low slope (5-15%)					
		Medium slope (15-30%)				-	Bee hives
		High slope (>30%)		Area closure Bench terraces		-	Bee hives
	Moist	Flat (<5%)		Field bunds Grass strips Tie ridges Fanya Juu Stone/soil bunds	Construction of artificial water retention ponds - Roof top water harvesting	- Improved varietes for seedlings, nursery sites, - Improved and hybrid breedings	- Bee hives - vegetables and food crops - Poulty farming - Cow fattening/ Dairy farm
		Low slope (5-15%)					
		Medium slope (15-30%)					
		High slope (>30%)		Gabion check dams Area closure			-

Range lands	Dry	Flat (<5%)		Grass strips Zai pits Micro basins	- Sand dams - Infiltration ponds	-	- Cow fattening and dairy farm - Bee hives - Poultry farming
		> Slope (5%)					
	Moist	Flat (<5%)		Micro basins Stone /soil bunds Gabion check dams	Sand dams Infiltration ponds	-	- Fish farming - Cow fattening - Dairy farming - Poultry farming
		Low slope (5-15%)					
		High slope (>30%) & Leptosols	-	Bench terraces Area closure			
Urban area/homesteads				Roof top water harvesting			
Permanent water/ Wetlands				Fish farming, pig farming , wetlands and flood plain protection			
Wurch (elevation > 3,200 m asl)			-	Area closure and forestation			

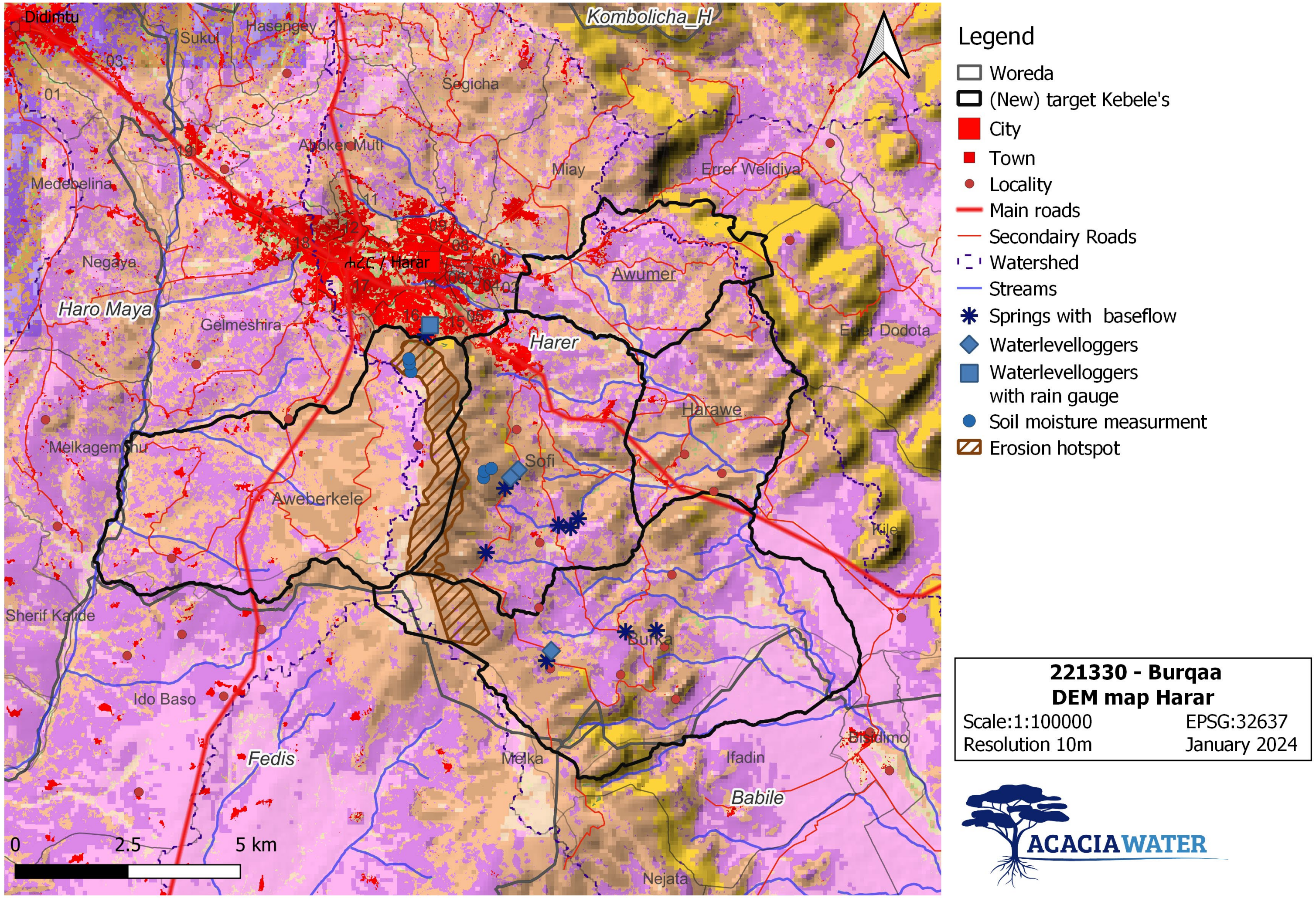


Figure 22 3R Map of Harar- Hakim Gara catchment.

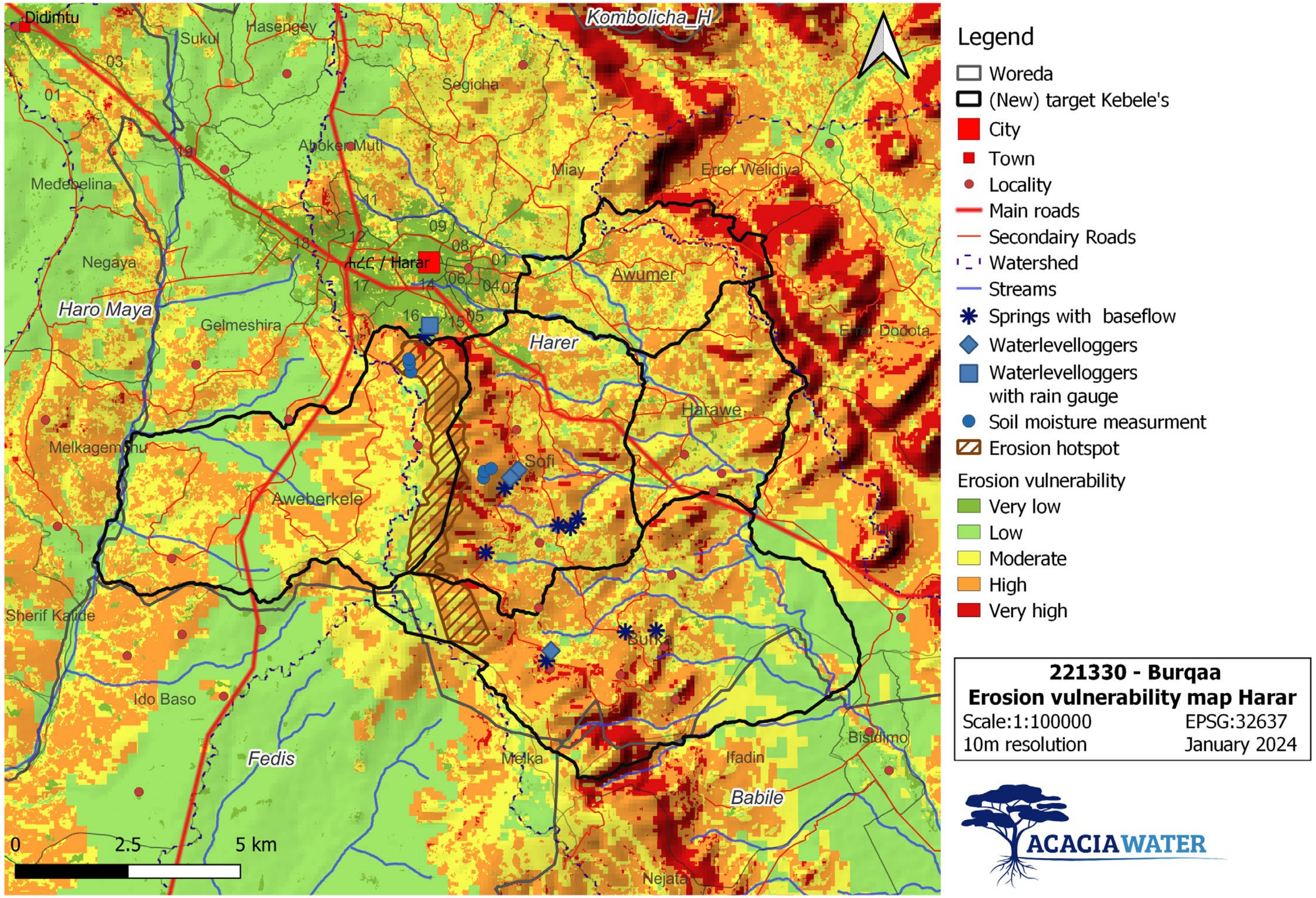
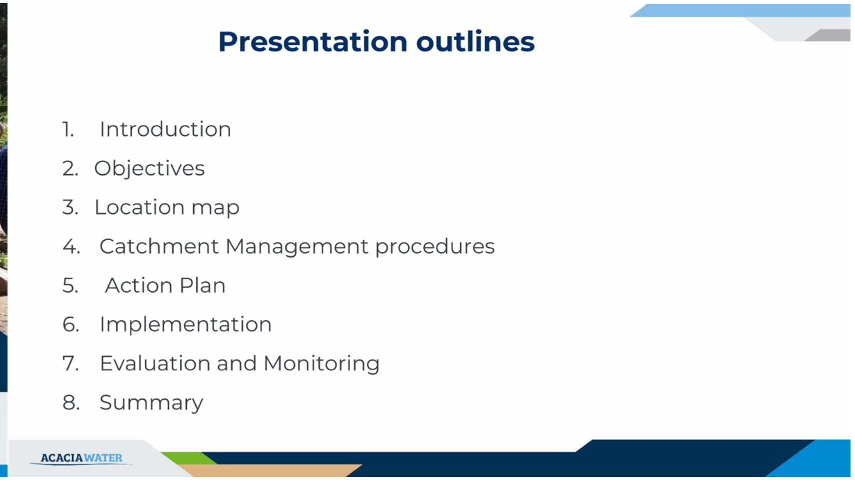


Figure 23 Harar- Hakim Gara Catchment Erosion Vulnerability Map.

Annex 2. PPT of CMG Workshop.



Introduction

BURQAA initiative: Hakim Gara and Dabena catchment project implemented for balancing water resources and livelihood improvement by World Vision Ethiopia .

Several interventions (Seedlings, soil and water conservation practices were implemented. (World Vision Ethiopia).

Acacia water involved in monitoring hydro-meteorological data and evaluation of Burka initiative interventions on surface and ground water sources **(telemetric)**

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Cont.

Building on this success, the **BURQAA Initiative (BI) Phase II** expands these efforts to new areas while focusing on ensuring long-term sustainability.

- A key element of this phase is the **development of a Catchment Management Guideline** that is simple, practical, and specifically designed for small-scale implementation at the community level.
- This guideline will serve as a hands-on tool for local experts to carry out effective catchment management in ways that are directly applicable to the needs of their communities.

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Objectives

- To provide a practical, **step-by-step framework for effective catchment management at the community level**.

The scope of the guideline includes:

- **Practical Water Management Interventions:** Simple techniques for enhancing water retention and availability, designed to be implemented with limited resources. **Soil and Water Conservation**: Low-cost measures such as tree planting, check dam construction, and soil bunds construction, which can be easily adopted by communities.
- **Community Participation**: Emphasis on involving residents in planning and implementing catchment management activities, ensuring ownership and sustainability.
- **Monitoring, Accountability and Learning:** Basic tools and methods for tracking progress and ensuring accountability, accessible to woreda and kebele-level experts.

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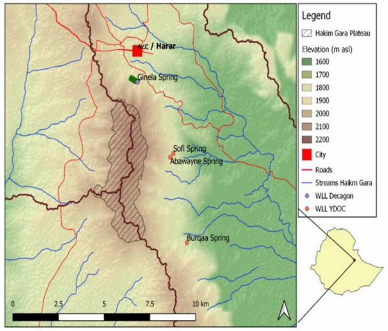
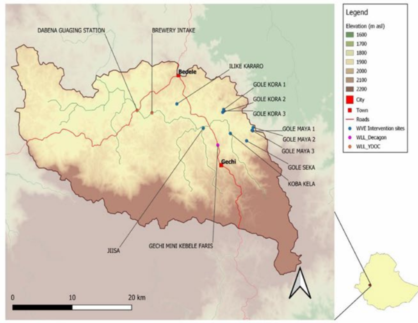
Study area: both Dabena and Hakim Gara catchments

Hakim Gara catchment-phase I



Dabena catchment- Phase I



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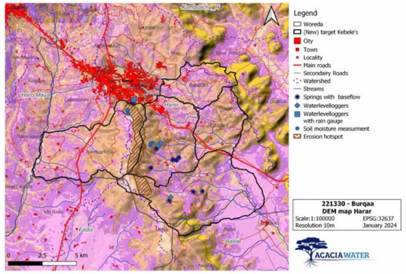
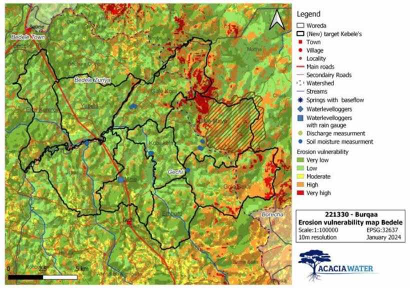
Existing and New sites under BURQAA phase- II





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Catchment Management plan procedures

Catchment characteristics

The **physical characteristics** of the catchments are derived from a combination of primary and secondary data collection, including literature reviews, existing reports, and satellite remote sensing analysis, supplemented by expert observations in the field.

- Land use and land cover
- Topography
- Soil condition
- Watershed Delineation
- Water Resources characterization

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Catchment management …

1. **Catchment Assessment and Analysis**

   1. **Overview of Baseline Study**

A comprehensive baseline assessment was conducted for both catchments , involving both primary and secondary data collection methods.

Methods of Data Collection

Primary Data: Collected through field measurements and surveys, including Soil moisture and temperature.

- Discharge measurements using the velocity-area method.
- Interviews, focus group discussions, and key informant interviews.

Secondary Data: Included remotely sensed data for rainfall and vegetation cover mapping (NDVI), analyzed using QGIS.

ACACIA WATER

Stakeholder Mapping

Engaging with local stakeholders is crucial for the success of water resource management initiatives. List all stakeholders involved.

Local Water Committee

- A local water committee must be established, serving as a platform for community.

Engagement Strategies

The community engagement strategies include:

- Community Workshops
- Regular Meetings: Conducted with the water committee to review progress.
- Feedback Mechanisms

ACACIA WATER 11

Environmental Impact

Environmental Impact Assessment (EIA)

The environmental impact assessment aimed to evaluate the changes in the ecosystem e.g., interventions and ongoing environmental factors:

- **Drought and land degradation.**
- **Vegetation Health (Ecosystem)**
- **Water Availability @ downstream**

Socio-Economic Aspects

Access to Water Resources

The restoration of springs and improved water harvesting practices to improve water availability for domestic, irrigation and livestock.

Agricultural Productivity

Better land management practices (e.g., tree planting and soil and water conservation bunds) have led to improved agricultural outcomes. Income generated and socio-economic system of community improved.

Community Participation and Empowerment

The engagement of local communities in the project was a significant factor in its success. Involving community members in restoration activities and develop a sense of ownership.

Hydrological Assessment

- **Catchment Delineation at sub-catchment**

Sub-watershed catchment is important that kebele boundaries when it comes to watershed (catchment management) plan. Usually sub watershed boundaries will not necessarily overlap.

- **Rainfall Analysis**

The target area receives annual rainfall reclassification, based on CHIRPS data (Main source for groundwater recharge). However, the natural groundwater recharge to superficial reservoirs that feed the drainage network of perennial rivers.

- **Infiltration Analysis –** through soil moisture data/NDVI.
- **Runoff (Q)-** Q-H relationships or hydrographs.

2. Challenges Analysis

The following water related challenges are observed in the catchment:

- **Land Degradation & Soil Erosion**: Deforestation and unsustainable land management practices
- **Water Scarcity**: Limited rainfall and lower groundwater recharge lead to severe water shortages, especially during the dry season.
- **Low Management Capacity**: The community struggles with inadequate infrastructure, maintenance skills.
- **Water Pollution**: Urban waste disposal pollutes surface and groundwater, affecting health and agricultural production.
- **Lack of soil conservation and Water Harvesting Technology**: Limited access to water harvesting and efficient agricultural techniques.
- **Climate Change Vulnerability**: Unpredictable rainfall and prolonged droughts.

ACTION PLAN

Development of the action plan includes the following steps:

Identify your catchment area and define your objectives in a "what to do" list.

Define clear methodology and procedures using the check list.

1) Propose a detailed action plan.
2) Identify high priority actions using relevant criteria.
3) Work on the implementation of the plan and define follow-up actions.

Indicator → Criteria → Strategy → Action

Catchment Management Action plan

Indicator	Criteria	Strategy
Water availability During dry seasons	Water level increased after intervention to rehabilitate springs / Enhanced base flow.	Stakeholder participation, preparation of action plan, study, campaigning, resource mobilization, preparation, design and implementation plan, monitoring and operation strategy
	Water Usage Efficiency improved.	Providing technical training on detection and reduction of water losses, efficient irrigation water application.
Improved soil moisture	Increased soil moisture	stakeholder consultation, preparation of intervention plan, resource mobilization
Degraded land rehabilitation	Erosion / sediment transport reduced	Recommendations of 3R interventions, design, planning, stakeholder involvement, cooperation and implementation techniques.

Action plan …

Improved vegetation cover	Increase Normalized difference vegetation index (NDVI).	Planning, identification of plant types, recommendations of fruit bearing trees, stakeholder participation, collaboration, mobilizing resources and plantation campaign.	Area closure, fruit bearing plantation establishment, improved grass cover or regreening, development of nursery sites.
Level of institutionalization and sustainability	Functionality of CBOs Interactions and engagement, water management and governance	Stakeholder mapping, documentation of institutionalization, planning, communication, responsibilities and involvement	CBOs working in action, Decision making, legal policies and regulations

ACTION PLAN PROCEDURES

Step 1- characterize the watershed overview **biophysical components** such as cover, vegetation, agricultural practices.

Step 2 - Characterize the **socio economic and livelihood aspects** of the community,

- Characterize Hakim Gara socio economic aspects such as demography, income, infrastructures and services.

Step 3 - Present the report of the **situation analysis** about the land degradation, water availability, ecosystem and environment.

- The baseline report of present situation related to objectives should be prepared.
- The traits and opportunities are proposed under this section.

CON'T

Step 4 - **Build a team to create** a plan from the bottom up that includes community inputs, in addition to technical aspects. The building team at woreda level should include a Watershed expert (Irrigation expert) to support.

Step 5 - **Identification of watersheds** within broader units with team member participation: each of the prioritized critical watersheds can be further subdivided based upon community locations into community based sub-watersheds.

Step 6 - **Development action plan**. Propose key actions and plan the intervention procedures.

What are possible measures. it is better to develop 3R suitability mapping to cross check the alternatives.

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CONT'D

- Setting Short-term, Medium-term, and Long-term goals

Priority Actions

- Identification of intervention and Priority Setting of Community watersheds with respect to actions are important.
- The constraints and limitations related to resources like financial and manpower requirements should be settled before implementation action.
- **Agro-ecological diversity** (Biophysical characteristics that constitutes soil condition, rainfall and land use and cover).
- Agriculture potential.
- **Watershed landscape approach and sequence** (Location / Orientation in upper reaches of the broader watershed.
- **Severity of land degradation.**
- **Food insecurity and support activities.**
- **Material availability and cost.**

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Cont'd

Implementation

- During the implementation of interventions in the catchment, guidance is important according to participatory watershed management.

Participatory catchment management supporting manual

- In the Hakim Gara catchment through the Burqaa project, soil and water conservation practices are recommended. The guiding manual has been prepared for the community to implement interventions to the standard.

- Please, refer to **Participatory Watershed management** manual prepared for landscape restoration.

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Timeline and Milestones for interventions

1. Preliminary desk development of term of references (TOR), maps and conceptual reports requires **(2-3) weeks**.
2. Field work data collection and reconnaissance survey for illustration of features, delineate and catchment description **(3-4) days.**
3. Prepare 3R suitability map considering the principles of participatory watershed management. The workload requires **(2-3) weeks**.
4. Participatory session with planning core team members and present the findings to the community and facilitate the cooperation **(within 1 week**).
5. Implementation action plan should be approved by core team members.
6. Implementation with a continuous follow up in monitoring to maintain and operate regularly **(2- 5) years.**

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Implementation Framework

- The implementation framework for catchment management is designed to provide a structured and comprehensive approach to sustainably managing water resources. It includes key components such as institutional arrangements, capacity building, stakeholder collaboration, and risk management, all aimed at enhancing coordination and engagement among local stakeholders.

1.Institutional Arrangements

Level	Key Institutions	Roles and Responsibilities
Local Authorities	Village or town-level government units (e.g., councils, local environmental offices)	- Oversee the implementation of the catchment management plan - Provide resources and technical support for water and land management practices - Facilitate enforcement of local rules
Catchment Committee	Representatives from local government, farmers, community leaders, and local NGOs	- Develop and update the catchment management plan - Monitor and assess ongoing management activities - Ensure local stakeholder involvement
Water User Groups	Groups representing farmers, water users, or irrigators within the catchment area	- Maintain water infrastructure - Resolve water use conflicts within the group - Ensure equitable water distribution

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2. Capacity Building

Capacity Building emphasizes the importance of developing the skills and knowledge of community members, local organizations, and stakeholders.

Capacity Building Activity	Target Group	Key Topics	Implementation Method
Technical Training on Water Management	Local authorities, farmers	- Rainwater harvesting - Water-efficient irrigation - Soil conservation practices (e.g., terracing)	- On-site workshops - Demonstration plots
Community Workshops on Catchment Health	Community members	- Benefits of catchment conservation - Reducing erosion and sedimentation - Protecting water sources	- Community meetings - Educational campaigns
Monitoring and Data Collection Training	Water user groups, catchment committee members	- Monitoring water flow and quality - Tracking land degradation - Managing simple data collection tools	- Practical sessions - Peer-to-peer learning

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3. Stakeholder Collaboration

Stakeholder Collaboration is vital for fostering a sense of ownership and shared responsibility among all parties involved in catchment management.

Stakeholder Group	Roles in Collaboration	Methods for Engagement
Farmers and Water Users	- Participate in water conservation and soil management activities - Implement sustainable agricultural practices	- Regular meetings with the catchment committee - Field visits
Local NGOs	- Provide technical expertise and resources - Facilitate community education and capacity-building initiatives	- Partner agreements with local authorities
Local Authorities (Municipal)	- Facilitate legal and financial support - Coordinate local resources and oversee compliance with management plans	- Joint planning and progress review meetings

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Evaluation and Monitoring

Water availability and Quality assessment criteria

Criterion	Indicator	Monitoring Method
Water Availability	Water storage levels in reservoirs, ponds, wells	Sensors, satellite imagery
Baseflow in streams	Gauge baseflow during dry months	Ground-based flow meters
Water Use Efficiency	Water use per unit of crop production	Flow meters, crop yield analysis

Criterion	Indicator	Monitoring Method
Water Quality	Chemical contaminant Levels (nitrates, phosphates)	Chemical water tests
Pathogen Levels	Microbial safety testing	Pathogen testing kits
Sediment Load	Turbidity and suspended solids	Turbidity meters, sediment traps

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CASE STUDIES
HAKIM GARA CATCHMENT

Indicator	Criteria	Strategy	Action check list: in Hakim Gara catchment
More Water Availability During Dry Seasons			Applying soil and water conservation practices, water harvesting structures at the proposed sites. Gully rehabilitation, check dams, infiltration ponds. **High priority**
			Construction Flood harvesting structures (artificial ponds). **High priority**
Improved soil moisture			Implementation of contour bunds, micro basin (half-moon), mulching, area closure, grass strips. **High priority**
Degraded land rehabilitation			Applying soil and water conservation practices, water harvesting structures at the proposed sites. Gully rehabilitation, check dams, infiltration ponds.
Improved vegetation cover			Area closure, fruit bearing plantation, grass cover or regreening, development of nursery sites.
Level of institutionalization and sustainability			CBOs working in action, Decision making, legal policies and regulations

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CASE STUDIES
UPPER DABENA CATCHMENT

Indicator	Criteria	Strategy	Action check list: in Hakim Gara catchment
More Water Availability During Dry Seasons			Applying soil and water conservation practices, water harvesting structures at the proposed sites. Gully rehabilitation, check dams, infiltration ponds.
			Construction Flood harvesting structures (artificial ponds).
Improved soil moisture			Implementation of contour bunds, micro basin (half-moon), mulching, area closure, grass strips.
Degraded land rehabilitation			Applying soil and water conservation practices, water harvesting structures at the proposed sites. Gully rehabilitation, check dams, infiltration ponds. **High priority**
Improved vegetation cover			Area closure, fruit bearing plantation, grass cover or regreening, development of nursery sites.
Level of institutionalization and sustainability			CBOs working in action, Decision making, legal policies and regulations **High priority**

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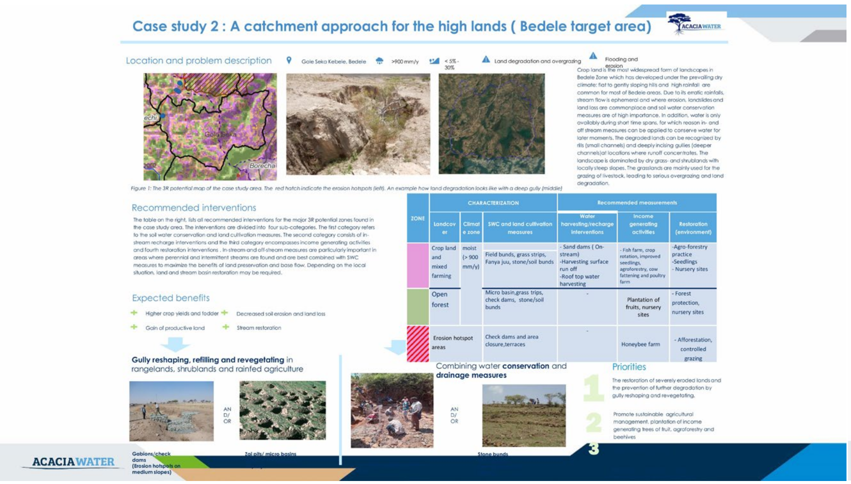

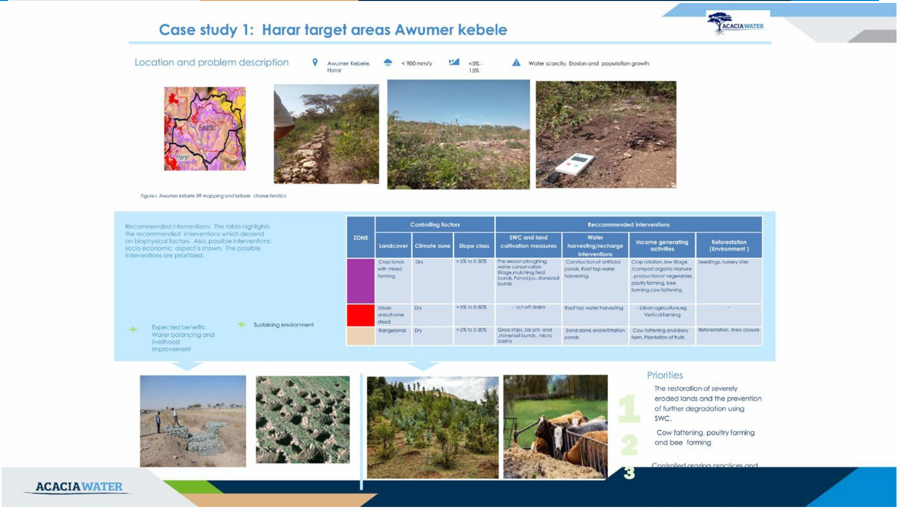

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