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Gender Equality and Social Inclusion (GESI) for Climate-smart Water Management Practices

The Case of Upper Awash River Basin of Wollo and Lower Awash River Basin of Afar in Ethiopia

Synthesis Report

Likimyelesh Nigussie, Deepa Joshi, Bayush Tsegaye, Wondye Admasu and Nahusenay Abate

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Cover photo: A woman picking avocados in a farm in Ethiopia (*photo*: Maheder Haileselassie / IWMI)

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Project

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Contents

Summary

This research study on gender and water resources management, led by the International Water Management Institute (IWMI) and its partners in Ethiopia, was designed to collect primary and secondary data on how smallholder agricultural producer communities in selected catchments are impacted by and cope with climate change. Our focus was on exploring opportunities and barriers for designing and implementing gender-responsive and climate resilient water resources planning and management interventions that are contextually relevant. The research findings will be further translated into actionable recommendations for gender-responsive decision support tools for climate-smart water resources management. The study, informed by the Gender Empowerment Framework and a qualitative research methodology, analyzed soil and water conservation initiatives and small-scale irrigation (SSI) interventions in four districts of the Awash River Basin. These locations were the Kalu and Habru districts from the Upper Awash Catchment in Wollo, and the Ewa and Afambo districts from the Lower Awash Catchment in Afar. These four districts were chosen for their diversity of conservation initiatives and livelihoods. Data were collected from a total sample size of 309 individuals – 288 of whom were smallholder farmers (160 women and 128 men) and 21 were key informants from local government offices – by conducting 96 in-depth interviews, 24 focus group discussions and 21 key informant interviews. The data were analyzed to assess the gender dynamics of productivity, production and practices, and SSI practices, focusing on three key dimensions: resources, agency and institutions. The three key results and recommendations are as follows:

First, climate impacts result in diverse outcomes for women (and men). It causes malnutrition in persons with special needs and increases the workload of women and girls, who are predominantly responsible for domestic work. This requires interventions that focus on the needs, priorities, barriers and challenges of these groups, and ensure targeted opportunities in decision-making, access to resources and services, and benefits.

Second, deep-rooted sociocultural norms and barriers impact outreach efforts for women and marginalized groups; this includes the effective engagement of these groups in capacity building training programs, and their access to relevant information, entrepreneurial opportunities and linkages across the value chains. Without addressing these barriers, making a sustained impact in terms of gender equality and social inclusion will not be possible. We recommend adopting interventions that address the structural barriers to women's participation in leadership positions, promoting gender-responsive practices across institutions and building synergy among relevant stakeholders.

Third, insufficient institutional capacities among implementing actors present key obstacles to the design and implementation of gender-responsive climate-smart water technologies and practices. Overcoming these challenges necessitates commitment from leaders and the allocation of sufficient resources to establish and enhance institutional systems such as mechanisms for accountability, monitoring and evaluation. Additionally, it entails evidence-based and data-driven research on gender to collate gender and social inclusion challenges.

This report presents a synthesis focused on the methodology and key findings of the Gender Equality and Social Inclusion (GESI) study. For further information, the reader is advised to refer to the detailed report prepared as part of the study, which can be accessed by contacting the lead author.

Introduction

Water plays a critical role in enabling small-scale producers (SSPs) to adapt to climate change (Abdul-Razak and Kruse 2017). Building the adaptive capacity of SSPs to cope with climate change requires enhancing their access to affordable and climate-smart use of water across various scales, from farms to landscapes, small watersheds and catchments/basins (Shikwambana and Malaza 2022). However, it is important to note that SSPs are not a homogeneous group (Naah and Braun 2019; Vincent 2022). Evidence from Sub-Saharan Africa indicates that women SSPs are particularly vulnerable to the impacts of climate change (Yiridomoh et al. 2021). The reasons for this are: i) the gendered responsibility of women at home to secure water for domestic use (UN Women 2022); ii) the lack of representation and voice in decision-making processes regarding productive water use at various levels (Hlahla 2022); iii) the limited access to extension services, technology (including mobile phones), inputs, credit and markets (Awiti 2022); and iv) the prevalent practice of gender-blind design and implementation of technological innovations (Rai et al. 2021).

Past studies show that ensuring equitable access to, and benefits from, any type of technological innovation require addressing three key issues:

Firstly, unless gender and other intersecting disparities, such as age, poverty and disability, are considered in the design, use and application of climate-smart technologies, and tools and capacity development activities, women will continue to be excluded and disproportionately vulnerable to climate impacts (Walker et al. 2021). Designing gender-responsive and inclusive interventions requires robust gender-disaggregated data.

Secondly, designing gender-responsive tools, technologies and approaches alone will not address the underlying factors perpetuating gender norms and inequalities for women. Addressing the root causes of gender inequalities requires tackling the norms, values, attitudes and practices that contribute to these disparities, using participatory (Ogunlela and Mukhtar 2009) and transformative approaches (McDougall et al. 2021). These interventions can create spaces and opportunities for women and men in various unequal social relationships (such as husbands and wives, mothers-in-law and daughters-in-law) to engage in discussions and collaboratively explore strategies.

Finally, targeting SSPs does not ensure the long-term sustainability of project interventions and innovations. The latter involves creating gender-responsive awareness, providing transformative tools for change, and, most importantly, changing the mindsets and attitudes of predominantly male institutional actors at various levels, from community to watershed to catchment/basin scales. A study conducted by Leder et al. (2019) demonstrates that participatory gender training in communities, which encourages open discussion about societal norms, can foster enthusiasm and inspiration for reflecting on potential changes towards a more equitable division of labor. The training also promotes transformative change by raising awareness among farmers, community mobilizers and project staff about the potential for social change within their own communities.

The purpose of this study was to understand challenges related to gender equality and social inclusion in designing and implementing gender-responsive climate-smart water management practices in four selected sites within the Awash Basin. The Awash Basin was selected for two main reasons. First, the population living in the basin is estimated to be more than 18 million (Aklilu and Necha 2018) and the majority of this population relies on subsistence from mixed crop-livestock production systems that depend on rainfall (Maru et al. 2023). Pastoralism is the primary livelihood in the middle and lower parts of the basin (Ibid). Climate change is driving water scarcity in the basin (Taye et al. 2018), negatively impacting the livelihood activities and wellbeing of these social groups (Adeba et al. 2015). Second, gender inequality in agricultural productivity exists in Ethiopia, with an overall difference of 23.4% in favor of men (Drucza et al. 2020) and the Awash Basin could be a location that reflects this inequality existing at the national scale. Hence, the study aims to identify the gaps and opportunities for designing and implementing gender-responsive climate-smart water interventions in the Awash Basin by answering the following questions:

1. How are the water access, needs and use of women (and men) SSPs from diverse social groups in the selected catchments affected by climate change?
2. What are the gendered impacts of the existing agricultural water management technologies and practices on these specific social groups?
3. What are the key elements of gender-responsive design and implementation of climate-smart water technologies and practices?

While the recommendations will contribute to water management decision-making at the national level in Ethiopia, the target beneficiaries are small-scale producers (SSPs) from diverse social groups, including agricultural farmers, pastoralists and those engaged in off-farm and non-farm activities.

Conceptual Framework

For this study, we applied the Gender Empowerment Framework developed by the Royal Tropical Institute of the Netherlands (van Eerdewijk et al. 2017). The framework defines empowerment as "*the expansion of strategic choices and strengthening of the voice of women and girls through the transformation of power relations, so that women and girls can realize their full rights*." It also provides a set of principles to guide project implementers in promoting gender equality and social inclusion in project design and implementation at various levels, which includes:

- recognizing that women and girls experience gender (in)equality and (dis)empowerment differently and acknowledging their agency to bring about change to meet their specific individual and collective needs, and
- applying an intersectionality lens to ensure that diverse voices are heard and emphasized, regardless of social background and context. Understanding and transforming unequal power relations to empower women and girls, allowing them to have more control over their lives, livelihoods and futures. This can expand aspirations, strengthen voices and provide women and girls with more choices.

In this framework, empowerment is viewed as both a process and an outcome that involves interactions between three key factors: resources, agency and institutional structures, each of which includes several dimensions (see Figure 1). The focus on *resources* includes understanding ownership, access and use of productive resources, services and opportunities by women (and men) SSPs from diverse social groups for utilizing climate-smart water technologies and practices. This also requires understanding the ability of different individuals to use their assets to benefit and gain from the economic and social opportunities that new technologies, innovations and practices offer.

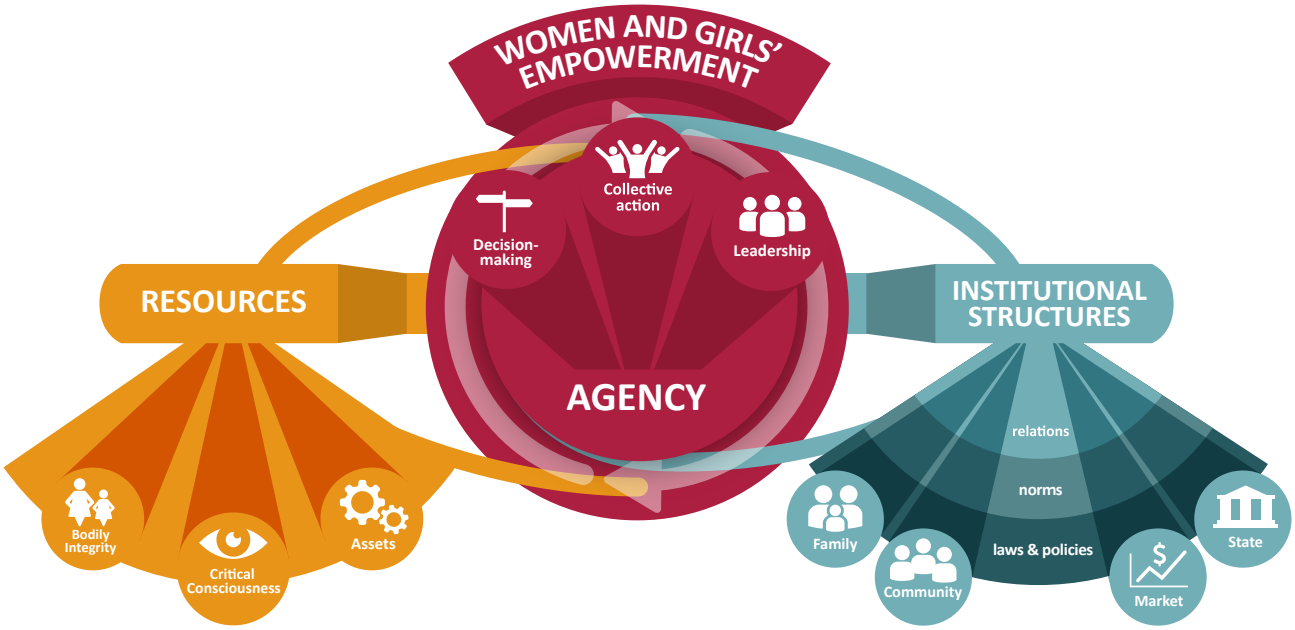

Figure 1. Women and girls' empowerment model of the Royal Tropical Institute of the Netherlands.
Source: van Eerdewijk et al. 2017.

The analysis on *agency* focuses on examining the degree to which women (and men) SSPs from various social backgrounds are involved in decision-making processes and consulted in the development and application of climate-smart water technologies and practices. Additionally, it focuses on exploring the mobility and ability of women (and men) SSPs from diverse social groups to build capacity to access and derive benefits from climate-smart water technologies and practices.

The focus on *institutional structures* is to determine how formal and informal rules and norms in different contexts shape access to new technologies and innovations for diverse groups of women (and men) SSPs.
These three factors are mutually reinforcing and complex. Empowerment is achieved when women and girls have access to and control over resources, the ability to make choices, and voice and representation in institutional structures. Our aim in using this methodology is to identify key barriers affecting resources, agency and institutional structures for designing gender-responsive climate-smart water technologies and practices. For our assessment, soil and water conservation initiatives, and small-scale irrigation (SSI) schemes and technologies will be used as contextual cases to investigate the gendered impacts of climate-smart water technologies and practices.

Methods

Description of the study areas (see Figure 2 for locations of study sites). This study was conducted in four *woredas*[1] (districts) within the Awash River Basin: the Habru and Kalu *woredas* from the Upper Awash Catchment in Wollo and the Ewa and Afambo *woredas* from the Lower Awash Catchment in Afar. A *kebele*, the smallest administrative unit within each *woreda*, was purposively selected to capture a range of circumstances, including farming systems, water availability, access to and use of climate-smart technologies, livelihoods and traditional practices. A *kebele* from each of the four *woredas* was selected for two reasons. First, it allowed the examination of commonalities and disparities across various settings, enabling the recognition of underlying patterns and developments that may not be apparent when focusing solely on a single location. Second, the sites were accessible for primary data collection.

The two *kebeles* from Afar are First Badole *kebele* from the Ewa *woreda* and Humeydota *kebele* from the Afambo *woreda*. The dominant livelihood activities of communities in the two *kebeles* are livestock production and high-value crop production using irrigation and grazing land management. Due to flooding, drought, soil salinity and invasive weeds and trees such as *Parthenium hysterophorus* and *Prosopis juliflora*, communities in the two *kebeles* face challenges, including reductions in productivity of grazing land, livestock, water and crops. Displacement due to flooding is also common. To enhance adaptive capacities of SSPs in the two *kebeles*, the local government, in collaboration with development partners and communities, has constructed flood protection structures, small-scale irrigation schemes (in some areas), river diversions, and water points for livestock and domestic use. The local government also promotes compost and vermin compost.

The two *kebeles* from Wollo are *kebele* 18 in the Habru *woreda* and *kebele* 32 in the Kalu *woreda*. The livelihood of communities in the *kebeles* is dependent on an integrated crop-livestock farming system — rainfed farming for growing staple crops and irrigation farming for growing cash crops. However, due to declining water availability and loss of soil, SSPs are challenged by a reduction in productivity. To enhance adaptive capacities of men and women SSPs, the local government is promoting agricultural water management practices. These include hillside terraces, trenches, micro-basins, check dams, plantations, agroforestry, compost and vermin compost, stone bunds, check dams, biogas technologies and crop rotation.

Data collection - The study utilized a qualitative research methodology. It used secondary data sources to select the conceptual framework, gather background information about the study area and obtain location maps. It also used primary data collected through in-depth household (HH) interviews, focus group discussions (FGDs) and key informant interviews (KIIs). A total of 309 informants, 159 from Wollo and 150 from Afar, participated in the study (see Table 1).

A total of 96 in-depth household interviews and 24 FGDs were conducted in the Wollo and Afar sites. In selecting informants from communities, the researchers consulted relevant local governments and community administration offices. The study made a significant effort to ensure diversity and representation among the community informants. The informants included individuals from 24 households per kebele (16 females and 8 males) who were drawn from better-off (12) and resource-poor households (12). Each wealth category selected from a *kebele* consisted of the following age and sex groups: female spouses (2), female household heads (2), young women (2), elderly women (2), adult men (2) and young men (2). Participants of FGDs were also selected from both better-off (24) and resource-poor (24) households. The informants from each wealth category were divided into three subgroups: exclusively female, exclusively male and mixed groups comprising both men and women. Each FGD included eight participants.

[1] *Woreda* is the third-level administrative division of Ethiopia.

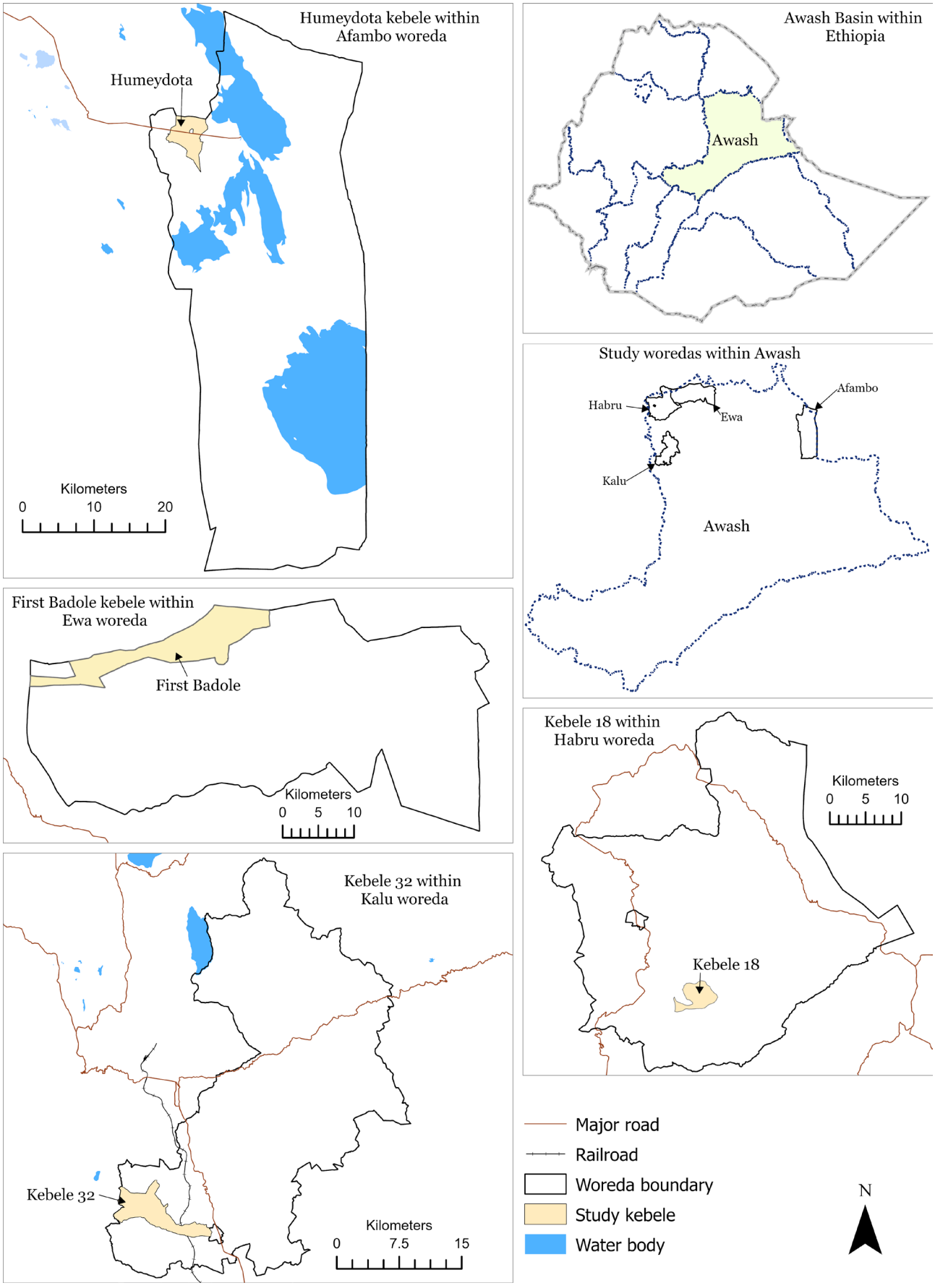

Figure 2. Location map of the learning watersheds.

Table 1. Number of informants.

Region/Province	*Woreda*	*Kebele*	Number of focus group discussion participants		Number of in-depth household interview participants		Number of *woreda* officials	Number of zone officials	Total
			Women	Men	Women	Men			
Wollo Province	Kalu	32	24	24	16	8	5	-	77
	Habru	18	24	24	16	8	5	5	82
Afar Region	Afambo	Humeydota	24	24	16	8	3	-	75
	Ewa	First Badole	24	24	16	8	3	-	75
Total			96	96	64	32	16	5	309

The in-depth household interviews and FGDs were guided by semi-structured questionnaires. The discussions with the focus groups and in-depth interview informants addressed livelihood activities; experiences of climate change; ownership, access and use of resources and services; involvement in decision-making at the household and community levels; and awareness of and access to institutions to turn to when in need or on a regular basis. The informants for local government offices were specialists representing various disciplines and included gender experts, natural resource management experts, irrigation and lowlands experts, livestock experts and crop experts. Key informants from the North Wollo Zone Office were inaccessible during the survey due to security concerns at the time of data collection. The discussions with key informants addressed gender equality and women's empowerment in water, land, environmental and climate policies and programs. It also focused on the potential opportunities and challenges for designing and implementing gender-responsive and inclusive programs.

Data collection in Afar and Wollo was conducted by the staff of the International Water Management Institute (IWMI) in collaboration with researchers from Samara University (for sites in Afar) and Wollo University (for sites in Wollo), who have experience in qualitative research. Training was provided to familiarize the team (data collectors and translators) with the tools. Semi-structured interviews and focus group discussions were conducted in local languages. In Afar, interviews and discussions with communities were conducted in the local language, *Afar 'Af*. The researchers utilized translators to convert the data into Amharic, the language used by all data collectors across the study sites. Interviews and discussions in Wollo were conducted in Amharic. The data in Amharic were translated into English for transcription purposes.

Data analysis - The primary and secondary qualitative data were analyzed using coding and content analysis, guided by the conceptual framework. Initially, three themes were identified: resources, agency and institutional structures. Then, key terms and phrases for each theme were distinguished. Under the theme of resources, the researchers identified access, use and ownership of resources including land, water, assets and income, loans, farm inputs and technologies, time, roads, transport and markets. Within the theme of agency, the aspects of participation in decision-making processes, freedom of mobility, willingness and ability to take on leadership roles and freedom for expressing opinions were recognized. The researchers located policies, strategies and initiatives on gender equality and women's empowerment, institutional capacities and gender norms within the theme of institutional structures. Finally, each response was tagged with three themes and sub-themes to analyze how resource access, use and ownership, and agency interact with institutional structures to shape the design of gender-responsive climate-smart water technologies and practices.

Results and Discussion

This section discusses how climate change affects the livelihoods of men and women from diverse social groups. Further, this section explores the key barriers that impact the three factors —resources, agency and institutional structure — for the design and implementation of gender-responsive and climate-smart water technologies and practices.

Resources

This subsection explores whether access to and benefit from soil and water conservation initiatives and SSI initiatives are determined by resource access, ownership and use. We discuss the awareness among women (and men) from diverse social groups of their resource rights and their capacity and ability to act on those rights. Specifically, we discuss ownership, access and use of resources including land, water, inputs and technologies, credit, income, time, roads, transport and market.

Land – Land ownership, access and use by women (and men) SSPs is key to enhancing food security and resilience to the impacts of climate change. However, land ownership, access and use do vary among different social groups. Across the study sites, land is a joint resource for male and female spouses. Decisions on what to produce, whether to rent out or rent in land, and how to spend the money generated from rental charges, are jointly made by spouses. Anything decided unilaterally is unacceptable and becomes a potential cause for family disputes and the disintegration of family relations. While consultations and collaborative decision-making are common, a focus group discussion with women in Wollo highlighted a specific issue. According to a female informant, a woman going through a divorce is legally entitled to an equal share of the land with her husband. However, the informant herself had faced discrimination during the implementation of the law. The distribution of land by the *kebele*-level committee had favored the husband, allocating the most fertile area of land to him. This was attributed to the fact that the *kebele* leaders, who were predominantly men, either had personal connections with the husband or were easily influenced by him.

Land rights for women in polygamous households, notably in the Afar Region, vary. The first wife retains control over land obtained prior to the addition of other spouses to the family. Subsequent spouses entering the family after the primary wife have no entitlement to these pre-existing resources, although they may participate in decisions regarding new acquisitions. In many cases, women, across the study sites, assume sole ownership of land and decision-making responsibilities in the absence of their spouses. However, due to customary laws and inheritance practices aimed at ensuring high-value assets belong to the elder male, if there is an adult son, he will be consulted, and his consent is needed in the decision-making process.

Regarding land ownership and access by young people, the practice in Wollo differs from that of Afar. In Wollo, in the past, the government used to allocate land to landless individuals, including youth. However, due to the increasing population and competition for land, acquiring and accessing land has become more challenging. As a result, many young people now obtain land from their parents upon marriage or starting a new family. In Wollo, land has been consistently divided among children through the generations, resulting in small land holdings for most households. Consequently, parents encounter challenges in transferring land to their children. An adult male informant from Kalu reported the following:

> *"I am living proof. In my parents' family, there were eight children. The land I inherited from my father is very small. The farmland that once sustained the family and generated economic benefits now produces insufficient food and economic returns. Hence, I am unable to divide and distribute my land among my children."*

In the case of Afar, young men have good access to land, either from their parents or clan leaders. Rural communal land is under the administration of clan leaders, who have the authority to grant or deny land use rights to their clan members, including young people.

In summary, women and youth from diverse social groups face constraints in terms of land ownership and access, primarily stemming from customary laws, inheritance practices and land shortages. These factors impede their capacity to participate in soil and water conservation as well as irrigation initiatives, thereby adversely impacting their economic empowerment and food security.

Water – In Wollo, mixed crop-livestock farming is the predominant livelihood, while pastoral and agropastoral practices are prevalent in Afar. In the context of climate change, access to water plays a crucial role in enhancing the adaptive capacities of SSPs. Variations in rainfall, either excessive or insufficient, result in losses of food grain, livestock feed and income, disproportionately affecting women and men from households with limited resource endowments. Women (and men) SSPs with limited assets, such as land and livestock, face challenges in securing reliable income sources and maintaining food reserves to withstand or recover from droughts or floods. Consequently, they may experience heightened poverty and become reliant on assistance from wealthier individuals and the government. The loss of livelihoods and income often leads to malnutrition, particularly among vulnerable social groups such as

children, the disabled and older individuals from resource-poor households. To address this issue, women may choose to forgo meals to ensure that their family members are adequately fed, which can have adverse effects on their own physical well-being and health. Female household heads from resource-poor households bear the responsibility of providing for their family members with limited resources, exacerbating the impact on their well-being. An illustrative example of this experience is provided by a female farmer:

> *An elderly household head woman farmer who is resource-poor from Habru (Wollo) is expecting to face a food shortage in a few months. One reason is that she lost a farm plot downstream as it became swampy and was no longer cultivable. It has been out of production for 2 years now. This reduced the family's food stock. A farm plot in another location is under a share-cropping arrangement. The harvest she gets from this plot is not enough to sustain her family for the whole year because she is getting only 50% of the harvest. To make matters worse, the farm plot she managed was planted with chickpea and mung bean during the big season of 2023, and both crops failed. This means that she lost the expected harvest to support her family during the main rainy season. Now, without a harvest, she is facing a serious concern regarding the sustenance of her family until the next harvest is ready in October/November 2023.*

Gender plays a significant role in the context of water resource management across the study sites. Women are primarily responsible for the collection and management of water for domestic purposes. In Wollo, access to water for domestic use is obtained from protected sources such as communal taps. Women follow an agreed schedule to fetch water. Conversely, in Afar, the community relies on open sources such as rivers, ponds and seasonal streams for domestic water needs. However, the reliability of water from these sources is compromised due to their seasonal nature and susceptibility to contamination. Consequently, when these water sources become unavailable or unsafe, pastoral and agropastoral women in Afar are compelled to travel longer distances in search of safe water, leading to an increase in their workload. Furthermore, the extended travel exposes women to a higher risk of injuries, illnesses and physical strain. A key informant from the Afambo *woreda* in Afar highlighted the labor burden, stress and heightened risk of exposure faced by pastoral and agropastoral women:

> *"Women often prioritize the needs of their family members, including their husbands, children and elders, which adds to their stress levels. Furthermore, women are often engaged in activities that expose them to environmental risks, such as gathering firewood and fetching water. This puts them at a higher risk of being attacked by unexpected floods such as those from the Awash River."*

To address the problem of limited access to domestic water in the Afar Region, the community works together to build shared wells (known as *Ella*) and water collection structures to collect water during the rainy season for use in the dry season. Despite these initiatives, the primary challenge in the Afar Region remains access to safe drinking water, with a disproportionate impact on women and girls.

In an effort to provide access to water for productive purposes such as irrigation, the local government, either independently or in collaboration with a non-governmental organization, constructs small dams. In the case of Ewa *woreda*, SSPs also access water for irrigation from small ponds. Women (and men) SSPs who possess irrigable land in the designated area, either through ownership or contractual agreements, are eligible to access water for irrigation. The responsibility of ensuring equitable distribution of irrigation water falls on the leaders of water user associations, known as *Dura'abba* in the Afar Region and *Gan gefii* in Wollo. These positions are typically held by men selected by the community, as women are traditionally constrained by the gender-based division of labor which limits their participation in activities outside the home. Consequently, women's underrepresentation in leadership positions and their lower social status often led to their needs being given lower priority. For example, both male and female irrigation users access water on a rotational basis according to a 24-hour watering schedule to ensure fairness. However, accessing water during the nighttime schedule poses significant risks for female SSPs who lack access to adult male labor. These risks are related to concerns about animal attacks and gender-based violence, which compel women SSPs to transfer their land to sharecroppers.

In summary, climate change predominantly jeopardizes the financial stability, livelihood security and welfare of men and women SSPs, particularly those from resource-poor households. In particular, the seasonality of water sources in the Afar Region compels the women and girls in the region to long-distance travel in search of safe water, thereby increasing their workload and susceptibility to hazards. The restricted participation of women in leadership positions in water management frequently undermines their requirements and preferences in the allocation of irrigation water, thereby impacting their empowerment and involvement in irrigation activities.

Assets and income – Access to financial resources and assets is essential for women (and men) SSPs to engage in activities that promote resilience to climate change and to implement adaptive strategies. However, the distribution of access to income and assets varies across different social groups. Within households, decisions related to the sale of products, the amount to be sold, and the allocation of income and savings resulting from collaborative efforts are typically made through prior discussions between spouses. A female spouse respondent from Wollo highlighted her access to a diverse range of agricultural products, such as grain crops, fruits, vegetables, poultry and dairy items. Emphasizing the significance of making decisions together, she explained, "*I need to consult my husband if I want to sell or buy any of these products. I cannot make the decision alone. My husband and I always discuss everything before making decisions.*"

Livestock, with the exception of camels, which are considered the property of men, are regarded as shared assets, and therefore decisions regarding them are made jointly by spouses. However, despite ongoing discussions, ultimate decision-making authority rests with men. In the Afar Region, although men retain the final say in decision-making, women seek the intervention of elders to assert their rights in cases where men mismanage income or assets. A woman is only permitted to utilize a man's camel or other assets in the event of his death or if she has inherited them from her own family. A male participant from the Afar Region articulated this practice, stating, "*I have 23 goats, 5 sheep, 14 cattle, and 11 calves. I seek input from my family when it comes to selling or giving away livestock, but ultimately, the final decision is mine. However, if she brings livestock from her family, she has the autonomy to make independent decisions.*" Inherited items typically benefit all family members equally. However, the named recipient retains control and has the authority to distribute them as they see fit.

Individual women (and men) SSPs retain primary control over their income when it is derived from their personal labor or small-scale craft enterprises. For example, women engaged in pastoral and agropastoral activities in the Afambo *woreda* have complete autonomy over the income generated from the sale of handicrafts. Furthermore, women often exercise full autonomy over low-value products, such as dairy items (milk and butter) from livestock, as well as small quantities of vegetables (onion, tomato, kale) and fruits (mango, papaya). In contrast, men in pastoral and agropastoral communities in Afar typically handle the sale of larger livestock, such as cattle and camels, which yield higher income. In sum, for married spouses, livestock (excluding camels) and income derived from joint endeavors are considered shared assets, with final decisions typically made by male spouses. However, female spouses have full control over assets inherited from their families, income earned independently and low-value products, thereby enhancing their adaptive capacities.

Loans – Access to credit enables women (and men) SSPs to obtain the necessary capital for investing in climate-resilient livelihoods, such as climate-smart water technologies and practices. The primary sources of loans for men and women SSPs in the research areas are financial institutions. However, access to and control over loans vary among different social groups. For instance, pastoral and agropastoral women and men in Afar have limited access to loans due to the absence of financial institutions offering loan services in their areas. In contrast, women SSPs in Wollo can access loans from Tsedey Bank, which provides loans to groups of five women members as part of a collective guaranteed system. Nevertheless, women's ability to obtain loans from the bank is impeded by concerns about repayment and religious beliefs that prohibit them from participating in interest payments. In terms of loan decisions, spouses make joint decisions, and financial institutions also promote joint decision-making by requiring spouses to agree to and sign loan application forms together before loans are granted.

In general, female and male small-scale producers face challenges in obtaining loans due to the lack of financial institutions offering such services, concerns about repayment and certain beliefs about interest payments. This restricted access to loans impedes the capacity of women (and men) to invest in climate-resilient water technologies and practices, thereby limiting their ability to mitigate the effects of climate-related disasters.

Farm inputs and technologies – Women (and men) SSPs require access to agricultural inputs and technologies to implement sustainable farming practices, which are crucial for improving their ability to adapt. Informants across the study sites have observed that obtaining farm inputs and technologies from markets and cooperatives is increasingly difficult due to escalating prices and limited availability at the appropriate time and in sufficient quantities. At the household level, decisions regarding the purchase of inputs or the rental of farming machinery are typically made jointly by spouses, as such decisions often necessitate the sale of livestock or a portion of the harvested crop. Limited access to local markets and the prevailing assumption that men are responsible for procuring farm inputs and technologies further hinder women's access to these resources. For instance, in the Afar Region, married women rely on their male spouses for access to farm inputs and technologies, while unmarried or divorced women depend on their fathers or brothers. In summary, both women (and men) SSPs face challenges in accessing farm inputs due to limited

availability and rising prices. The situation is particularly dire for female SSPs in Afar, as they lack access to local markets and depend on male relatives to obtain farm inputs and technologies.

Time – Climate change and adaptation activities change the time used by male and female SSPs for domestic, productive and communal activities. Across the study sites, women were solely responsible for domestic work, whereas both men and women were responsible for productive and communal activities. Climate change increases women's workload because of their close relationship with natural resources (e.g., land and water) and their greater domestic obligations. Sociocultural expectations surrounding gender roles within the home and community disproportionately increase women's workloads. For example, changes in the environment due to climate change, such as unexpected rain, can cause disease outbreaks that affect the health of communities. Disease outbreaks disproportionately affect women because they are responsible for caring for sick household members. The increase in workload during disasters, such as droughts or flooding, is more significant for pastoral and agropastoral women in Afar because of different factors. First, in times of drought, men may migrate with livestock to other areas in search of water and grazing land, and household responsibilities fall entirely on women. Second, when flooding or drought leads to relocation, pastoral and agropastoral women bear the responsibility of constructing new traditional houses (*Qarri*) and preparing the entire household setting, which is an immense burden on them.

Competing demands on women's time for household, productive and communal activities make it challenging for them to participate in income-generating and self-development activities. An example is a woman in Wollo who heads a household and engages in small-scale trading by selling fruits and vegetables to support her family. When a campaign for soil and water conservation work coincides with market days, such as the Jum'a market, she is unable to purchase fruits and vegetables from wholesalers for her retail business. If she obtains permission from the watershed committees that organize the soil and water conservation campaign, she visits the market, purchases supplies from wholesalers and engages in small-scale trading activities. If she does not obtain permission, she will miss the opportunity to go to the market and buy the fruits she sells to supplement her income. Missing out on this opportunity could affect her ability to earn enough money to support her family. She happily joins the campaign work on days when it does not conflict with her market schedule. To alleviate the workload on women and enhance their engagement in self-development and income-generating activities, the *woreda*-level agricultural offices, in collaboration with the *woreda* health offices in Wollo, promotes time- and labor-saving technologies. This includes fuel-saving stoves, solar lighting, biogas and water pumps. In summary, climate change disproportionately increases the workload on women, particularly on pastoral and agropastoral women, which inhibits their ability to participate in self-development and income-generating activities and affects their adaptive capacities.

Roads, transport and markets - In all the study sites, there are dry-weather dirt roads that facilitate transport and provide access to markets. Men and women SSPs either walk or use various modes of transportation, such as Bajaj taxis and camels, to go to the market. During the rainy season, these roads become muddy, slippery and swampy. In addition, the lack of a permanent bridge over rivers, such as the Awash River in Afambo *woreda* of Afar and the Borkena River in Kalu *woreda*, creates challenges for men and women SSPs when traveling to nearby towns, other *kebeles* and market centers. Insufficient road networks significantly limit the mobility of men, women and marginalized SSPs, as well as their access to services, markets, employment and social interactions. In Afar, the markets are situated at a distance from the villages, requiring women to be accompanied by other women or men when they go to the market, which further restricts their access. To enhance economic opportunities for women (and men) SSPs, informants in Afar expressed a need for more reliable infrastructure services, such as roads and transport and the construction of a bridge over the Awash River to facilitate transportation. Expansion of roads enhances market, business and employment opportunities for men and women SSPs.

In summary, participation and types of authority in resource ownership, access and use are shaped by various sociocultural factors, including norms, inheritance traditions, polygamy and the value of assets or independent incomes. The study findings show that while the resources are controlled through patriarchal norms and structures in the research locations, several other intersectional factors, including age, marital status and social status etc., determine that the impacts of these vary among women.

Agency

In this section, we explore the ability of women (and men) SSPs to engage in, shape and gain from soil and water conservation and SSI initiatives as a means of their own informed choice. Specifically, we assess their participation in decision-making processes at the household and communal levels. At the household level, we examined i) participation in decision-making processes regarding engagement in domestic or productive work and ii) freedom of

mobility. At the communal level, we investigated i) willingness and ability to take leadership roles and ii) freedom to express opinions.

Participation in household decision-making processes - At the study sites, participation in decision-making processes is context-specific. Both male and female spouses make independent decisions regarding their daily routines. Women are solely responsible for domestic work and are often assumed to be responsible due to the traditional gendered division of labor. Adult males seldom participate in these activities; they may occasionally fill gaps, particularly when there are no older children available to provide care.

Other decision-making processes in households are typically hierarchical but are evolving. Most women (and men) SSPs noted that the changes in women's participation in making decisions were driven by training and awareness campaigns conducted by various actors. In contrast to the past, men or household heads now involve other household members in discussions, although power dynamics may differ depending on the situation. For instance, as per prevailing gender norms, engaging in new income-generating activities and making decisions to travel outside their villages (for meetings, markets or training) necessitate prior consultation with marital partners or family members. However, decision-making authority is exclusively reserved for males. A male study participant from Afar provided a statement that exemplified this. "*My wife can attend meetings and other external events. She should, however, inform me. Unless I give her permission, she will not participate in any activities outside the home.*" This suggests that equal participation in decision-making processes is still a work in progress. Such assumptions stem partly from a limited understanding of women's valuable contributions, particularly in recognizing the importance of unpaid domestic work. A male farmer from Kalu highlighted the value he assigned to his spouse's domestic care work. "*Women do not have many time-consuming activities. She may bake injera, cook stew, wash clothes and make coffee. That's it. She is a stay-at-home worker. I spend most of my time on the farm, doing physically demanding work. I don't have much to do at home.*" Nevertheless, women often have multiple responsibilities. Labor-intensive tasks such as fetching water, collecting firewood, going to the grain mill, caring for babies, cleaning the barn and tending to older adults and the sick demand the time and attention of women. Furthermore, they participate in productive activities such as farming, livestock rearing, other off-farm activities and communal activities. Another male study participant in Afar indicated, "*I am the breadwinner in the household, and while I discuss issues with my wife, the final decision is mine.*" Failing to acknowledge and appreciate the time and effort women contribute hinders their involvement in household decision-making processes. Social norms also affect progress toward achieving equal participation in decision-making processes.

In most households, women rarely exercise their sole decision-making rights without male consent. In principle and in most cases across the study sites, women have full autonomous decision-making power over family matters when they are household heads. However, this is not always the case. In the Afar culture, when a husband dies, the power to make decisions is sometimes transferred to other male household members, such as the eldest son. An elderly woman in Afar exemplified this by stating, "*There is no change; most of the time, my husband makes all decisions. When he is ill, decision-making authority is transferred to my sons.*"

Participation in decisions at the communal level - Across the study sites, leadership positions in decision-making processes at the communal level, particularly in mixed groups, have traditionally been dominated by wealthy, highly respected and influential men. Young men and women are often deemed too inexperienced to take on leadership roles.

Women play active roles in leadership positions within women-only associations and informal community associations (such as *Equb*[2] or women's *Idir*[3] in Wollo). Across the study sites, women who possess impartiality, knowledge, trustworthiness and strong communication skills are qualified for leadership positions. However, many women lack the qualities and confidence needed to take on leadership roles. For example, in Afar, barriers such as a lack of education, awareness about public initiatives and confidence seem to restrict women from taking on leadership positions. Hence, many women respondents reported that they have never held formal leadership positions in groups or communities. One participant attributed her lack of education as the reason for feeling unequipped, despite her willingness. Some women also indicated that they were unaware of the available leadership positions for women at the local level. This suggests that a lack of opportunities or information regarding these positions becomes a key barrier for women to take on leadership roles in public spaces. Furthermore, social norms such as subordination of women to men, responsibility for domestic tasks, early marriage, expectation for women to remain at home and men's authority over land also serve as barriers to women's leadership opportunities.

[2] Equb is an association established by a small group of people in order to provide substantial rotating funding for members in order to improve their lives and living conditions.

[3] Idir is an association established among neighbors or workers to raise funds that will be used during emergencies, such as a death within these groups and their families.

Additionally, women in the study sites faced challenges in expressing their opinions due to discouraging social norms, lack of self-confidence and experience, and the lesser value given to their voices. A young woman informant from Wollo expressed her belief that she could freely speak in public. "*However, I lack practical experience and the confidence to speak in public spaces where there are many older individuals present. Our suggestions are not taken seriously by the leaders. As a result, we feel discouraged and choose to stay silent rather than speak out in public and not be listened to.*" Among women, the young, the educated, the older adults and the well-respected have a greater ability to express their views, and their voices are highly valued.

In summary, decision-making authority at the household and communal levels is predominantly held by men. At the household level, decision-making processes, except for those on daily routines, are hierarchical but evolving due to training and awareness-raising campaigns. At the communal level, women take on leadership roles mainly in women-only collective actions. This is driven by a number of factors, including the disproportionate burden of domestic responsibilities, stereotypical attitudes towards women's leadership and low self-esteem.

Institutional Structures

Institutions are essential for creating and enforcing laws, policies and interventions that promote gender equality and empower women in soil and water conservation and irrigation initiatives, at both the watershed and farm levels. Institutions include formal institutions/organizations (policies, strategies and interventions), community groups and households. In this section, we assess gender dynamics at i) formal institutions and organizations and ii) communal and household levels.

Gender dynamics in formal institutions and organizations

According to the informants, various policies, such as the national policy and strategy on disaster risk management (FDRE 2013) and Ethiopia's Climate-Resilient Green Economy strategy (EPA 2011), mainstream climate change issues. However, these policies are often criticized for their one-size-fits-all approach. Policies sometimes fail to account for the unique and diverse conditions found at the local level. Most policies focus on highland and agrarian contexts and overlook pastoral and agropastoral contexts or livelihood systems. Key informants in Afar stated that policy design processes have not adequately considered the specific vulnerabilities and priorities of pastoral and agropastoral communities. Despite this issue, Ethiopian water policies are inclusive, and incorporate provisions for the participation of women and individuals with special needs. Policies and strategies granting equal rights for i) participation in natural and water resource development and planning, ii) land and other properties, iii) participation in decision-making processes and iv) inclusion are in place.

The national Plan for Accelerated and Sustained Development to End Poverty (PASDEP) (2005/06-2009/10) is aimed at enhancing the role and benefits of women in environmental management and protection (MoFED 2006). Policies in the water sector also encourage the participation of women. The 2001 Ethiopian Water Sector Policy, specifically Article 2.2.10, aims to promote women's full involvement in planning, implementation, decision-making, training and self-reliance initiatives to empower women to take on leadership roles (MoWR 2001a). Additionally, the Ethiopian Water Sector Strategy emphasizes gender mainstreaming in water resources management, planning and development. Article 4.1.8, sub-article 1(a) specifically highlights the importance of considering the role of women in establishing community-based structures for managing localized small-scale irrigation systems. "The community-based structure should allocate a specific number of seats for women, considering the nature and size of the scheme" (MoWR 2001b).

Policies ensuring equal rights to land, water and other properties are also in place. Article 35 of the Ethiopian Constitution recognizes women's right to acquire, administer, control, use and transfer property (FDRE 1995). It also states that women have the same rights as men regarding the use, transfer, administration and control of land. Furthermore, the Amhara Regional State Irrigation Water Users Association (IWUA) Proclamation, Article 5, sub-article 4, states that there should be no discrimination among members of an association in the use of water based on ethnicity, gender, religion or any other similar grounds (ZIKRE HIG 2016). According to the respondents, local sector offices organize public awareness initiatives and provide training and workshops to ensure that women and men SSPs know their rights.

The policy environment also encourages women's participation in decision-making processes. For example, Ethiopia's Climate-Resilient Green Economy strategy aims to empower local communities and their institutions to participate in decision-making processes related to climate change. It also builds their capacity to respond by drawing on their own and others' experiences (EPA 2011). The Ethiopian Water Sector Strategy and the IWUA proclamation have provisions to increase women's participation in decision-making processes and collective action. They emphasize the importance of including and representing women in every administrative hierarchy. In response, both in Wollo and Afar, the local

government encourages women to take on leadership roles in sector offices. In Wollo, sector offices such as the Irrigation, Lowlands and Natural Resources Management (NRM) departments are making efforts to empower women and promote their leadership roles.

Implementing inclusive and equitable initiatives on the ground is challenging because of limited institutional capacities. The lack of a formal institutional structure at the local level that offers comprehensive and sustained support to women and other marginalized groups is a persistent issue at all study sites. For example, in Wollo, there was no specific structure within the NRM department to address the requirements of people with special needs and gender issues. At the *kebele* level, there is no extension agent specifically dedicated to addressing gender and social inclusion, including the needs of individuals with disabilities. Gender activities are either often neglected or conducted by individuals who lack the expertise to design gender-responsive initiatives, resulting in limited participation. Inadequate accountability, monitoring and evaluation and information management systems further inhibit the design of gender-responsive climate-smart water technologies and practices.

There are also gaps in budget allocation for sector offices to perform gender activities, including providing technical support, training and regular monitoring. Despite the principle of allocating 2% of the agricultural office budget to the gender unit, the budget is either unused and redirected to other units or remains insufficient to perform gender activities. Financial resources allocated to women and marginalized groups for economic and social empowerment are also insufficient. Recurrent disasters, such as floods and droughts, also place significant strain on institutional capacities, such as those in Afar, limiting their ability to meet the diverse needs of SSPs. The current efforts to address these gaps are still insufficient, highlighting the need to overcome these constraints to promote inclusive participation.

Gender dynamics at community and household levels

In line with the policies discussed above, soil and water conservation initiatives and SSI initiatives that aim to improve the resilience of small-scale producers promote inclusion, empower vulnerable groups and ensure gender equality. Accordingly, women (and men) SSPs from diverse social groups participate in initiatives for watershed- and farm-level soil and water conservation and small-scale irrigation. The goals of the initiative are to prevent land degradation, restore vegetation cover, and improve soil and water retention while also supporting livelihoods. Participation in these initiatives involves collective activities in communal areas and individual activities on private farmlands. In implementing these initiatives, different strategies are adopted to ensure inclusion.

One of the watershed-level soil and water conservation activities is performed every year during January, a time when the main-season crops are fully harvested, and farmers have time to spare. It is part of a national government program launched as a campaign across the country. In this campaign, able-bodied men and women must participate in and perform a range of tasks by providing free labor. These include digging, removing soil, building soil bunds and stone terraces, leveling, compacting, planting and collecting stones. In Afar, they create river crossings by using the trunks of date palm trees on the Awash River to build bridges. While both women and men are responsible for most activities, some activities are gendered. For example, women SSPs tend to dominate less labor-demanding activities such as transporting seedlings, filling sacks with small stones or soil, and placing them around the canals to protect against flooding and maintain canal cleanliness. In this campaign, social groups deemed physically unfit for demanding tasks and those that require special care are exempt from participating. These include the elderly, disabled individuals, the sick, nursing mothers with babies aged 6 months or less and pregnant women. Schoolchildren are also not required to participate on school days, as this would disrupt their education. However, they participate on weekends when there are no classes.

Women (and men) SSPs described the benefits and trade-offs of participating in the campaign. Women actively participating in campaigns indicated that participation allowed them to network with other women. A quote from an older woman in the Habru *woreda* highlights the advantages women gain from social connections. "*Most of our development activities, such as watershed management, are done collectively. We use it to form social connections and make new friends*." The Amharic saying she shared, "**ምክር ሸማ ነው፤ ታጥፎ ይለበሳል**", translates to "advice is like a blanket and one can fold and wear it." Additionally, she mentioned, "*We seek advice from our friends, which is invaluable and cannot be purchased*." However, a few women (and men) SSPs expressed concerns regarding how participation in campaigns creates time constraints. For example, a resource-poor man from Habru woreda described the time constraints he experienced participating in the campaign: "*I am a daily laborer. When I take on a construction job that involves tasks such as preparing the floor of a house, participation in the campaign slightly extends the time it takes for me to complete the project. Therefore, it has a negative impact on my time.*"

Another type of watershed-level soil and water conservation initiative (such as Cash for Work programs) economically empowers marginalized men and women SSPs. In such programs, women (and men) SSPs from resource-poor and food-insecure households are provided with wage employment opportunities in development work. To ensure inclusion, the programs offer financial or in-kind assistance, such as provisions of food and shelter, to social groups who are physically unfit to take the opportunity.

To foster development work and empower women (and men) SSPs, local government offices encourage women (and men) SSPs to form cooperatives. The cooperatives provide a range of opportunities to engage in income-generating activities, collaborate and improve livelihoods (through skill building, business ventures, better management of natural resources and advocating for their rights). For example, the local government and development partners in Afar are actively promoting the formation of village savings and credit associations among women. Through these associations, pastoral and agropastoral women are able to access finance and technical training. These enable the women to engage in small businesses such as dairy businesses, vegetable farming, livestock rearing and retail sales. Women in the livestock business also receive support from non-governmental organizations, including technical assistance and resources for rangeland management, restocking female goats, and livestock vaccines and medicines. Soil and water conservation initiatives in Wollo have also provided unemployed young men and women in cooperatives with opportunities to participate in beekeeping activities in restored forest areas.

Despite progress, sociocultural barriers hinder women's substantial involvement in community development and decision-making. The barriers include the perception of women as subordinate to men, early marriage, the allocation of domestic responsibilities to women and limitations on women's mobility. According to female respondents in Afar, they typically receive information about various initiatives or opportunities from their husbands, who learn about them through the *Dagu* system (a traditional communication technique). The system allows men to engage in collective action, socialize and discuss daily matters, which helps them easily access information and strengthens the bonds between clans. In contrast, women are occupied with domestic and productive tasks within their homes and have limited access to social networks and information about different opportunities. Primary domestic responsibilities limit their time and hinder their ability to socialize, access information, and participate in collective actions and decision-making processes. Limited participation of women in decision-making often leads to the neglect of their needs, priorities and knowledge, which in turn impedes their ability to act and make a difference.

In summary, the policy environment and initiatives on climate change, water and land, support advancing gender equality, women's empowerment and the inclusion of marginalized groups in designing gender-responsive climate-smart water technologies and practices. However, effectively translating the policies or initiatives into action is challenging, primarily due to sociocultural norms and limited institutional capacities.

Conclusion and Practical Implications

We used the Gender Empowerment Framework to identify the main opportunities and challenges in designing and implementing gender-responsive soil and water conservation and SSI initiatives to enhance the adaptive capacities of women (and men) SSPs. The results indicate that the impacts of climate change and the adaptive capacities of SSPs are gendered. Climate change negatively affects the availability of and access to natural resources, including water, which hampers the adaptive capacities of women (and men) SSPs from diverse social groups. In addition, too much or too little water due to climate change disproportionately affects women and other marginalized groups, including children, the disabled and the elderly, particularly from resource-poor households. The gendered division of labor increases the workload and strain on women. Children, the disabled and the elderly from resource-poor households suffer from malnutrition when the income or livelihood of the household is lost due to climate change. To enhance the adaptive capacities of SSPs, local governments design and implement various initiatives, including soil and water conservation and irrigation initiatives. Participation in these initiatives and the ability to benefit from them are also gendered because they depend on access to and control over resources and the agency of SSPs and their institutional structure.

Findings of the study indicate that women SSPs have limited participation in soil and water conservation and SSI initiatives for three main reasons. *First*, participation and types of authority in resource ownership, access and use are shaped by various sociocultural factors, including inheritance traditions, polygamy and the value of assets or independent incomes. Due to these factors, women have limited access to and ownership of productive resources, such as land, water, time and information, to participate in and benefit from initiatives focusing on climate-smart water technologies and practices. *Second*, women SSPs also have limited participation in decision-making processes

at household and community levels due to low educational status, low self-esteem, and unequal distribution of labor and power in the household. Results also show that there are positive changes in engaging women in decision-making processes due to training; however, this is a work in progress.

Third, inadequate support from institutions and patriarchal social norms inhibit the ability of women SSPs to participate in and benefit from these initiatives. Although the policy environment is favorable for gender equality, women's empowerment and inclusion, institutions have insufficient financial and human resources to effectively implement policies. In some contexts, the problem is exacerbated by the absence of an institutional structure accountable for gender activities at the local level. Social norms that result in the unequal distribution of power, labor and resources also negatively impact the ability of women SSPs to participate in and benefit from these initiatives. Designing gender-responsive climate-smart water technologies and practices can help empower women (and men) SSPs from diverse social groups to enhance their adaptive capacities. To achieve this, the following recommendations are suggested:

- Increasing access to productive resources, upgrading infrastructure and developing skills can effectively tackle priority challenges for women (and men) SSPs in resource access (e.g., finance and water), flood management and transportation. In addition, tailored financial services, renewable energy sources and labor- and time-saving technologies can create more opportunities, particularly for the economic independence and entrepreneurship of women SSPs.
- Raising community awareness is essential for addressing the sociocultural barriers that impede women and limit their collective agency. This awareness should persist until communities have a complete understanding of and support for the concept. Targeted discussions with influential leaders and platforms for women to share their challenges and successes can gradually change the norms that hinder progress. Initiatives that promote safe spaces and supportive attitudes can empower women, boost their confidence and facilitate their meaningful participation in public life.
- Enhancing the capacities of institutions through the commitment of leaders for i) the allocation of resources for activities related to gender and social inclusion, ii) establishing institutional support systems such as accountability and monitoring and evaluation mechanisms and iii) fostering collaboration and synergy among stakeholders at different levels, is essential for designing and implementing gender-responsive initiatives. It also requires evidence-based and data-driven research on gender to address gender and social inclusion challenges.

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