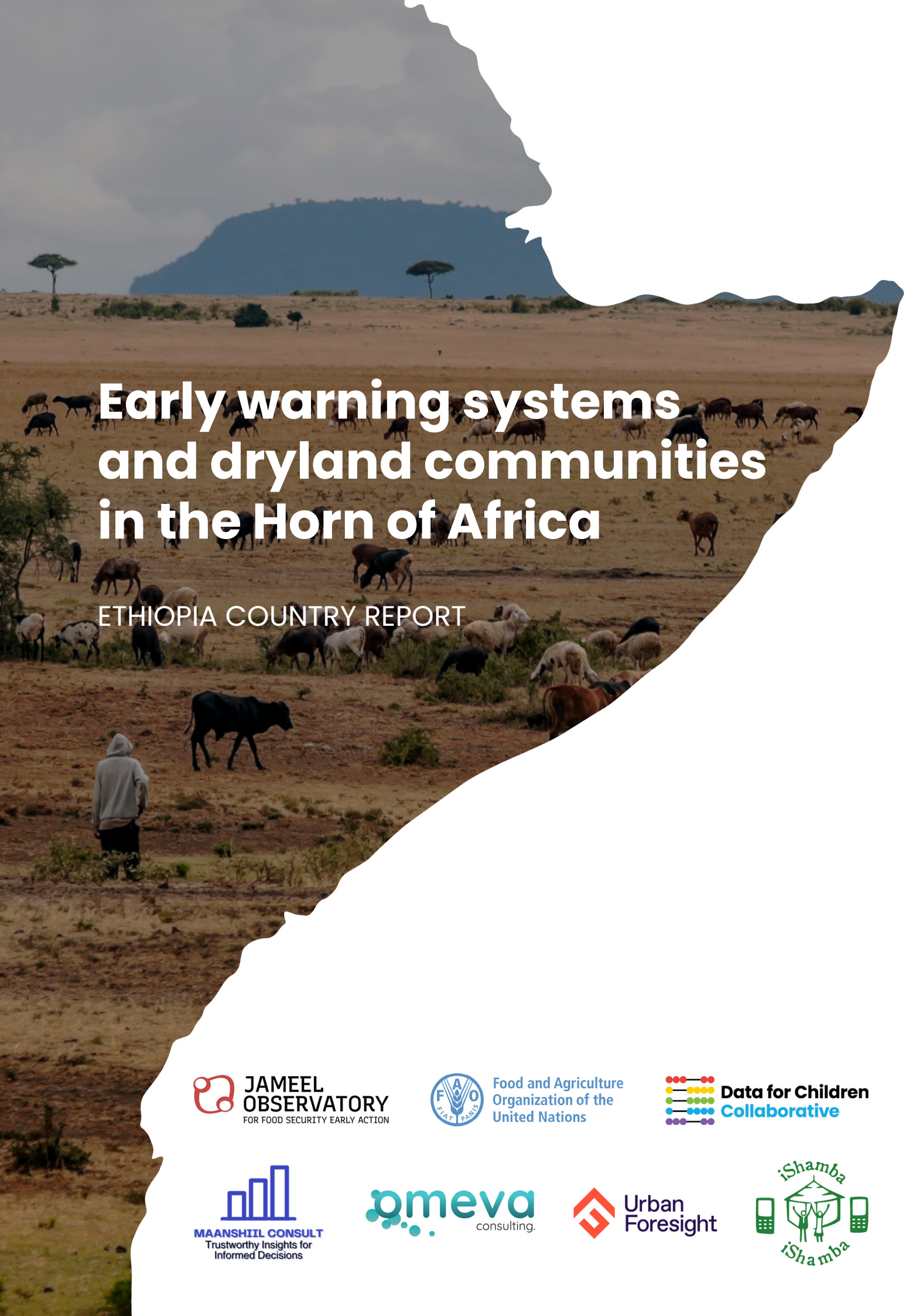

Early warning systems and dryland communities in the Horn of Africa

ETHIOPIA COUNTRY REPORT

JAMEEL OBSERVATORY
FOR FOOD SECURITY EARLY ACTION

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Early warning systems and dryland communities in the Horn of Africa

Ethiopia country report

Abdulfatah Adam, Naima Mohammed, Aurelie Walker, Julia Allard, Fraser Brown, Lilian Kirwa, Alvin Muhandale, Maria de la Puerta Fernandez, Nathaniel Jensen, Brenda Lazarus, and Kim Kristensen

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Copyright statement

Contents

List of acronyms

AA	Anticipatory Action
AWD	Acute Watery Diarrhea
BBC	British Broadcasting Corporation
DPPA	Disaster Preparedness and Prevention Agency
DPPC	Disaster Preparedness and Prevention Commission
DRM	Disaster Risk Management
DRMB	Disaster Risk Management Bureau
EDRMC	Ethiopian Disaster Risk Management Commission
EMI	Ethiopian Meteorological Institute
ERCS	Ethiopian Red Cross Society
EWC	Early Warning Committees
EWPS	Early Warning and Planning Service
EWRD	Early Warning and Response Directorate
EWS	Early Warning System
FAO	Food and Agriculture Organization of the United Nations
FBF	Forecast Based Financing
FGD	Focus Group Discussions
ICPAC	IGAD Climate Prediction and Applications Centre
ICT	Information and Communication Technology
IFRC	International Federation of Red Cross and Red Crescent Societies
IKF	Indigenous Knowledge Forecasting
ILRI	International Livestock Research Institute
INGOs	International Non-Governmental Organizations
JESH	Jijiga Export Slaughterhouse
KDRMC	Kebelle Disaster Risk Management Committee
KIIs	Key Informant Interviews
LEAP	Livelihood Early Assessment Protection System
LIAS	Livelihood Impact Assessment Sheets
MoARD	Ministry of Agriculture and Rural Development
MSF	Médecins Sans Frontières
NAATWG	National Anticipatory Action Technical Working Group
NGO	Non-Governmental Organization
PSP	Participatory Scenario Planning

RFM	Risk Financing Mechanism
RIPA	Resilience in Pastoralist Areas Project
RPSNP	Rural Productive Safety Net Project
RRC	Relief and Rehabilitation Commission
SMS	Short Message Service
SNNPR	Southern Nations, Nationalities, and Peoples' Region
SRTV	Somali Region TV
TWG	Technical Working Group
UK	United Kingdom
UN	United Nations
UNDRR	United Nations Office for Disaster Risk Reduction
USAID	United States Agency for International Development
VSAT	Very Small Aperture Terminal
WDRP	Woreda/District Disaster Risk Profiles
WFP	World Food Programme

Foreword: Understanding early warning systems and dryland communities in the in Horn of Africa

Pastoral and agro-pastoral communities in the Horn of Africa face severe challenges from climate shocks and natural disasters. Frequent droughts, erratic rainfall, and extreme weather events leave millions food insecure, exacerbated by a reliance on rain-fed agriculture and pastoralism. Despite advancements in scientific weather forecasting, many communities struggle to access reliable and actionable information, while poor infrastructure further delays response efforts.

In 2023, the Jameel Observatory for Food Security Early Action commissioned and financed an 'impact collaboration' process aimed at reducing the impacts of shocks on pastoral and agro-pastoral communities in East Africa by studying if and how early warning systems could better support those communities. This process was 'sponsored' by the Food and Agriculture Organization of the United Nations acting as 'customer' for the outputs and emerged from a co-development process with stakeholders from the region facilitated by the Data for Children Collaborative. The impact collaboration process and team were established to address the following challenge question.

Challenge question

"How can we bridge the disconnects between food security, climate, and natural hazards early warning systems and the anticipatory actions that pastoral and agro-pastoral communities in the Horn of Africa can take to overcome recurring shocks and threats to their lives and livelihoods?"

This challenge question prompted a year-long study on early warning systems and anticipatory actions in the Horn of Africa, resulting in a desk review and country reports for Ethiopia and Kenya. This Ethiopia Country Report is part of that series.

1. Introduction

Ethiopia, the largest country in the Horn of Africa, suffers from recurrent natural hazards such as droughts, floods, and landslides. Due to climate change, these hazards are growing more severe, frequent, and erratic. As 85% of Ethiopia's population relies on rain-fed agriculture, these climatic shocks pose a great threat to livelihoods, health, and food and water security in the country.

There are an estimated 12 million pastoralists and agro-pastoralists who reside principally in the lowland areas of Ethiopia (Mehretu and Crummey, 2025; Tofu et al., 2023). These regions are some of the most susceptible to the impacts of climate change and variability, specifically drought and floods. Additionally, these areas have been historically marginalized, deepening the development gap and compounding their vulnerability to climatic hazards (World Bank Group and U.K. Department of International Development, 2019).

Both early warning systems (EWS) and anticipatory actions (AA) are crucial for reducing the impact of hazards on shock-effected communities. According to the United Nations Office for Disaster Risk Reduction (UNDRR), EWS are integrated frameworks that combine monitoring, risk assessment, forecasting, communication, and preparedness strategies to empower individuals, communities, and governments to take proactive measures to reduce risks ahead of hazards (UNDRR, 2015). Closely related to EWS are anticipatory actions, which are proactive measures taken before a predicted hazard to reduce its impact.

Although Ethiopia has made significant advances in its EWS, the use of those systems by communities and individuals to inform preparedness activities has been limited. Research has identified several barriers to greater use (e.g., language, mode of delivery, trust) and suggests that EWS will need to be better tailored to the needs of their potential clients to ensure the intended impacts are achieved. For more information and these studies, see reviews by De la Puerta Fernandez et al., (2025), Hassan et al., (2024), and Vincent et al., (2025).

This report presents the findings from qualitative research carried out with agro-pastoral and pastoral communities in the Doollo and Faafan zones in Ethiopia. The study aimed to identify early warning communication methods and their limitations, document existing Indigenous knowledge, and co-design recommendations to

improve early warning systems with these communities. More specifically, the research was guided by the following objectives:

- Identify current early warning communications methods both available and most used, formal and informal, modern and Indigenous, as identified by communities.
- Carry out community engagement to understand barriers to current communications channels and communities' preferred channels of communications; and to understand how local actors in agro-pastoral and pastoral communities interpret and act on the content that they receive.
- Co-design recommendations with the communities concerned, on the preferred content and means of communication for an effective early warning system so they can effectively respond based on this messaging.
- Document the community practices and Indigenous knowledge used to anticipate and mitigate climate shocks and disasters. Assess the effectiveness of the practices and the potential to scale the response to the national or regional level. Explore the value and opportunities to integrate community practices and indigenous knowledge into scientific early warning systems to improve their effectiveness and acceptance levels.

This report begins with an overview of current early warning institutions, policies, and technologies in Ethiopia, followed by a description of the fieldwork methodology. Findings from focus group discussions (FGD) and key informant interviews (KIIs) are then presented thematically to address the research's key objectives.

2. Background

2.1 Overview of governmental early warning systems and policies in Ethiopia

Ethiopia's early efforts to address drought and famine began after the 1974 famine, which claimed 200,000 lives. In response, the Relief and Rehabilitation Commission (RRC) was formed in 1975 to provide emergency aid. However, as there was no regular drought monitoring, the RRC's responses remained reactive instead of providing early warning information. By the late 1970s, an inter-ministerial Technical Working Group (TWG) was integrated into the commission's decision-making process. In the early 1990s, the TWG dissolved, and the Early Warning and Planning Service (EWPS) under the RRC initiated the development of a EWS. This process continued until 1993 when the RRC transitioned into the Disaster Preparedness and Prevention Commission (DPPC).

The evolution of EWS saw further changes, with the DPPC transforming into the Disaster Preparedness and Prevention Agency (DPPA) and falling under the Ministry of Agriculture and Rural Development (MoARD). The current Ethiopian Disaster Risk Management Commission was established in 2015 by the Council of Ministers through Regulation No. 363/2015 to pursue a proactive disaster risk management (DRM) approach.

A landmark development in Ethiopia's DRM evolution was the introduction of the Rural Productive Safety Net Program (RPSNP), Africa's second-largest safety net project, with an annual budget of $2.3 billion in 2020. Launched in 2005, the RPSNP is a resilience-building social safety net that provides conditional and unconditional support to Ethiopia's poorest households. Initially implemented in Oromia, Amhara, Southern Nations, Nationalities, and Peoples' Region (SNNPR), and Tigray, the RPSNP expanded to Somali and Afar regions in 2009, reaching up to 8 million beneficiaries (Taylor, 2024). It includes contingency planning and a risk financing mechanism (RFM), with 20% of its budget reserved for shocks such as droughts. By 2020, the fifth phase of the program covered 40% of Ethiopia's districts, selected based on critical criteria including drought frequency, poverty prevalence, and historical reliance on emergency food assistance.

The integration of early warning systems into the RPSNP framework highlights its dual functionality as both an input and an output. On one hand, the program leverages

advanced tools, such as the Livelihood Early Assessment Protection (LEAP) system, Livelihood Impact Assessment Sheets (LIAS), and the EDRMC early warning systems to identify at-risk households and coordinate disaster preparedness and response actions (EDRMC, 2024). On the other hand, the RPSNP collaborates with the Early Warning and Response Directorate (EWRD) of the EDRMC to manage natural hazards and protect vulnerable populations, and strengthen Ethiopia's early warning capacity.

Despite the advancements made over the past 50 years, Ethiopia still faces challenges such as fragmentation, inadequate funding, and a lack of proactive measures. Furthermore, the focus of the government and humanitarian partners remains on crisis management rather than on anticipatory actions, which has led to inefficient resource allocation and massive expenditures on relief support on a year-round basis.

In response to these significant gaps, the Ethiopian Disaster Risk Management Commission and stakeholders developed *A Roadmap for Multi-Hazard, Impact-Based Early Warning and Early Action System 2023-2030* that aims to transform the Ethiopian early warning system into a Multi-Hazard, Impact-Based Early Warning and Early Action System between 2023 to 2030 (EDRMC, 2022). The new system aims to enhance disaster preparedness and response by leveraging technology, improving data accessibility, and strengthening coordination among stakeholders. It aligns with international frameworks like the Sendai Framework and the Paris Climate Agreement. The proposed changes include: comprehensive disaster risk knowledge; strengthened disaster detection and monitoring; improved early warning dissemination and communication; and enhanced preparedness, early action, and response.

It is crucial to note that the roadmap development process is accompanied by a legal reform initiative. The reform extends the Commission's mandate to effectively coordinate disaster risk management endeavours with multiple stakeholders, including government bodies, civil society organisations, and the Red Cross and Red Crescent Societies. Moreover, it promotes local community participation and raises public awareness about disaster risk reduction and management.

Another key development is the launch of a Disaster Risk Financing (DRF) Strategy (UNDRR, 2023). The Ministry of Finance has been working with development partners to finalize the strategy and prepare for implementation. Currently, Ethiopia is heavily

reliant on humanitarian aid to finance the cost of disasters, but there is a recurring and increasing shortfall in contributions (UNDP, 2024).

The most prominent stakeholders in Ethiopia at national level are the EDRMC and the Ethiopian Meteorological Institute (EMI). The EDRMC is Ethiopia's main federal agency responsible for disaster prevention, response coordination, and disaster risk reduction. It is crucial for intervention as it orchestrates the national response to disasters, ensuring efficient and effective management of resources and coordination among various agencies. EDRMC's organizational structure is present at all administrative levels including the lowest administrative unit—the Kebelle—which ensures considerable contextual knowledge and stakeholder engagement at all levels.

One key function of EDRMC has been preparing Woreda/district Disaster Risk Profiles (WDRP) by collecting data on each district's hazards, vulnerabilities, and coping capacities (EDRMC, 2022). The WDRP was supposed to act as a baseline for woreda DRM plans but as of December 2022, only 480 woredas had WDRP completed. Even for those woredas with WDRP, it has been observed that the current WDRPs were not updated to include new trends and early warning risks. The database has not been digitised and has never been easily accessible or open to the public. Taken together, these challenges have constrained the effectiveness of the WDRPs.

The EMI, on the other hand, is expected to provide meteorological services and contributes to DRM by delivering timely and accurate weather data. However, the EMI has faced challenges in disseminating timely early warning information due to various factors, including some stations not sending data at all, occasional database system failures, insufficient trained personnel, and malfunctioning instruments that are not repaired or replaced in a timely way (Shanko, 2024). Unlike the EDRMC, the EMI's organizational structure is limited to the regional level and lacks meaningful representation at lower administrative levels.

The subnational structure of Disaster Risk Management (DRM) in Ethiopia mirrors the federal governance system, with DRM duties distributed across regional and local levels. While overall regional leadership rests the Office of the President, the Somali Regional State Disaster Risk Management Bureau (DRMB) coordinates disaster preparedness, response, and recovery efforts within the region. Although this Bureau, like its federal counterpart, focuses heavily on response, there are recent examples of anticipatory action. In late 2021, the Office of the President, at the request of the DRMB, issued a circular instructing all the districts to set aside a fixed portion of their budget

for emergency water trucking in the event of drought that year. This was a tangible anticipatory action from the side of the regional government. The same circular directed districts to decide, based on woreda cabinet committee, whether to trigger the water trucking or to reallocate the funds for other purposes in the last quarter of the fiscal year.

The Kebelle Disaster Risk Management Committee (KDRMC) represents the lowest administrative level of disaster risk reduction in Ethiopia. However, capacity and technical expertise tends to decline progressively from federal to regional to woreda-level institutions. These subnational levels are also where most implementation occurs, highlighting a critical mismatch between the existing capacities and operational responsibilities.

2.2 International agencies and non-governmental organizations

Apart from the above-mentioned governmental bodies, multiple international non-governmental organizations (INGOs) and United Nations (UN) agencies play a pivotal role through donor-funded projects in which early warning systems are a key component. Prominent among these are the World Food Programme (WFP), FAO, the UNDRR, the Ethiopian Red Cross Society (ERCS), Save the Children, Mercy Corps, and Médecins Sans Frontières (MSF), all of which have been instrumental in advancing multi-hazard early warning systems and anticipatory action plans. Their activities include rehabilitating water sources before the rains, providing drought-resistant seeds, livestock feed, and veterinary services to vulnerable agricultural communities ahead of predicted climatic events, delivering cash-based interventions to help at-risk households prepare for shocks, and implementing capacity-building programs to strengthen local early warning systems and community preparedness.

The ERCS, supported by grassroots volunteers and partners from the International Federation of Red Cross and Red Crescent Societies (IFRC), is actively engaged in building Ethiopia's anticipatory action capacity. It currently serves as the secretariat of Ethiopia's National Anticipatory Action Technical Working Group (NAATWG). The ERCS supports risk mapping, vulnerability assessments, and impact-based forecasting and contributed to the activation of national-level EAPs for drought and riverine floods in 2022 and 2023 (UNDRR, 2024).

WFP has also implemented a Forecast Based Financing (FBF) programme in Somali Regional State, developed with support from the International Research Institute for

Climate and Society of Columbia University, in collaboration with the EMI. In 2022 the FBF mechanism played a key role in activating the drought Anticipatory Action Plan for the Somali Region, jointly implemented by WFP and the Somali DRMB (ReliefWeb, 2024).

Save the Children has previously implemented projects focused on community-based early warning systems in Ethiopia's Somali Regional State. For example, in 2024 Save the Children partnered with the Ethiopia Red Cross Society to provide fodder seeds, water pumps, water harvesting facilities, and agronomic training to support anticipatory action (Save the Children, 2024). Mercy Corps, through its Resilience in Pastoral Areas (RIPA) initiative, strengthens community-based resilience programs in several woredas of the region (Mercy Corps, 2024). They bring together key stakeholders, including community members, through woreda-level Participatory Scenario Planning (PSP) meetings to forecast upcoming seasons and develop advisories which are then disseminated by the DRMB. The MSF complements these efforts by addressing health early warning by leveraging its grassroots networks in parts of the region.

FAO plays an active role in national AA coordination mechanisms and provides technical support to strengthen early warning systems and anticipatory actions with a particular focus on agricultural livelihoods and food security. It has also implemented several drought-focused anticipatory action interventions in the Somali Regional State in recent years, aimed at mitigating the impacts of forecasted drought on pastoral and agro-pastoral households.

The collective efforts of these actors highlight the role of international partnerships in supporting Ethiopia's capacity to manage risks and enhance resilience to future shocks. Further details on these and other organizations' activities are provided in the separate desk review report.

2.3 Technology providers

Modern telecommunications and digital transformation play a critical role in strengthening early warning systems globally, and Ethiopia is no exception. The telecom market is dominated by Ethio Telecom, which reported 78.3 million subscribers as of June 2024, including 75.8 million mobile subscribers and operates the mobile money service TeleBirr, which processed transactions worth 1.81 trillion Birr in 2023/2024 (Ethiotelecom, 2024). Despite achieving a 21% profit increase (21.7 billion Birr), Ethio Telecom's investment in infrastructure remains modest, with plans for only

150 new towers in 2023/2024 compared to Safaricom's plan to build 5,000 towers within three years (Safaricom, 2024). Many underserved areas are in agro-pastoral regions, where Ethio Telecom has attempted to expand access through initiatives such as providing satellite (VSAT) services in collaboration with the Somali Regional State in 2021. However, significant gaps persist. Safaricom, which began operating in Ethiopia since 2021, initially faced security and leadership challenges but has since gained momentum, including expanding operations to Tigray in 2024, while continuing to compete with Ethio Telecom's long-established market dominance.

Although no specific reference could be found on EDMRC's website, the research team is aware of collaboration between EDRMC and Ethio Telecom to support early warning systems, with an aim of ensuring timely alerts and messages reach communities, particularly for hazards such as flash floods, landslides, and droughts. While project documents or peer-reviewed studies assessing the effectiveness of these platforms could not be identified, the use of ICT for hazard communication presents a clear opportunity for further development.

In addition, Ethio Telecom and Safaricom operate mobile money platforms (TeleBirr and M-PESA respectively), which could be leveraged as potential delivery mechanisms for anticipatory action cash distributions.

3. Study methodology

To complement the desk-based policy analysis outlined above, field research was undertaken in Ethiopia to gather community-level perspectives on early warning systems and anticipatory action.

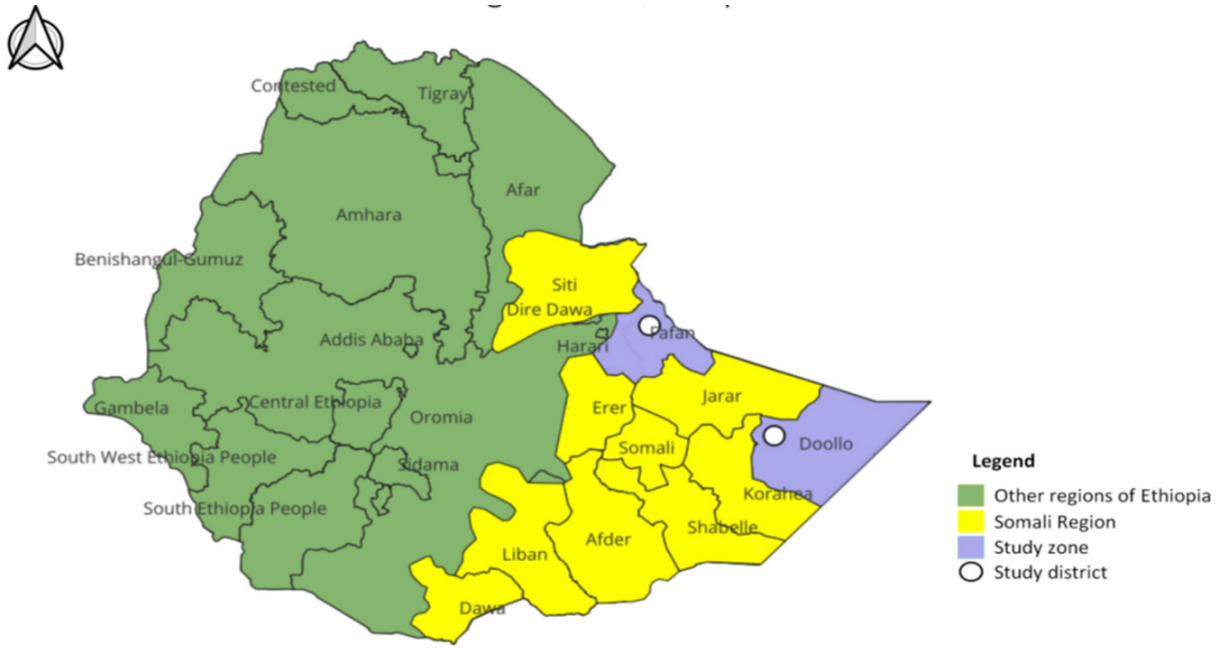
This approach was driven by the need to understand how national systems are experienced on the ground, identify gaps between policy design and local realities, and explore how communities interpret and act on early warning information. Conducting fieldwork also enabled the research team to capture the role of Indigenous knowledge in climate preparedness, and to identify context-specific barriers and enablers of timely response. The following section outlines the methodology used to select study sites, gather data, and engage with communities.

3.1 Study sites and sampling

This study employed a multistage purposive sampling method to capture a wide variety of experiences among pastoralists and agro-pastoralists, particularly regarding their circumstances and access to early warning communication systems. This cost-effective approach focused on the most relevant groups, including individual pastoralists and agro-pastoralists, community leaders, and local authorities, enabling the collection of in-depth insights on early warning communication methods and channels. While the findings provide valuable perspectives, they are not statistically generalizable to the wider population of the Somali Regional State.

In the first stage of sampling, districts from diverse geographical locations and with different dominant livelihood types were selected to capture potential variations in access to and use of early warning communications. In Ethiopia, the districts of Qorile/Danot in Doollo Zone and Haroreys in Faafan Zone were chosen (Figure 1), representing the contrasting livelihood types in the Somali Regional State—pastoralist and agro-pastoralist communities.

Figure 1: Study sites in Haroreys district and Danot district, Somali Regional State, Ethiopia (Boundaries as identified by the Somali Regional State, Bureau of Planning)



Within each district, sampling was conducted in collaboration with local leaders to select two study villages that differed in terms of infrastructure and remoteness, while ensuring that their populations were primarily dependent on agriculture (crop farming or livestock) and were large enough to fill the various FGDs. Table 1 presents key characteristics of each sampled zone in the study.

Within each community, participants were selected from pastoralists or agro-pastoralists households (excluding government employees and full-time traders) and stratification was used to ensure variation in wealth, age, and gender.

Table 1: Characteristics of the two zones in Ethiopia that were targeted by the study

Characteristics	Doollo zone	Faafan zone
Agro-ecological zone	Two seasons (Gu: March–May, and Deyr: October–November)	Kremt dominant—bimodal, with the Belg season (March–May) and the main Kremt season (June–October).
Average rainfall amount	150mm	660mm
Main livelihood activity	Pastoralism	Agro-pastoralism
Main livestock type	Camels and goats	Cattle and sheep
Remoteness	Very remote	Accessible
Infrastructure	Very limited infrastructure, with no local radio and minimal telecom coverage.	Relatively better infrastructure, with radio access and good telecom coverage.
Mobility	Mostly transhumant populations	Mostly settled (due to farming) or semi-settled
Access to social services (e.g., education, health facilities)	Almost non-existent	Relatively better
Land property rights	Communal/clan land ownership	Individual land ownership

3.2 Data collection

Two qualitative data collection methods were used: focus group discussions (FGD) and key informant interviews (KIIs).

3.2.1 Focus group discussions

The research team conducted a minimum of four FGDs in each village. The ideal number of participants for FGDs is six to eight (Kitzinger, 1994); however, because

there was a risk that not all recruited participants would attend, it is recommended to over-recruit by 10–25% (Nyumba et al., 2018). Therefore, up to 10 community members were recruited for each session to compensate for potential dropouts. This approach aligns with Krueger (2002) who considers ten participants sufficient to capture a variety of perspectives while remaining small enough to avoid disorder or fragmentation.

The focus group discussions were stratified by gender and age and held separately for each group. In Haroreys district, Faafan zone, focus group discussions were conducted from 21-24 November 2024; while in Danot district, they were held from 19-21 December 2024.

In total, 87 people participated in the FGDs, with a relatively balanced gender distribution: 45 males and 42 females. There were slightly more older participants, with 47 individuals (23 older males and 24 older females) compared to 40 younger participants (22 younger male and 18 younger females).

3.2.2 Key informant interviews

In addition to the FGDs, in-depth insights were gathered from a diverse range of stakeholders engaged with early warning systems in the pastoral and agro-pastoral areas targeted by the field survey. A list of the stakeholders interviewed is provided in Annex 1. By drawing on the knowledge and experiences of these key informants, the research team aimed to identify the most effective communication methods and channels currently used to disseminate early warning information, as well as to explore potential improvements. The KIIs also documented community practices and Indigenous knowledge used to anticipate climate shocks and disasters.

A single KII guide and script were developed, and interviewers were trained to conduct the interviews following standard ethical and methodological norms. The KII questions are available in Annex 2.

3.3 Research ethics

Ethical clearance was granted for this study by the Research Ethics Review Committee of Jigjiga University (RERC/075/2024) (see Annex 3), from the International Livestock Research Institute (ILRI-IREC2024-35) and from the University of Edinburgh (HERC_2024_09). Data collection was implemented on the basis of the pre-approved ethics clearance.

4. Findings

This section presents the findings from the FGDs and KIIs conducted by the authors. Consistent with the study's objectives of capturing the perspectives of community members and local actors, data collection primarily employed open-ended questions, rather than focusing on specific early warning systems or delivery channels. Participants were invited to share their experiences with EWS, and as such, the findings reflect selected experiences and perceptions rather than providing a comprehensive account of all EWS operating in the region.

4.1 Organizations involved in early warning information

During the KIIs and FGDs, several key organizations were identified as important for collecting information, analysing data, and communicating early warning messages. These include village elders, local administrators, EMI, the Disaster Risk Management Office (district level), the Bureau of Environment and Climate Change, the Ethiopian Red Cross, and INGOs such as Mercy Corps.

The Ethiopian Meteorological Institute, mentioned repeatedly in the KIIs, carries out routine early warning activities. EMI reported that when a hazard is predicted, a federal-level meeting is convened, and information is then disseminated to the regional level. These warnings also include recommended actions, such as conserving water. However, the DRM is responsible for communicating this information to pastoralist and agro-pastoralist communities.

Regional DRMBs described two main types of early warning information: bottom-up and top-down. Under the bottom-up approach, information, often based on Indigenous knowledge, comes from the local or kebelle level. The DRMB attempts to verify the information by cross-checking it with modern, top-down sources such as EMI and ICPAC. If validated, an early warning is issued; otherwise, the report is logged. Given the localized nature of the data, DRMB relies on a decentralized chain of command, with Early Warning Committees (EWCs) at the kebelle level playing a central role. EWCs consist of trained individuals who monitor 11 early warning indicators (e.g., weather, pasture, water, human and livestock health, migration, nutrition status, market prices). They conduct on-site assessments and cross-check data with regional DRMB officials before a formal warning is issued. DRMB noted a persistent challenge: when community-provided information does not align with EWC

or DRMB assessments, it is difficult to balance the need to avoid false alarms with the importance of encouraging communities to continue sharing information.

NGOs are also key stakeholders in early warning systems, including Mery Corps and the Red Cross. A case study of Mercy Corps' RIPA-North program is presented in section 4.6.3. However, some INGO activities have been negatively affected by recent funding constraints.

4.2 Early warning communications

In Ethiopia, FGD participants reported receiving early warning information through a variety of channels. The main sources included mobile phones (calls, messaging, and social media), radio, and in-person communication, either from other community members or from trained communicators using loudspeakers in common areas such as tea shops, water points and animal markets.

Identified levels of early warning information, communication channels, enablers, and barriers are summarized in Table 2.

Mobile phones and social media were considered important tools for accessing and sharing early warning information, a view consistent across age groups and genders. Older people also noted that even those without personal mobile phones could find someone in their household or community with a mobile phone.

Participants further explained that their communities often received information through social media platforms, such as the DRMB's Facebook page and localized WhatsApp groups. This demonstrates how mobile phones are enabling direct communicate from national to local levels, bypassing traditional channels where information first passed through regional and local representatives before reaching communities.

> *"Recently we got warnings ahead of forecasted failed rains. It was published on the Ministry's Facebook page. Then this was circulated via all pastoralist gathering areas, particularly the tea shops."*
>
> **- Older woman, Qorile/Danot district**

Table 2- Levels of EWS engagement described by project participants

Level of engagement	Communication channels	Enablers	Barriers to information use by communities
Supranational (e.g. UNDRR, ICPAC)	Press conferences, websites, official government media	Recipients include regional DRM bureaus, which facilitate conveyance to pastoral and agro-pastoral communities; forecasts cover broad geographical areas in a consistent way; well-resourced (capacity and financially)	Language barriers, literacy challenges, lack of awareness, infrastructure gap (mobile network, internet, electricity)
Federal level (Government of Ethiopia)	Press conferences, websites, official government media, directives to lower government structures	Regional DRMB and other relevant federal structures that are present in target areas and can be leveraged to disseminate information Federally managed media outlets (e.g. Fana Radio, Ethiopian Television) include Somali-language sections; radio and social media pages can be used for targeted messages	Language barriers, literacy challenges, lack of awareness, infrastructural gaps (mobile network, internet, electricity), absence of regional representation by some federal agencies
Regional level (Somali Regional State)	Somali Region Television (SRTV), radio, mobile phone, WhatsApp groups, SMS, DRMB social media pages, trained community messengers	Policy support: DRMB is legally mandated to coordinate DRM; decentralized structures at woreda level; local language proficiency	Literacy challenges, lack of awareness, infrastructure gaps (mobile network, internet, electricity)
Woreda/District level (Haroreys and Danot district)	Face-to-face meetings, mobile phone, WhatsApp groups, SMS, woreda social media pages	Close proximity to communities; local language proficiency; serves as a bridge for bi-directional information flow (bottom-up and top-down)	Literacy challenges, budgetary and logistical obstacles, lack of awareness, infrastructural gaps (mobile network, internet, electricity)
Kebelle level	Face-to-face meetings (e.g., EWCs), loudspeakers, WhatsApp groups, mobile phone, SMS	Direct relationships with grassroots leaders; ability to navigate clan and inter-community dynamics; can leverage support from local Development Agents; culture of information sharing suitable for direct and localized communication; local language proficiency	Literacy challenges, budgetary and logistical obstacles, lack of awareness, infrastructural gaps (mobile network, internet, electricity)
Sub-kebelle level	Face-to-face meetings, WhatsApp groups, mobile phone, SMS	Closest to the community; familiar with households; highly trusted; strong understanding of cultural and Indigenous knowledge; act as information gatekeepers; highly localized approach; direct engagement enhances effectiveness; local language proficiency	Literacy challenges, budgetary and logistical obstacles, lack of awareness, infrastructural gaps (mobile network, internet, electricity)

This is also reflected in an example from a man in Qorile/Danot who recounted a DRMB conference he heard about on social media:

> *"The bureau head of Disaster Risk Management Bureau held a press conference. I saw on social media. He warned of impending heavy rains and he warned the people in low lying land areas to be aware of the flash floods. The next day there was huge rain."*
>
> **- Man, Qorile/Danot district**

Radio was frequently highlighted as an important tool for receiving early warning and weather-related information, especially in areas with limited mobile network coverage. BBC Somali and local FM channels were mentioned as examples. Notably, radio was most often cited by older FGD participants.

Some stakeholders, such as federal officials, noted that they use Somali Region TV (SRTV) to distribute early warning information. However, FGD participants did not report receiving information via TV. Other KII stakeholders noted that TV is not an effective method for reaching pastoralist and agro-pastoralist communities due to practical constraints, including lack of permanent electricity, household mobility, and cost.

Face-to-face communication was also seen as an important channel, with information often relayed by local administration, traders, community leaders, and other officials visiting villages. Several participants explained that they sometimes received warnings while traveling from the local administration or others while they were traveling.

In Haroreys district, an innovative in-person communication method used public-private partnerships to disseminate critical information through existing communication channels. Specifically, the federal government collaborated with local private trade and transportation operators to deliver weather-related messages directly to agro-pastoralist communities. This approach was particularly effective in reaching remote areas through transportation networks. The use of local messengers communicating in Somali was also highly appreciated, as most federal employees lacked local language proficiency. This ensured that messages were accessible, culturally relevant, and impactful.

Additionally, both men and women emphasized that loudspeakers in public places were a common and highly effective means of receiving critical information.

Loudspeaker announcements were typically reserved for urgent messages, which underscored their importance. One woman noted that the repetition of messages through loudspeakers made them easier to remember.

The use of loudspeakers was reported more frequently in Qorile/Danot than in Haroreys, though the available data does not confirm whether this reflects a genuine difference in prevalence. In addition, KII respondents, including EWS officials and NGO staff, highlighted the value of loudspeakers as a primary communication tool. One NGO shared that they often preferred disseminating early warning messages through traditional songs broadcasted via loudspeakers, combining cultural relevance with practicality. This approach captured community's attention and fostered a stronger connection to the messages conveyed.

4.2.1 Knowledge sharing within and between communities

There is a strong cultural tradition of knowledge-sharing within and across communities, which serves as a vital mechanism for disseminating early warning information. This was consistently highlighted during the FGDs and KIIs in both districts, and across different age and gender groups. Participants noted that once early warning information reaches pastoral and agro-pastoral communities, it is readily shared among community members and with neighbouring communities.

> *"When we receive advance information on an impending drought, we call different people in all the directions. We are clan-based society. But we are also very interconnected"*
>
> **– Older woman, Qorile/Danot district**

During the KIIs, the Somali pastoralists' oral communication tradition was repeatedly emphasized as a key strength to be harnessed and integrated into early warning systems.

> *"The Somali pastoralist people have a strong oral communication tradition, and this should be leveraged when targeting them with early warning information."*
>
> **– Federal official, Haroreys district**

Older men and women were the primary recipients of early warning information from government officials in recent years. In the FGDs, several participants explained that village elders and leaders typically received early warnings from local government or kebelle officials and then relayed this information to the wider community. More

informal channels, such as SMS and social media, were accessed by those with mobile phones, with young people more likely to use these methods.

Female FGD participants in both districts were more likely to report that they did not personally receive early warning information from sources outside their community. However, once warnings reached the community, women often learned of them through internal channels, for example, from other community members or in public gathering places such as the *Jamac* (women's group).

4.2.2 Barriers and preferred communication methods

Mobile phones were consistently regarded as a preferred means of communication across communities, age groups, and genders, offering instant and efficient access to information. However, despite their importance, participants noted several challenges with mobile phones. Many areas lacked antennas or network coverage, and people often had to travel long distances to charge their phones. While communities tried to overcome poor connectivity by sending people to areas with better signals, the unreliability of the network remained a major obstacle. Communities in both districts and key stakeholders emphasized the importance of developing network infrastructure to support mobile communications.

Not all communities have access to smart phones with internet, which limits the use of weather-related apps. Instead, early warning information is still widely shared through calls and text messages. FGD participants also recommended establishing a call centre or helpline that individuals could phone or text to receive up-to-date forecasts or hazard information specific to their area.

Language and literacy were seen as primary barriers to communicating early warning information. Limited literacy affected people's ability to read and interpret messages and weather forecasts. One of the key recommendations suggested by the FGD participants was to ensure that the communication of early warnings, whether through mobile phones or radios, is tailored to Somali or other relevant local languages to ensure accessibility.

Many participants across the communities, age groups, and genders emphasized that their preferred option would still be in-person communication. They valued opportunities to discuss information directly, ask clarifying questions, and share their own knowledge, features that are often missed when messages are delivered in a top-down manner. Others suggested displaying this information in common public areas, such as signboards, where community members can readily access critical updates alongside guidance for appropriate responses. Such displays could include

written instructions, videos on digital boards, and visual aids like infographics and images, enabling those with limited literacy to understand the messages.

Overall, the research suggests that no single communication method is suitable for all groups, and therefore, recommends the use of multiple platforms and formats to maximize the reach and effectiveness of early warning information.

Organizational barriers

Early warning officials and other key stakeholders noted that organizations faced significant challenges in implementing EWS and communicating early warning information effectively. Budgetary and personnel constraints were identified as major challenges, as there are not enough resources to comprehensively cover the wide geographic area at risk. For example, in 2024 when below-normal *Deyr* rains were predicted, the regional DRMB was only able to send representatives to 15 of the 45 affected districts.

Regional and government officials also emphasized that resource and capacity constraints hindered the timely implementation and communication of early warning information. For example, the EMI reported that it does not have staff deployed at the district and kebelle levels, relying instead on NGOs and the DRMB to disseminate information at more localized levels. This reliance increases the likelihood of delays and reduces the quality of the information, as it must pass through several intermediaries.

Since multiple key stakeholders, including the EMI, DRMB, and NGOs, are involved in early warning systems and information dissemination, stakeholders highlighted the need for a more efficient and coordinated approach. Such improvements would reduce duplication and make the process more efficient than current systems, enabling faster and more accurate communication of warnings to communities.

Improving organizational knowledge through staff training and better data collection and retention was identified as a critical step to strengthening EWS. Building staff capacity in key organizations such as the EMI and DRMB was seen as essential. For example, one key informant noted that many regional and local DRMB staff have not received formal training to effectively perform their roles. Stakeholders also pointed to the lack of institutional memory regarding past events. As one official described:

"If you wanted to research what happened in the past to check how the trend has been over the past 30 years, it is scattered all over the place. There is no single database or records for past early warning activities."

- Official

These knowledge gaps contribute to inefficiencies and wasting of limited resources, undermining the sustainability of the system.

There were also calls for the government to improve electrification and mobile phone networks to improve early warning systems and support broader regional development. These infrastructure challenges affect both communities and the organizations involved in early warning efforts, which depend on electricity to conduct research and to disseminate information.

4.3 Empowering community response

4.3.1 Message content and timing

Participants across age groups, genders, and districts reported that they often do not receive any external early warning information about upcoming climatic hazards, or that such information arrives only after the drought has begun or the flood has already passed. It is interesting to note that it was more common for those in the Haroreys district to say that they do not receive any early warning information, especially among older FGD participants. They described significant challenges stemming from the absence or delayed delivery of early warnings, which left them unable to prepare effectively for these hazards. For example, during the FGDs, participants in Qorile/Danot shared that their communities received no warning prior to a cholera outbreak, which resulted in the loss of many children.[1] Respondents noted that even when early warning information is provided, is not always specific to their exact area and therefore was not very helpful. They emphasized the need for locally-relevant information, not generic information covering large geographic areas.

[1] It is not clear though whether the community had the capacity to respond to the outbreak even if they had received timely and accurate early warning. It is very likely the cholera referred here is the acute watery diarrhea (AWD) outbreak in the area in 2017, which led to post-disaster interventions by the government and NGOs.

The analysis of the FGDs revealed that the quality of early warning information, people's past experiences with EWSs, and the alignment of their belief systems with modern EWSs all intersect, to influence how early warning information is perceived and trusted by communities. This is explored further in the following sections. Participatory EWS (i.e. involving the public in the co-production of early warning information) are believed to enhance both the quality of information and the trust in, and perception of, these early warnings. The research suggests that, collectively, these interlinked factors facilitate the uptake and response to early warning information.

4.3.2 Trust in early warning systems

Trust in EWS and institutions emerged as a recurring theme during discussions. In some instances, this affected how people perceived the information they received, and how they responded to the early warning information.

> *"Recently, we received a forecasting that said the next weeks will be dry. But some community member said 'let us prepare for all outcomes, you never know whether this forecast will be true or not.'"*
>
> **- Regional official, Haroreys district**

During the FGDs, many participants expressed scepticism toward meteorological forecasts and modern technologies, often describing them as unreliable. This sentiment was seen in both Haroreys and Qorile/Danot. In particular, previous experiences of inaccurate or irrelevant warnings eroded confidence in these systems. However, despite their scepticism, in many instances, participants still described taking anticipatory actions in response to early warning information (see section 4.4).

> *"I am very sceptical of the modern information. There is conflicting information nowadays. I trust more the local knowledge. Even if they miss, it is not deliberate. I sometimes feel as if the radios are made just to create salary for urban people."*
>
> **- Man, Haroreys district**

As one participant described, receiving inaccurate early warning information eroded their trust in such messages. As a result, they are now hesitant to share this information within their community because they do not want to spread false information. As previously discussed, community knowledge sharing has been

identified as a key strength in dissemination of early warning information in these areas. This underscores the importance of building trust in early warning systems to ensure that communities continue to share and act upon the information they receive.

> *"We tried to share this information with the community. But we lost credibility after what we said turned out to be false. Now I am afraid to share information I get from the internet with people. People think we are misleading them."*
>
> **– Woman, Haroreys district**

Participants particularly highlighted that early warning messages delivered via radio were often unreliable. Radio was singled out because the messages typically covered a broad geographic area and were not localized to their specific area. However, participants from Haroreys expressed mixed views of early warning information transmitted by BBC Somali. While one older female reported that she always trusts information from BBC Somali service, a village administrator countered that their messages are too generic and do not address the specific needs of their community.

Conversely, when warnings were accurate or aligned with Indigenous knowledge, they played a pivotal role in fostering trust in the EWS and its information. For example, some older male participants in Haroreys district shared how they now rely on an individual from their area who provides accurate weather updates via a mobile phone with internet access, demonstrating a gradual build-up of trust in reliable modern systems.

> *"We found out there were several cases where his information was accurate and useful. So now we often go to him and ask him to look at his phone for the weather."*
>
> **– Older man, Haroreys district**

Trust in early warning information was mixed within the communities; however, consistently receiving reliable and useful information helped to build trust and improve perceptions of these EWS.

Trust in government

Similar sentiments were expressed about government involvement in early warning systems. While some participants acknowledged the government's critical role in delivering warnings and coordinating disaster response, others cited repeated

instances of unfulfilled promises and delayed support. For example, older men in the Haroreys district recounted promises of infrastructure development and water trucks during droughts that either arrived too late or never materialized, further undermining their confidence in government services. This impacted trust in early warning information provided by the government, as there was doubt if these systems and information would materialize when they were needed.

> *"How can you ask us which channel we would prefer for early warning information, when the government is not even taking care of old investments?"*
>
> **- Older man, Haroreys district**

4.3.3 Religious beliefs and early warning system uptake

In both districts, community beliefs significantly shaped the acceptance, trust, and perception of early warning systems. Some community members—particularly older pastoralists and agro-pastoralists—expressed scepticism toward meteorological forecasts, often stating that only Allah knows the future.

> *"Look, both the traditional forecasting and the so-called meteorology forecasting have in the past shown that we cannot trust them completely. Therefore, we put our trust only on Allah. And we prepare for them [hazards]."*
>
> **– Man, Haroreys district**

This theological perspective contributed to a cautious or dismissive stance toward scientific prediction. However, a notable inconsistency emerged: the same individuals who questioned the legitimacy of modern meteorology also reported routinely using Indigenous knowledge forecasting (IKF) methods to anticipate future conditions of pasture and water availability. In this case, belief inconsistency may stem from limited understanding of how modern meteorology operates. Many elements used in IKF—such as wind speed, wind direction, and temperature—are also integral to meteorological models. Yet this overlap often goes unrecognized. Information from KIIs support the notion that this inconsistency is largely due to a lack of awareness among older community members regarding the principles and methods underpinning scientific forecasting. This finding underscores the importance of targeted awareness efforts.

Stakeholders and practitioners should engage with these communities to explain that modern meteorology does not conflict with religious beliefs. Indeed, this

reconciliation is not merely theoretical—it has been publicly affirmed by respected religious scholars and community leaders, who emphasize that using scientific tools to anticipate environmental conditions is both permissible and beneficial for these communities.

4.4 Anticipatory actions taken based on early warnings

Although community members frequently reported receiving no formal early warning information, some communities indicated that early warnings allowed them to prepare in advance for hazards. However, they did not always provide detailed accounts of the specific actions taken in direct response to the information they received. Contradictory statements, where participants reported not receiving early warning information, and then later describing anticipatory actions they have taken in response to forecasts, were also occasionally observed during the FGDs. Despite some scepticism in early warning information, participants noted that even if they know warnings can be inaccurate, they nevertheless take anticipatory actions whenever possible because it is more costly if the hazard materialises and they did not prepare.

Most examples of anticipatory action identified in this study originate from independent initiatives by pastoral and agro-pastoral communities, with only a few instances involving third-party management by governmental or non-governmental organizations. The most common anticipatory action reported by participants in both communities was partial migration, where communities relocated some livestock to areas with better prospects for rain and pasture in response to forecasted drought or failed rains. These migrations are informed through communication with neighbouring areas, messengers, and *Sahan* (see section 4.6.2).

FGD participants in both districts described how their communities will prepare in response to forecasted droughts by storing animal feed, minimizing water consumption prior to the onset of drought, and preparing communal water sources to maximize water storage. This is also guided by local water committees who issue guidance on the usage of common water resources in response to forecasted droughts.

> *"When they tell us there will be water shortage, we are extra careful to not waste water. We also store as much as we can."*
>
> **- Older woman, Qorile/Danot district**

"The government sometimes tells us to prepare for a possible drought next season, so we typically store animal feed to use that later in the drought time."

- Older woman, Qorile/Danot district

In response to advance warning of floods, many of the FGD participants described how communities employed strategies such as using sandbags to divert floodwaters, constructing flood protection structures in flood-prone areas, and relocating to higher ground. For example, a DRMB coordinator recalled how, upon receiving advance warning of potential floods, a community in Kellafo constructed a flood defence system, and also contacted the Irrigation Bureau for assistance to do so.

"We organized the community and warned all pastoralists to move their children and livestock to higher grounds. And stay away from low lying areas and areas close to ponds."

– Man, Qorile/Danot district

Externally managed anticipatory actions also contribute to community resilience. A notable example is the partnership between the WFP and the Somali Regional DRMB. In response to forecasts that the *Deyr* rains would fail in nine of the 11 zones in the region, they disseminated early warning messages through training and loudspeakers in targeted districts, mobilized communities to carry out anticipatory actions including fodder production and rehabilitation of water bodies. The WFP allocated approximately $200,000 to the DRMB for early warning activities, though bureaucratic delays in fund transfers were noted as a challenge, undermining the timeliness critical to anticipatory action.

"We have already information that the Deyr rains will fail in 9 zones out of the 11 zones in the region. So, WFP along with DRMB and other local NGOs have mobilized the community to carry out anticipatory actions such as fodder production."

- Regional key informant

Another example of external support comes from the Jijiga Export Slaughterhouse (JESH), a livestock processing plant backed by USAID and Mercy Corps. Mercy Corps collaborates with JESH, Kalifa Meat Processing, Waddani Agro-processing, and other businesses to develop DRM plans. Following past losses due to inadequate preparedness, these businesses now implement early warning and awareness-raising activities for their pastoralist and farmer suppliers. These efforts include

contingency plans for droughts or conflicts, such as preparing land for animal feed production to ensure supply chain stability. Such initiatives have proven effective for both the businesses and their local suppliers, demonstrating the value of integrating anticipatory action into commercial operations.

4.5 Improvements to early warning systems

In instances where communities reported receiving early warning messages, participants did not provide detailed descriptions of the message content during the FGDs. However, participants emphasized that effective early warnings should include comprehensive information: the forecast hazard, accurate timelines, the precise areas likely to be affected, and specific recommendations for anticipatory actions. This information should be communicated in the local language and, where possible, supplemented with visual aids. FGD participants also highlighted the importance of ensuring that recommended actions are feasible and accessible. For instance, one community was advised by the government to combat a pest outbreak by spraying pesticides, but they lacked access to the required materials, guidance on how to obtain them, or instructions on their proper use.

Regarding the content of early warning information, several participants mentioned that beyond climate hazards such as droughts and floods, advance warning of other threats—including disease outbreaks, animal health risks, invasive birds, pests, inter-communal conflict, and illnesses affecting humans, livestock, or crops—would be beneficial, enabling communities to prepare proactively. For example, agro-pastoralists in Haroreys district reported that many of their farms are suffering from new pests, and without any advance warning until these threats arrive, these result in significant crop and livelihood losses. These hazards are particularly perilous when communities have prepared for predicted rainfall by planting specific crops, only to have them devastated by additional hazards they were unable to plan for.

Several FGD participants also highlighted that the EWS would benefit from greater interactivity. This includes establishing a call centre where agro-pastoralists and pastoralists can phone to inquire about upcoming hazards in their area and receive guidance on how best they can prepare. In addition, participants suggested integrating a feedback mechanism into the EWS so that communities can report on the accuracy and usefulness of the information they receive. Moreover, participants felt that greater interaction was important for building awareness and trust in the information communicated. This included hosting in-person sessions with communities so that people could learn about the technologies and how they work, which would also increase trust in these systems. One FGD participant cited the

example of awareness sessions conducted during the Covid-19 pandemic, which included hand-washing demonstrations, noting that these in-person sessions were very beneficial.

> *"For us to trust the new technologies, we need awareness raising. We need to see how they work."*
>
> **– Traditional elder, Haroreys district**

4.6 Indigenous knowledge in changing contexts

The findings from the FGDs and KIIs indicate widespread awareness and use of Indigenous knowledge forecasting approaches by pastoral and agro-pastoral communities. The number and diversity of the approaches demonstrate how reliant these communities are on IKF. The communities interpret a wide range of signs from their natural environment, including the Manaasil system (based on the lunar cycle), stars known as xiddigis or xiddigin (including their distance from the moon and specific groupings of stars), wind type and direction, changes in animal and plant behaviour, lightning, cloud movements, presence or absence of specific plants, and the performance of previous seasons.

Most of the community members seem to be aware of the existence and use of the IKF; however, not all community members possess the knowledge to make these forecasts themselves. Across both communities, it is primarily older males who possess the knowledge to interpret the movement and alignment of stars. As one woman described:

> *"Only men, and not all of them, have this kind of knowledge."*
>
> **- Older woman, Haroreys district**

Moreover, several participants described how younger generations are not as well-versed in Indigenous knowledge, especially star reading, and that this knowledge is declining among the younger generations who are more reliant on modern technologies.

4.6.1 Trust, integration and adoption of Indigenous knowledge

The majority of research participants expressed the view that IKF and modern forecasting are complementary and should be integrated to enhance their effectiveness. As one KII participant remarked:

"Even science is not absolute, and it is constantly being improved. Indigenous knowledge is also a product of what people have been observing and learning over hundreds of years and passed down from one generation to the next."

– Federal official

Indigenous knowledge enjoys high trust within communities and is valued by key stakeholders, many of whom highlighted how Indigenous and scientific knowledge often validate each other, producing similar predictions. Participants emphasized that modern technology and forecasting systems could be enhanced by integrating Indigenous methods for hazard prediction and traditional communication channels for disseminating early warnings. This perspective aligns with findings from previous studies (Ajibade, L.T. and Shokemi, O., 2003; Masinde and Bagula, 2011).

While some pastoralists, particularly elders, expressed scepticism towards scientific forecasting methods, the majority believed that actively involving them in modern forecasting efforts and combining these with Indigenous practices would improve the quality, dissemination, and adoption of the forecasts.

"Traditional knowledge has helped us survive. But this can be improved by use of modern ways and means. But how this is disseminated should be a way that suits our culture."

- Older woman, Qorile/Danot district

Although generally trusted and considered accurate most of the time, some FGD participants noted instances where Indigenous predictions were not accurate. Additionally, participants observed that the climate was becoming increasingly difficult to predict using Indigenous knowledge, as weather patterns often no longer follow historical patterns and hazards are becoming more frequent and harder to predict.

4.6.2 Current integration methods

One key example of integrating modern technologies with Indigenous knowledge, identified during the FGDs, lies in utilizing contemporary communication tools to disseminate early warning information acquired through IKF.

Participants highlighted the pivotal role of mobile phones and transportation in facilitating *Sahan* –an old practice based on IKF. *Sahan* (or *Sahamin*), a Somali term loosely translated as "exploration," encompasses much more than its literal meaning.

At its core, *Sahan* represents the act of seeking optimal pastures and water sources, involving travel over significant distances to locate areas with adequate resources. This journey combines exploration with active observation of environmental indicators to forecast weather and ecological conditions, ultimately guiding pastoralist communities to relocate to areas with better livelihood prospects. Given the physically demanding nature of these expeditions, they are traditionally undertaken by men who share and exchange critical information about weather patterns and ecological changes, forming the basis for informed decision-making within Somali pastoralist communities.

Although Indigenous *Sahan* is as old as pastoralism itself, modern communication methods have improved its effectiveness. One FGD participant described how they are increasingly phoning messengers instead of having them report back on foot, making the process more efficient.

The integration was also highlighted as an opportunity to bring communities into the EWS process, with co-creation seen as a tool for increasing trust in and ownership of information. Institutional stakeholders view the Indigenous knowledge held by communities as valuable inputs to inform and validate modern forecasting.

Several stakeholders identified existing examples of co-creation and community consultation. Mercy Corps' Resilience in Pastoralist Areas-North (RIPA-North) project (Mercy Corps, 2024), implemented in Somali Regional State, was highlighted as good practice for co-creating seasonal weather forecasting with pastoralist and agro-pastoralist communities.

These findings align with Ajibade and Shokemi (2003), who emphasize that Indigenous methods complement Western-based weather forecasting approaches. This perspective underscores the importance of leveraging the strengths of Indigenous practices alongside scientific methods to develop holistic solutions. By embracing this synergy, future early warning initiatives in pastoral and agro-pastoral areas can achieve greater inclusivity, enhance community trust, and ensure outcomes that are both sustainable and grounded in local realities.

CASE STUDY

Collaborative seasonal weather forecasting: Bringing together Indigenous forecasting knowledge and scientific forecasting methods

Mercy Corps' RIPA-North project operates in 11 woredas in Somali Regional State. Through grassroots DRM Councils, Mercy Corps has effectively integrated Indigenous knowledge with scientific weather forecasting methods via Participatory Scenario Planning (PSP) meetings held periodically at the woreda level to forecast upcoming seasons. These meetings bring together key stakeholders including community members with deep Indigenous expertise, scientific experts from institutions like EMI, local administrators, and others to collaboratively forecast seasonal rains and develop actionable advisories.

The key informant stressed that traditional weather forecasters are included in PSP meetings on equal footing with EMI representatives. However, they found that Indigenous knowledge and modern forecasting methods "agree with each other in the overwhelming majority of cases." When disagreement occurs between the two knowledge systems, consensus is reached through discussion. They felt that this blending of traditional and modern forecasting enhanced community trust and produced tailored recommendations.

Through collaboration with the DRM Bureau, jointly-produced advisories and alerts are disseminated across multiple platforms including television, radio, mobile phones and loudspeakers. Key communal areas, such as water points and animal markets, were specifically targeted to maximize reach among pastoralists.

Additionally, a network of early warning communicators has been established, comprised of trusted community members equipped with communication skills training. This network plays a critical role in ensuring timely and widespread dissemination of early warning information using loudspeakers and culturally appropriate messaging. The key informant reported that they conduct community surveys to understand what communities find useful and what they would change.

Overall, Mercy Corps believes their approach had been successful, highlighting the value of combining Indigenous practices with modern technologies to increase adoption of jointly formed early warnings, thereby strengthening resilience and decision-making of pastoralists and agro-pastoralists.

5. Conclusions and recommendations

Early warning systems play a crucial role in supporting pastoral and agro-pastoral communities to prepare for predicted hazards. These communities, especially older men, possess extensive Indigenous knowledge for weather forecasting and strong traditions of information sharing information. However, climatic hazards are becoming increasingly difficult to predict accurately using Indigenous knowledge, as climate change disrupts historical weather patterns, and younger generations rely more heavily on modern technologies.

Communities reported significant EWS limitations, noting that information often lacks relevance or fails to reach them in time for effective anticipatory actions. This compounds the scepticism in meteorological forecasts that is more prevalent among older community members. These limitations and previous negative experiences undermine trust in these systems and affects perceptions of the information conveyed.

Early warning dissemination is further constrained by structural barriers including inadequate mobile phone infrastructure and electrification, as well as organization-level obstacles. Similarly, the findings from the FGD revealed that women were more likely to report that they personally had not received early information from sources outside their community, but rather they often learned of them through other community members or in communal gathering places.

Modern technologies can enhance the efficiency and reach of information dissemination for both IKF and EWS. This aligns with communities' preference to receive early warning information multiple channels including mobile phones, radio, and traditional in-person methods, which was seen across communities, ages, and genders. Communities are already embracing modern technologies to spread early warning information, using mobile phones to share news and to facilitate practices such as *Sahan*.

There is strong appetite among participating communities for integrating Indigenous knowledge with modern technologies and early warning systems. Both KII and FGD participants suggested that integration through co-creation will likely have several

benefits. Integrating offers opportunities to improve early warning accuracy and, involving communities in EWS co-production and integrating Indigenous knowledge can enhance their understanding and trust in these EWS and empower them to take anticipatory actions.

Overall, integrating modern technologies with Indigenous knowledge and involving communities in co-producing EWS, provides opportunities to improve the reach, efficiency, and accuracy of information dissemination, strengthening trust and understanding of these systems.

5.1 Recommendations

The key recommendations arising from the research are summarized below.

Development

- Engage target communities in the co-creation, planning, development, and continuous improvement of early warning systems, including the prioritization of hazards, integration of Indigenous knowledge, and selection of appropriate communication methods.
- Develop multi-hazard EWS covering climatic shocks, animal health risks, invasive birds or pests, inter-communal conflict, and disease outbreaks affecting humans, livestock, or crops.

Communication

- Ensure early warning messages reach communities well in advance of hazards, providing details of the threat, timelines, and recommended actions, and allowing sufficient time for local dissemination and anticipatory action.
- Use multiple communication methods (radio, SMS, social media, posters, loudspeakers and in-person) to disseminate early warning information in communities.
- Create a call center that people can phone or text to receive region-specific, up-to-date forecasts.
- Leverage decentralized administration to facilitate in-person community engagement.

- Increase inclusivity of EWS by ensuring messages are distributed through women's groups and communal gathering places, and by involving women and other underrepresented groups in co-design processes.

Process strengthening

- Host awareness-building sessions with communities to build understanding, allow for questions and feedback, and build trust in the EWS.
- Document existing Indigenous knowledge so that it is preserved for future generations and can be used to inform EWS and AA.
- Incorporate feedback mechanisms so communities can submit their knowledge and provide input on information received.

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Annex 1: List of stakeholders consulted

Composition of KII participants

KII participant type	Number targeted	Number interviewed
Traditional elders	2/district	4
Other local leaders	1/district	2
Livestock and cereal traders	1/district	2
Water point managers	1/district	2
Local DRM officials	2/district	4
Regional DRMB officials	2	2
Federal EDRM & EMI officials	3	3
NGO staff (Mercy Corps)	1	1
Total	20	20

Annex 2: KII and FGD questions

Key informant interview questions

1. Can you describe the early warnings that your community receives?
2. Who within your community receives these messages?
3. Are there early warnings that have led to timely action by the community in the past? Please elaborate.
4. Do you know of any early warnings that are available but not used? If yes, why do you think they are not used?
5. How do various community members prefer to receive early warnings?
6. Do you know of any Indigenous knowledge systems that your community uses to predict hazards such as droughts? If yes, please elaborate on the type of knowledge and how it is used.
7. Do you think Indigenous early warnings should be integrated into formal systems, and if yes why? If no, why not?
8. Do you have any further suggestions for how existing early warnings could be improved to better address your community's needs?

Focus group discussion questions

1. Can you describe whether you receive warnings or information about hazards like droughts or floods before they occur? If yes, how often do you receive these warnings?
2. In what ways have you used the information that you have received?
3. To your knowledge, how are warnings or information about hazards communicated to your community?
4. What is your preferred means to receive warnings or information about hazards, and why?

5. Do you have recommendations on how warnings could be improved?
    - **Prompt:** Please give examples of when warnings have been useful/not useful, inaccurate/accurate. Capture timeliness, and ability to understand the warnings linguistically and ability to make decisions from the information shared. What knowledge exists within the community or among community leaders to anticipate, predict, and communicate events like droughts, erratic rainfall, shortfalls in rain, or floods?
6. Describe what an effective early warning communication system would look like for your community. Do you think others in the community might see it differently? If so, how?
    - **Prompt:** Consider objective criteria like timeliness, accuracy, and whether the warnings are actionable.
      How can existing good practices be strengthened, and what barriers need to be overcome to improve the system?
7. In the last three crisis events, what Indigenous early warning information did you receive, how was it communicated to you, and how did you respond?
    - **Prompt:** Has Indigenous knowledge influenced the decisions your community made about which actions to take?
8. Do you think Indigenous early warnings should be integrated into formal systems, and if yes why? If no, why not?

Annex 3: Ethics approval

Ethics approval from the Institutional Research Ethics Committee at the International Livestock Research Institute.

ILRI
INTERNATIONAL LIVESTOCK RESEARCH INSTITUTE

CGIAR

31 October 2024

Our Ref: ILRI-IREC2024-35
International Livestock Research Institute
P.O. Box 30709 00100
Nairobi, Kenya.

Dear Guyo Roba,

Ref: Harvesting Resilience: understanding early warning system communications to inform anticipatory action and enhance food security in the Horn of Africa

Thank you for submitting your request for ethical approval to the International Livestock Research Institute (ILRI) Institutional Research Ethics Committee (IREC).

ILRI IREC has reviewed and granted ethical approval to your study titled *'Harvesting Resilience: understanding early warning system communications to inform anticipatory action and enhance food security in the Horn of Africa'* and referenced ILRI-IREC2024-35. The approval period is from 31 October 2024 to 30 October 2025 and is subject to the following conditions:

- Only approved documents (research design, consent forms, survey tools) will be used.
- All changes anticipated or otherwise that may increase the risks or affect the safety and or welfare of study participants and others or affect the integrity of the research must be submitted to ILRI IREC for approval before implementation.
- Death and life-threatening problems, and serious adverse events or unexpected adverse events whether related or unrelated to the study must be reported to ILRI IREC within 72 hours.
- Request for renewal of approval must be submitted to ILRI IREC at least 30 days prior to expiry of the approval period.
- Executive summary report must be submitted to ILRI IREC within 90 days upon completion of the study.

Note that you will be required to obtain a research license from National Commission for Science Technology and Innovation (NACOSTI) in Kenya and that there may be additional approvals required in Ethiopia prior to commencing the study. Please contact ILRI IREC on ILRIResearchcompliance@cgiar.org for any further assistance you may need.

Yours Sincerely,

Elise Schieck, PhD
Chair, ILRI Institutional Research Ethics Committee

Patron: Professor Peter C Doherty AC, FAA, FRS

Animal scientist, Nobel Prize Laureate for Physiology or Medicine–1996

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ILRI has offices in East Africa • South Asia • Southeast and East Asia • Southern Africa • West Africa

Ethics approval from Jigjiga University

JIGJIGA UNIVERSITY
Research Ethics Review Committee (RERC)

Ref. No. RERC/075/2024
Date: May 07, 2024

Ethical Approval Letter

Project title: Harvesting Resilience: Understanding early warning system communications to inform anticipatory action and enhance food security in the horn of Africa

Study category: - Community based study

Study site: Somali Regional State, Eastern Ethiopia

Investigators: MAANSHIIL CONSULT(contact@maanshiil.org)

Study duration: From May 07, 2024 to May 07, 2025

Ethical clearance validation time: From May 07, 2024 to May 07, 2025

Project Reg. No. JJU-RERC 075/2024

Jigjiga University Research Ethics Review Committee (JJU-RERC) Decision

The above-mentioned research project was dully considered and approved by the JJU-Research Ethics Review Committee after reviewed the proposal based on standard ethical guideline. All your most recently submitted documents have been approved for use in the study and to pursue all the valuable of ethical standard principles to protect human and animal subject against risk and harm while doing research. The principal investigator should also notify the JJU-RERC ahead of any amendments or modifications in the protocol or premature suspension or termination of the study.

Semhal Haile
Secretary of JJU Research Ethics Review Committee

Jigjiga University Research Ethics Review Committee

Solomon Yared (Ph.D.)
Chairperson for JJU Research Ethics Review Committee
JJU Research Ethics Review Committee Chair Person

Cc:
- **Research and Community Service V/President Office**

Tel +251 913138054 /+251 936880746 | 1020 Jigjiga, Ethiopia | Fax + 251 25775-5976/47
Website: https://www.jju.edu.et; In replying, please quote our reference

Ethical approval from the Human Ethics Review Committee at the University of Edinburgh

Human Ethical Review Committee (HERC)

Royal (Dick) School of Veterinary Studies

The University of Edinburgh

Roslin

EH25 9RG

Email HERC.vets@ed.ac.uk

29 August 2024

Dear Nathan

HERC Reference: HERC_2024_091

Full name of applicant: Nathan Jensen

Study title: How can communication contents and methods between early warning system providers and agro-pastoral and pastoral communities increase the effectiveness of the early warnings and the anticipatory actions that can be taken before hazards occur?

Ethical Opinion

The Committee can give a favourable ethical opinion of the above research on the basis described in the application form and supporting documentation.

You may proceed with this research only on the basis that it conforms to the description you provided and the assurances you made in your application and email of 29/8/2024. If you undertake research that deviates in any significant way from the application you submitted, that research needs to be reviewed/considered by HERC before proceeding. If, following the receipt of this letter, you find that you want or need to change your methods and/or materials in any significant way, or where there have been any serious incidents you must submit a revised application and/or notify HERC by email.

With HERC's best wishes for the success of this project.

Yours sincerely

Human Ethical Review Committee (HERC)

Annex 4: Photos

Figure 2: Focus group discussion with elder women, Haroreys District, Faafan Zone, Somali Regional State

Figure 3: KII with water point manager (*birka* owner) in Danot District, Doollo Zone, Somali Regional State

Figure 4: Focus group discussion with younger women, Haroreys District, Faafan Zone, Somali Regional State

Figure 5: FGD with younger women, Danot District, Doollo Zone, Somali Regional State

Figure 6: A photo taken after a successful KII with cereal trader, Haroreys District, Faafan Zone, Somali Regional State

Figure 7: Members of Maanshiil Consult team with elder men who participated in a FGD, Haroreys District, Faafan Zone, Somali Regional State

Figure 8: Focus group discussion with elder women, Danot District, Doollo Zone, Somali Regional State

Figure 9: Members of Maanshiil Consult team with younger men who participated in a FGD, Danot District, Doollo Zone, Somali Regional State

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iShamba iShamba