Impacts of Floods and Drought, State of Climate Services, and their Gender and Social Dimensions

BASELINE ASSESSMENT REPORT FOR GARISSA AND TANA RIVER COUNTIES

WISER
Weather and Climate Information Services

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1. Introduction

1.1 Background

Africa is highly vulnerable to climate change due to its sensitivity to climate variability and insufficient capacity for adaptation. Despite contributing relatively little to global greenhouse gas emissions, the continent faces severe consequences from climate change, hindering its socio-economic development.

Kenya, located in the Greater Horn of Africa, is one of the vulnerable countries given that about 80% of the country is classified as arid or semi-arid. Extreme weather and climate events have increasingly burdened households, the economy, and communities. The severity of droughts and floods has increased over time. For example, the country experienced the worst drought in four decades between 2020 and 2023 after five consecutive seasons of failed rains. It resulted in up to 5.4 million Kenyans, most of them pastoralists and agro-pastoralists, facing acute food insecurity. In 2024, heavy rains and flash floods affected 38 out of 47 counties, including Tana River and Garissa Counties, which are both characterized as Arid and Semi-Arid Lands (ASAL) counties, resulting in deaths, injuries, displacement, and significant livelihood losses. Adverse climate-related events between 2010 and 2020 led to annual economic losses of 3–5% of the total GDP (IFPRI, 2023.).

In response, Kenya has implemented a climate change policy, and a national climate adaptation plan, and established the National Framework for Climate Services (to be officially launched in 2025). At the county level, initiatives such as the Garissa County Climate Change Act and the Tana River County Climate Change Act have been enacted. Notwithstanding, the reconfiguration of the National Framework for Climate Services to support the delivery of climate services at the county level has been undertaken by ADA in Garissa but not in Tana River County.

However, climate change continues to disproportionately affect vulnerable groups, including women, immigrants, indigenous populations, older persons, and persons with disabilities. Structural inequalities and socio-cultural practices exacerbate these vulnerabilities, particularly for women and people with disabilities. Furthermore, insufficient gender-disaggregated data and limited stakeholder participation hinder the customization of early warning information to effectively meet their needs.

1.2 Rationale

Tana River and Garissa counties have been persistently affected by climate-related hazards. Frequent droughts have caused severe water shortages, exacerbated food insecurity, and disrupted lives and livelihoods. Flooding has led to the displacement of communities, the spread of diseases, heightened mental stress, significant damage to infrastructure, and widespread environmental degradation. Additionally, resource-based conflicts have intensified due to the scarcity of natural resources.

Inadequate effective **climate information services** tailored to local needs have exacerbated the impacts of these climate challenges. Currently, many communities in these counties do not have access to timely and relevant climate information to make informed decisions about their livelihoods. Moreover, existing climate services need to fully incorporate local knowledge, and they are often not co-designed with the communities they aim to serve. **The Co-design, co-development, and co-delivery** of climate services will ensure that these services are context-specific, accurate, timely, accessible, usable, and effective in helping the vulnerable communities and governments anticipate, prepare for, and respond to climate variability and change.

1.3 Objective of the Baseline Study

The following were the objectives of the study:

1. To understand the status of climate services in Garissa and Tana River Counties including its GESI dimensions
2. To analyze the differentiated impacts of drought and floods on men, women, youth, older persons, PWD, and marginalized groups in Tana River and Garissa Counties.
3. To offer actionable recommendations for improving climate services for enhanced access and uptake by all gender groups.

1.4 Baseline Survey Process

The baseline survey process started with desk reviews and training of the field researchers. which was followed by data collection in Garissa County (4-7 November 2024) and Tana River County (11-14 November 2024). Data was collected by field researchers who were drawn from the two respective counties. Kobo Survey tool was used which comprised mainly of the household survey questionnaires. This tool was purposely proposed considering timeliness and cost of collecting the data. Before the data collection exercise, training for key informants, and Focus group discussions with different groups (Annex 1) was conducted. Data collection was then conducted, after which the data was cleaned, and analyzed to provide additional input to the baseline report taking into account the input from the project partners who participated in the survey.

1.5 Organization of the report

This section of the report provides a summary of the overall structure of the baseline report. Section one (1) provides an overview of the survey- introduction, rationale, and aims. Section two (2) provides a detailed explanation of the survey methodology and approach. Section three (3) presents an overview of major survey findings. Section four (4) discusses the findings, and section five (5) summarizes and makes recommendations based on the survey's significant findings.

2 Methodology

2.1 Survey design

The objective of the baseline survey was to assess the demographic, socioeconomic, and climate-related characteristics of respondents, focusing on their access to and utilization of early warning information. The study employed a mixed-methods approach combining qualitative and quantitative data collection methods to provide a comprehensive understanding of the research questions.

2.2 Desk review

2.2.1 State of Climate in Garissa and Tana River Counties

Garissa and Tana River counties in Kenya are classified as arid lands where the population is highly vulnerable to the impacts of climate variability and change. Both counties are located to the east of Kenya **(Figure X1)** and have a lot in common including impacts from similar natural hazards such as floods[1] and droughts. These regions have experienced increasing frequency and severity of extreme weather events such as droughts and floods over the past decade, mirroring global climate trends (IPCC, 2021; WMO, 2023). Additionally, the GHA region, where Garissa and Tana River Counties lie, have also seen a steady rise in temperature since 1950s, **Figure X1.**

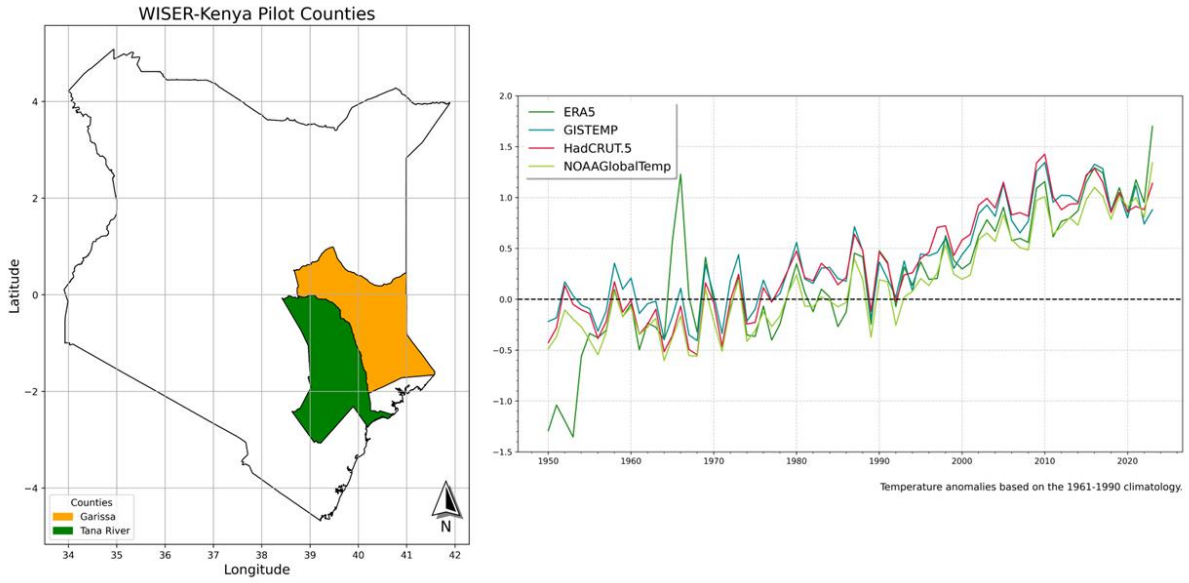

Figure X1: Map of Kenya showing the two pilot counties: Garissa and Tana River Counties shaded in green and orange respectively (first column) and temperature anomalies since 1950, relative to the 1961–1990 baseline, area averaged over the Greater Horn of Africa (GHA) region (second column). The plot illustrates a steady increase in temperatures over time.

Rainfall in the two counties exhibits a predominantly bimodal pattern, with the long rains occurring from March to May (MAM) and the short rains from September to December (SOND) **(Figure X2a, b)**. The highest rainfall amounts are observed in November, while the lowest occurs predominantly in February. Notably, the rainfall seasons coincide with periods of high temperatures in both counties, with the SOND season typically experiencing the highest rainfall.

[1] https://www.kenyanews.go.ke/garissa-farmers-count-losses-as-floods-sweep-away-crops/, https://www.unicef.org/kenya/stories/rising-above-floodwaters-tana-river

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Regarding temperature, March is the hottest month, with maximum temperatures exceeding 35°C, whereas the lowest maximum temperatures are observed in July. Conversely, minimum temperatures peak in April, while the lowest values are recorded in July in both counties **(Figure X2a, b)**.

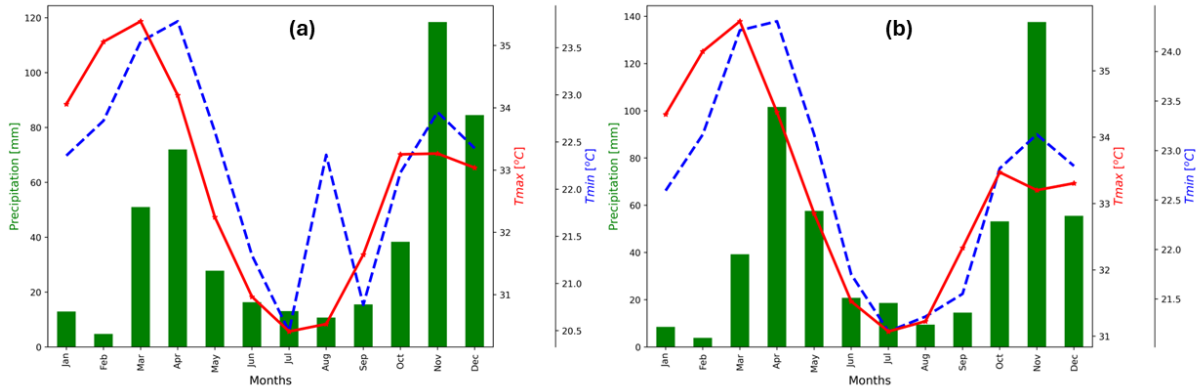

Figure X2: Climograph for Tana River and Garissa Counties (a and b respectively) depicting the area-averaged monthly climatological mean: rainfall (bars), maximum temperature (solid red line), and minimum temperature (dashed blue line).

The spatial analysis reveals that rainfall distribution is higher in the southeastern parts of the two counties, likely influenced by the Indian Ocean (Figure X3a). A similar pattern, with generally low rainfall amounts, is observed during the MAM season (Figure X3b). However, during the SOND season, rainfall distribution appears more homogeneous across the two counties.

The annual and seasonal distribution of maximum temperature shows a general decrease from north to south, with the northern parts of the two counties recording the highest annual maximum temperatures **(Figure X3d)**. During the MAM season, the areas experiencing the highest maximum temperatures expand spatially **(Figure X3e)**, while a similar but less extensive pattern is observed during the SOND season **(Figure X3f)**. In contrast, minimum temperature appears to be more influenced by the Indian Ocean, with the highest values occurring in the eastern and southeastern parts of the two counties. These elevated minimum temperatures are most prominent during the MAM season **(Figure X3g, h, i)**.

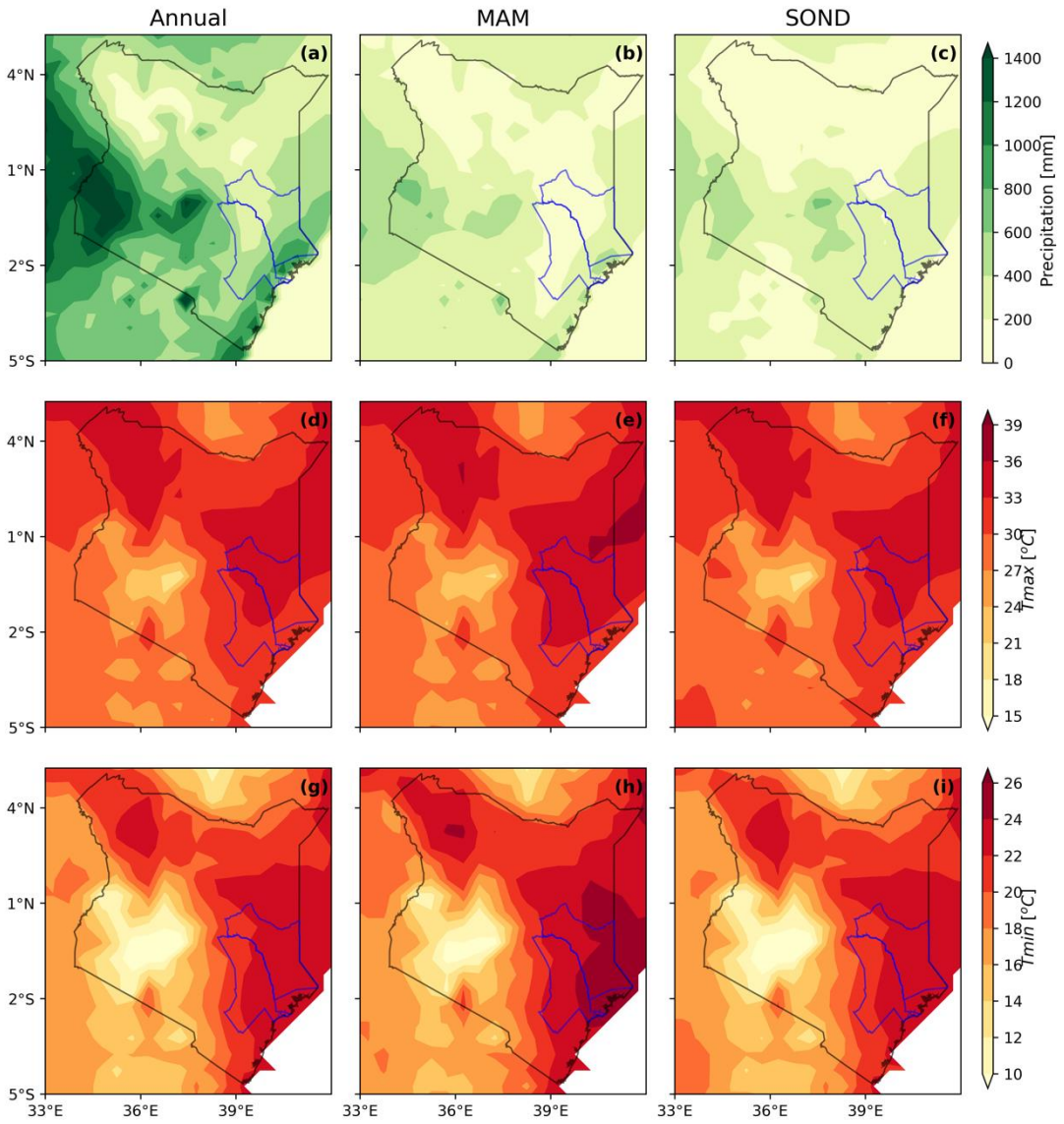

Figure X3: Spatial distribution of rainfall, maximum temperature, and minimum temperature climatology (1981–2010) displayed in the first, second, and third rows, respectively. The columns represent the means for annual, March–May, and September–December seasons. This analysis is based on CHIRPS and CRU datasets.

Given their proximity to the Indian Ocean, rainfall and temperature variability in the two counties are likely influenced by large-scale climate drivers, including the Madden-Julian Oscillation (MJO), Indian Ocean Dipole (IOD), and El Niño-Southern Oscillation (ENSO). At the local level, the Intertropical Convergence Zone (ITCZ) appears to be the primary driver. For instance, the positive IOD event in 2023 led to enhanced rainfall across Kenya, resulting in widespread flooding in Garissa and Tana River counties. These climate phenomena, combined with rising global temperatures, highlight the urgent need for reliable early warning systems to support effective climate adaptation measures (WMO, 2023).

The two counties have faced prolonged drought conditions in recent years, with five consecutive failed rainy seasons from 2020 to 2023. This led to acute water shortages, significant livestock losses, and widespread food insecurity, especially for pastoralist and farming communities who are highly dependent on natural resources (FAO, 2021; UNICEF, 2021). In contrast, periods of excessive rainfall have caused devastating floods, such as those which were observed during the OND season of 2023, when the Tana River surpassed the flood alarm level of 5.59 meters, displacing thousands and destroying property and infrastructure (WWA, 2023).

2.2.2 State of Climate Services in Garissa and Tana River Counties

The growing climate related challenges in Garissa and Tana River counties highlight the critical role of climate services in enhancing resilience and supporting adaptation efforts. Both counties are served by County Directors for Meteorology who are responsible for downscaling national-level climate information to provide localized and actionable insights. These directors work closely with the Kenya Meteorological Department (KMD) national office to deliver tailored climate products, including seasonal forecasts, early warning systems, and real-time weather updates.

Despite these efforts, significant gaps remain in the accessibility and utilization of climate services. While general forecasts and early warning systems are available, a substantial proportion of residents, particularly in remote and marginalized areas, lack access to this vital information. For instance, only 65% of respondents in Garissa and Tana River counties reported access to flood advisories, and fewer than 17% had access to detailed drought watches (CARE, 2020; WMO, 2021).

Challenges in the provision of climate services

The County Directors for Meteorology play a crucial role in bridging this gap by working with local government, non-governmental organizations (NGOs), and community-based organizations to enhance climate information dissemination and uptake. The survey in Garissa and Tana River showed that there was some level of County Meteorological Office engagement with other government agencies in the county, especially at county headquarters. The most climate products that were being communicated to the public were seasonal climate products despite the climate products existing at the national level. The challenges in the provision of climate services in both counties were identified in the following areas:

- Unclear roles and responsibilities of the CDMS and non-defined entry points to national and county policies and plans
- Provision of climate services is not guided by clear and user-centered frameworks
- No clear plans for county meteorological observations and data-future plans for observation network, lack of maintenance plan for observation network, role of volunteer and community weather observers and monitors, and management of non-KMD weather observations
- Provision of climate information services: early warnings and alerts, weekly forecasts are not being produced at the county meteorological offices- The capacity of the CDMs to downscale climate products and to package them in accessible user friendly is limited
- Communication and dissemination of climate information: Garissa County has been holding the PSPs which have led to good access to seasonal forecasts and sector advisories. Tana

River county, the CDM usually uses meetings organized in the county to share the seasonal forecasts. It was also found out that despite using the intermediaries in the dissemination and climate information, there is no specific training for intermediaries (extension service providers, media houses) involved in the communication and dissemination climate information and products; no training for users on how to access, interpret and apply climate information in the decision making

- Weaknesses in the planning and budgeting for climate information services
- Weak monitoring and evaluation of climate services

Recommendations and way forward

ICPAC and KMD to work with the stakeholders and users of climate services in Garissa and Tana River Counties to develop and implement the County Climate Service Information Plans. The Plans will include Background and context of the CIS plan; Framework for provision of climate services; Climate information services provision; Communication and dissemination of climate information services; Planning and budgeting; and Monitoring, Evaluation and continuous improvement.

Key Challenges in Climate Services

1. **Infrastructure and Connectivity**: Many rural areas in Garissa and Tana River counties lack the communication infrastructure needed to receive timely climate information, particularly during emergencies.
2. **Inclusivity**: Women, people with disabilities, and older populations face systemic barriers in accessing climate information due to cultural norms, mobility challenges, and lower literacy rates (UN Women, 2020; Hanshi, 2017).
3. **Digital Divide**: Limited internet access and digital literacy hinder the use of online platforms and mobile apps for accessing forecasts and early warnings.
4. **Integration of Indigenous Knowledge**: Traditional weather prediction methods, such as observing animal behavior, remain prevalent but are not effectively integrated into modern climate services, reducing their overall utility (Odhiambo & Odhiambo, 2019).

2.2.3 State of Gender Equality in Garissa and Tana River Counties

Gender Roles and Norms: Gender roles in Garissa and Tana River Counties are shaped by traditional practices and societal norms, with women typically responsible for household duties, including water collection, food preparation, and caregiving. Men are often the primary decision-makers, especially in matters related to land, livestock, and economic activities. While these roles are slowly evolving, women's participation in community leadership, decision-making, and economic development remains limited (Munyua, 2012).

Women's Empowerment: Despite progressive legal frameworks such as Kenya's 2010 Constitution, which advocates for gender equality, there are significant barriers to women's empowerment in these counties. Low levels of education, limited access to economic resources, and cultural norms that restrict women's participation in decision-making hinder progress toward gender equality (Kenya National Bureau of

Statistics [KNBS], 2020). Women in these counties face challenges in accessing education, health services, and legal rights, with persistent gender-based violence (GBV) exacerbating their vulnerability.

Gender-Based Violence (GBV): In the ASAL regions, including Garissa and Tana River, GBV is a pervasive issue, often linked to entrenched gender inequalities and patriarchal structures. Women and girls are particularly vulnerable to early marriage, female genital mutilation (FGM), and sexual violence. Displacement caused by climate stressors, such as droughts and floods, further exacerbates the risk of GBV, as social structures and protective mechanisms are disrupted (UN Women, 2017).

2.2.4 Gender and Climate Change in Garissa and Tana River Counties

The impacts of climate change in Garissa and Tana River counties are experienced differently across gender groups, reflecting intersecting vulnerabilities related to societal roles, age, and physical or social conditions. These counties, characterized by arid and semi-arid lands (ASALs), are vulnerable to climate stressors such as prolonged droughts, erratic rainfall, and resource-based conflicts. An inclusive analysis of gendered impacts reveals the following patterns:

Climate change has distinct effects on **men**, who are traditionally responsible for livestock herding and farming. Prolonged droughts severely reduce pasture availability and livestock productivity, threatening livelihoods. Many men migrate in search of alternative income opportunities, leaving women, children, and the elderly to manage households in increasingly difficult conditions. This disruption intensifies economic and social pressures on male household heads, often leading to mental health challenges and conflict over scarce resources (Hanshi, 2017; Karienye & Macharia, 2021).

Women face a unique set of challenges, as they bear the primary responsibility for domestic tasks, including water and firewood collection. Climate-induced water scarcity lengthens the time spent fetching water, exposing women and girls to physical strain and security risks. This additional burden often prevents girls from attending school, further entrenching gender inequality. Women's economic activities, such as small-scale farming and trading, are also disrupted by climate variability. Despite their central role in household resilience, women are often excluded from decision-making processes and resource allocation (UN Women, 2020; Wangila, 2023).

Children are particularly vulnerable to the impacts of climate change. For boys, climate stressors often mean leaving school to assist with herding livestock or contributing to household income. For girls, the effects are even more pronounced, as they are more likely to miss school to perform domestic chores or assist with caregiving during resource crises. Climate-related disruptions in education perpetuate cycles of poverty and inequality (Muriuki et al., 2020).

Older people face significant challenges due to limited mobility, declining health, and dependency on traditional knowledge systems, which may not always align with modern climate adaptation strategies. However, older persons remain key custodians of indigenous knowledge on resource management, particularly in sustainable land and water use. Their inclusion in climate resilience planning can bridge generational knowledge gaps and improve adaptation outcomes (Karienye & Macharia, 2021).

Persons with disabilities (PWDs) represent one of the most marginalized groups in the region, often excluded from community decision-making processes and climate resilience

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strategies. Limited access to water, food, and other essential resources during times of scarcity disproportionately affects PWDs. Furthermore, infrastructure designed to address climate challenges often fails to accommodate their specific needs, deepening their vulnerability (UN Women, 2020).

The intersectionality of these vulnerabilities highlights the need for inclusive adaptation strategies that recognize the diverse experiences of all gender groups. Effective interventions, such as community-based initiatives and participatory resource management frameworks, should ensure the equitable involvement of women, men, children, older persons, and PWDs in decision-making. UN Women has emphasized the importance of gender-sensitive policies that address these disparities, advocating for accessible infrastructure, education programs, and targeted financial support (UN Women, 2020).

2.2.5 Gender and Climate Services in Garissa and Tana River Counties

Access to Climate Information: Access to timely and accurate climate information is crucial for communities in Garissa and Tana River to respond to climate variability. However, studies suggest that women have less access to climate information and early warning systems compared to men. Women's limited access to mobile phones, radios, and other communication technologies, combined with lower literacy rates, often restricts their ability to benefit from climate services (Ong'ech et al., 2019). As such, women are at a disadvantage when it comes to preparing for and responding to climate events like droughts and floods.

Gender and Climate Service Delivery: Climate services in these counties are typically designed and delivered with little consideration of gender differences. A review of existing climate service programs in Kenya's ASAL regions reveals that most initiatives focus on improving access to climate information through technology, yet they do not adequately address the specific needs of women, especially those in marginalized communities (ICRAF, 2017). Gender-blind climate services often fail to account for women's roles in household decision-making and resource management, limiting their effectiveness.

Gender-Responsive Climate Services: Efforts to integrate gender considerations into climate services are growing. The National Drought Management Authority (NDMA) in Kenya has made strides in incorporating gender into its drought response programs, promoting women's leadership in community-based disaster risk management (DRM). Moreover, the Kenyan government's emphasis on gender equality in climate policies, such as the National Climate Change Action Plan (NCCAP), is helping to drive more inclusive climate service delivery (Republic of Kenya, 2018). However, more targeted efforts are needed in Garissa and Tana River to ensure that climate services address the unique vulnerabilities and needs of women.

2.3 Sampling techniques

Key Informants Interviews

Key Informants were selected based on their roles and expertise in climate-sensitive sectors. Example roles include County Directors of Meteorological Services, heads of agriculture, livestock, health, water, energy, environment, DRM, and representatives from local NGOs to gather insights including their role in climate information services, floods and drought events frequency and impacts and preferred early warning products. KIIs with communication experts consisting of local radio stations, local TV and

Newspaper were conducted to gather insights on how they communicate weather and climate information.

Focus Group Discussions (FGDs)

For FGDs, a stratified purposive sampling method was used to capture diverse perspectives from different demographic and occupational groups. Categories included crop farmers, pastoral farmers, journalists, women's groups, persons with disabilities (PWD), private sector representatives, and agro-dealers.

Household Surveys

A multistage sampling method was applied for household surveys, starting with stratified sampling by sub-county and followed by random sampling of households within each stratum. The sample size was calculated as 0.5% of the total households in each county based on the 2019 census data. Interviews were conducted in all the 7 sub-counties in Garissa Couty and all the 5 sub-counties in Tana River County.

2.4 Data Collection

Key Informant Interviews (KIIs)

Key Informant Interviews were conducted using semi-structured interview guides tailored to the specific categories of respondents. Each interview lasted between 30 and 45 minutes, capturing sector-specific climate impacts, access to early warning systems, and recommendations for improvement.

Focus Group Discussions (FGDs)

Focus Group Discussions were facilitated using pre-structured guides to ensure consistency. Each session lasted 1-2 hours and involved the use of audio recording devices. The discussions focused on community-level impacts, gender-specific challenges, and collective recommendations for enhancing early warning systems and climate services.

2.5 Data analysis and reporting

The analysis used both quantitative and qualitative methods for a comprehensive evaluation of their delivery, access, and utilization. Quantitative analysis involved descriptive statistics such as frequencies, percentages, and averages to identify trends. Cross-tabulations explored relationships between key variables like age, education, and access to WCIS, revealing socio-economic factors affecting information access. Qualitative data was gathered through in-depth interviews with government officials, NGO representatives, community leaders, media professionals, and farmers. Focus group discussions with women, persons with disabilities, and business communities offered diverse perspectives on WCIS challenges and opportunities. Thematic analysis was used for the qualitative data, involving transcription, coding of recurring themes, and interpretation of key findings. This revealed the effectiveness of WCIS, barriers to access, and areas for improvement. To ensure reliability and validity, data triangulation was applied, comparing results from both quantitative and qualitative sources. This integration provided a well-rounded understanding of WCIS effectiveness, challenges, and potential enhancements for the region, catering to various demographic groups.

2.6 Study Location

The survey study was conducted in Garissa and Tana River Counties, Kenya, using a combination of Key Informant Interviews (KIIs), Focus Group Discussions (FGDs), and household surveys. The study encompassed a wide range of sub-counties to ensure comprehensive coverage. In Garissa County, the included sub-counties were Lagdera, Garissa Township, Dadaab, Fafi, Ijara, Balambala, Modogashe, Hulugho, Waberi, and Bura. In Tana River County, the sub-counties covered were Tana Delta, Tana North, Tana River, Galole, Bangale, and Galedyertu.

Research assistants conducted household surveys across numerous wards within the two counties. In Garissa County, the sampled wards included Galbet, Nanighi, Bura, Maalimin, Waberi, Iftin, Sankuri, Township, Baraki, Lagdera, Dertu, Dadaab, Labasigale, Modogashe, Goreyale, Saka, Masalani, Ijara, Balambala, Sabena, Hulugho, and Fafi. Similarly, in Tana River County, the sampled wards encompassed Mikinduni, Madogo, Garsen Central, Garsen North, Garsen South, Chewani, Wayu, Hirimani, Sala, Kinakomba, Kipini East, Kipini West, Garsen West, Jarajara, Sabena, Maalimin, Fafi, Sangailu, Dekaharia, Baraki, Danyere, Nanighi, Labasigale, Saka, Abakail, Sankuri, Modogashe, Ijara, Bura, Jarajila, Damajale, Balambala, Benane, and Goreale.

This broad geographical coverage ensured the study captured diverse needs, challenges, and perspectives of residents across the different wards. This approach was instrumental in achieving a comprehensive understanding of the unique circumstances and priorities of communities in both counties.

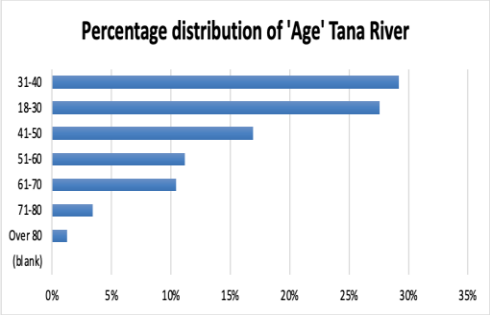
3. Research Findings

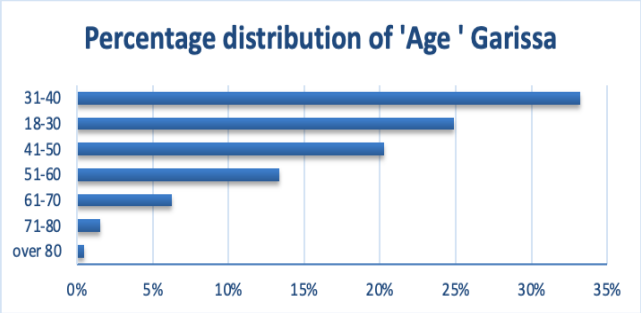
3.1 Demographic Characteristics

3.1.2 Age Distribution of the Respondents

The age distribution observed across the two counties reflects a relatively young and economically active population, with the largest proportions of respondents falling in the 31-40 years and 18-30 years age brackets. These two categories combined accounted for 58.1% of respondents in Tana River and 56.76% in Garissa, highlighting a significant representation of younger adults in the baseline survey.

Furthermore, the higher percentages of respondents aged 41-60 years in both counties (33.7% in Tana River and 28.11% in Garissa) suggest the presence of mature adults who may contribute significantly to household decision-making and community participation. On the other hand, the relatively smaller representation of older respondents aged over 60 years (8.3% in Tana River and 15.13% in Garissa) suggests that aging populations are present but not predominant.





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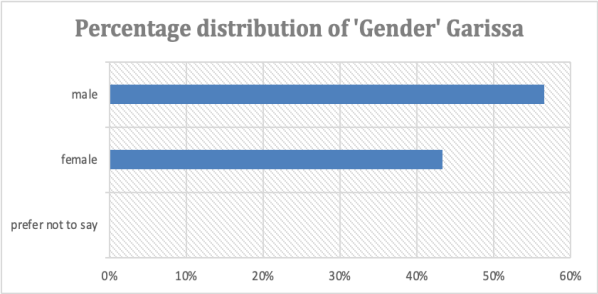
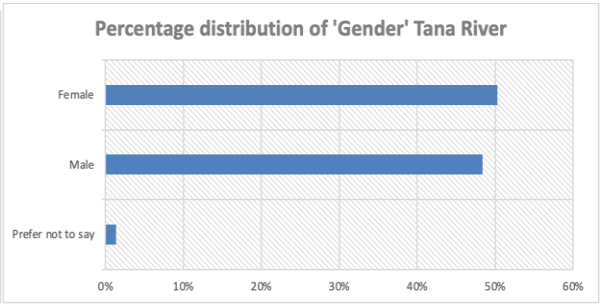
Given the demographic insights, it is important to tailor communication of weather and climate information services (WCIS) to accommodate user preferences. For the younger and middle-aged groups, digital platforms such as mobile applications, social media, and websites are ideal, leveraging their familiarity with technology and online tools. On the other hand, the older population would benefit from traditional media outlets, such as radio, TV, and community outreach programs, ensuring inclusivity and accessibility.

3.1.3 Gender

In Garissa County, the survey revealed that 56.5% of the respondents were male, while 43.3% were female. Additionally, a small percentage (0.2%) of respondents chose not to disclose their gender. In Tana River County, the gender distribution was slightly different, with 50.3% of the respondents being female, 48.4% being male, and 1.3% preferring not to disclose their gender.

These findings highlight a gender balance variation between the two counties, with Garissa having a higher proportion of male respondents and Tana River showing a slight predominance of female respondents.

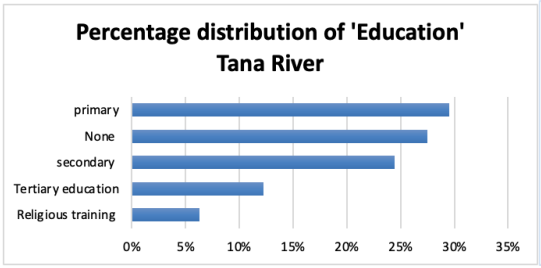


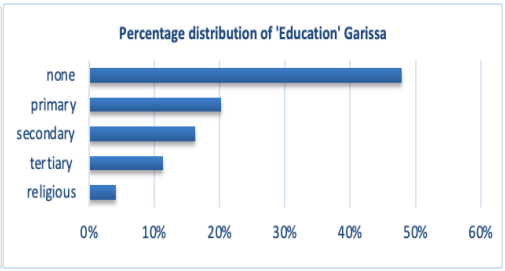


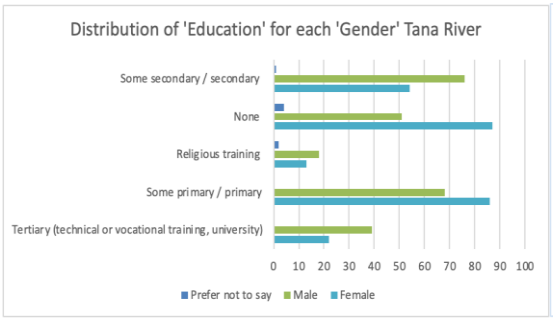
3.1.4 Literacy levels

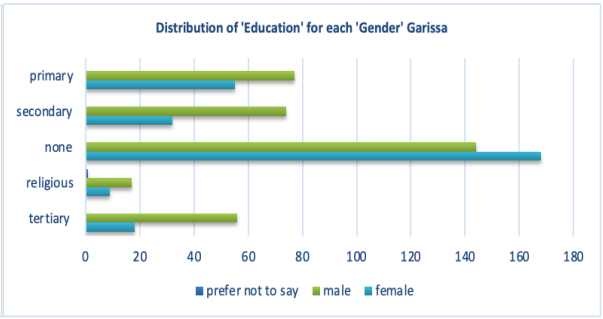
In **Garissa County**, nearly half of the respondents (47.93%) had no formal education, underscoring a high rate of illiteracy in the region. A further 20.28% had completed primary education, while 16.28% reached secondary school. Those who attained tertiary education accounted for 11.37%, and only 4.15% received religious training. Gender disparities were prominent: 39.1% of males had no education, compared to 44.6% of females. At the primary level, 20.9% of males completed schooling compared to 14.3% of females. The tertiary education gap was also notable, with 15.2% of males achieving this level compared to just 6.4% of females.

In **Tana River County**, the education distribution reflected slightly better literacy levels. Primary education was the most common level of attainment (29.5%), followed by no formal education (27.52%) and secondary education (24.46%). Tertiary education level was at 12.23% of respondents, and 6.29% had religious training. Gender differences were considerable in Tana River compared to Garissa. About 33.2% of females had no formal education, compared to 20.2% of males. Secondary school completion was higher among males (30.2%) compared to females (20.6%). Tertiary education showed a significant gender gap, with 15.5% of males reaching this level compared to 8.4% of females.



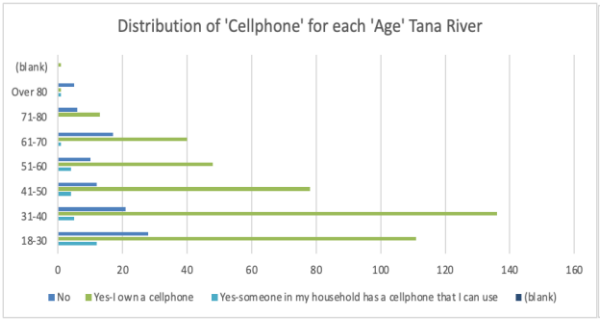


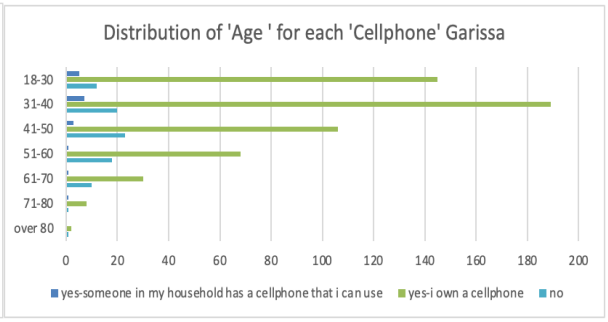




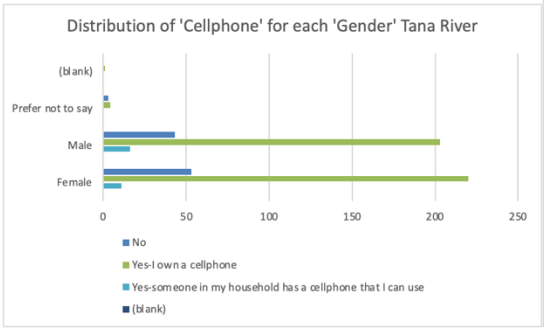
Across both regions, males consistently outnumbered females in achieving secondary and tertiary education. The level of education should inform how information is presented and communicated. For those with higher education, more technical information can be provided. For those with lower education levels, simpler and visual information would be more effective.

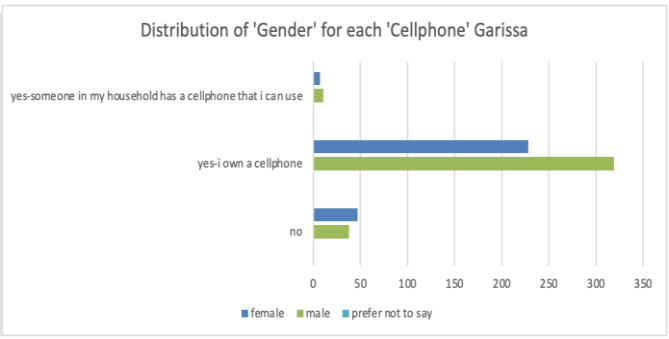
3.1.5 Access to technology



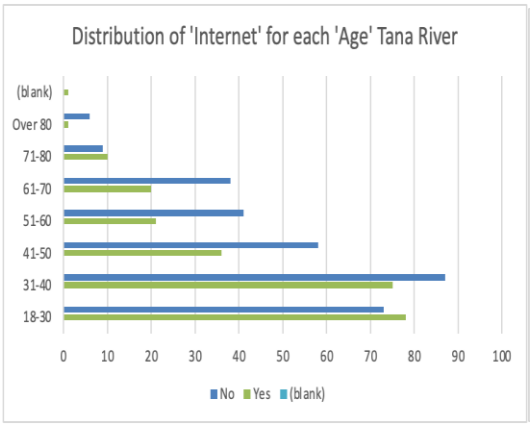


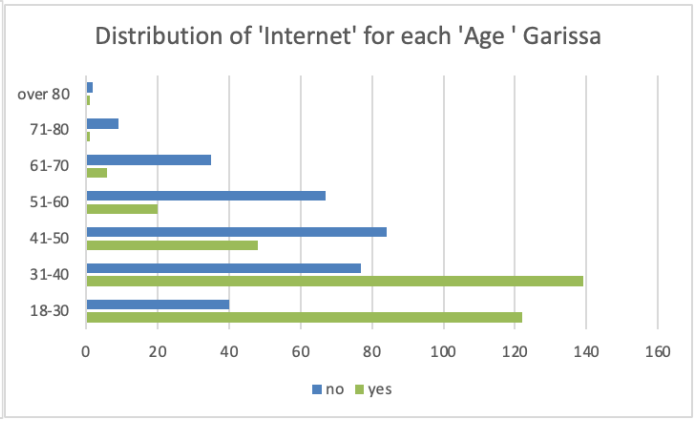
In both Tana River and Garissa Counties, the younger populations (18–30 and 31–40 age groups) demonstrated high levels of ownership to cell phones, with the 31–40 age group having the highest ownership. Conversely, the population over 80 years had the lowest access in both counties. A gradual decline in cell phone ownership was observed starting from the 41–50 age group, following a similar pattern across the two counties.



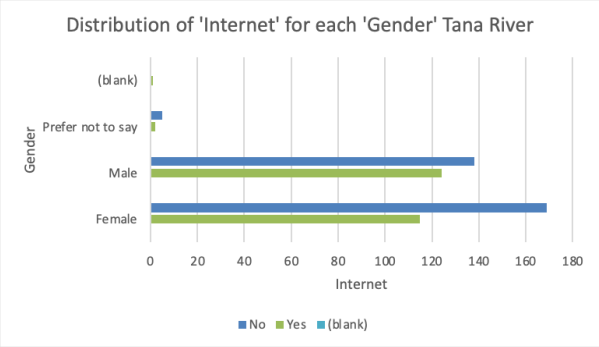


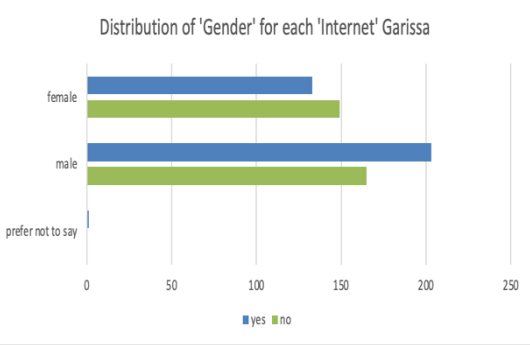
In terms of cellphone ownership by gender, women in Tana River had a higher rate of ownership compared to men. Conversely, in Garissa, men had a higher rate of cellphone ownership than women.





The age groups between 18-30 and 31-40 demonstrate the highest levels of internet access in both counties. This indicates that younger and middle-aged individuals are more connected to online platforms, likely due to their increased familiarity with digital tools and a higher likelihood of owning internet-enabled devices. The results underscore the importance of tailoring digital communication strategies to these age groups to ensure the effective delivery of weather and climate information services (WCIS).





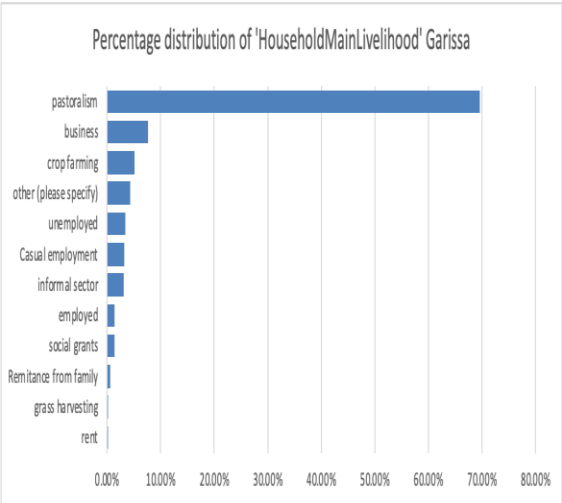
Gender disparities in internet access were evident in both counties. Men reported **higher levels of internet access** compared to women in both Garissa and Tana River. This disparity could be attributed to socio-economic and cultural factors, which may limit women's access to technology and digital platforms. Addressing these barriers is critical to ensuring equitable access to internet-based information services, particularly for weather and climate-related updates.

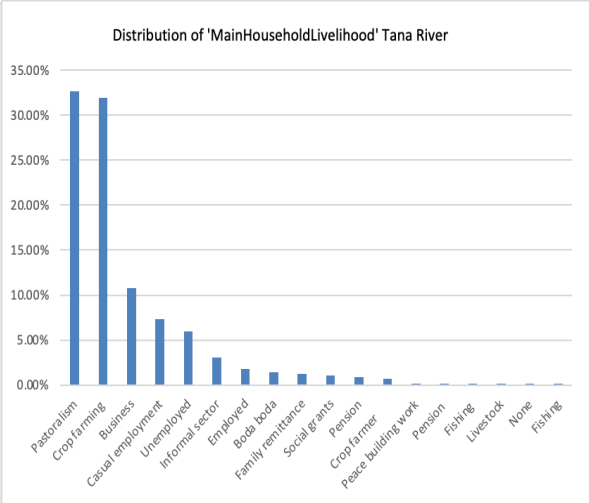
3.1.6 Physical disability

A significant number of respondents in both Garissa and Tana River Counties reported visual impairments, physical disabilities, and hearing impairments as the most prevalent physical conditions. Hearing impairment was particularly notable, while smaller groups reported other conditions, including intellectual or learning disabilities. These findings underscore the need to ensure the accessibility of materials and methods to accommodate these vulnerable populations.

Designing climate information services that address the specific needs of individuals with disabilities, particularly those with visual or hearing impairments, is essential. This includes adopting inclusive approaches such as audio formats, large print materials, braille, sign language interpretation, and accessible digital tools to ensure equitable access to vital weather and climate information.

3.1.7 Livelihood sources





In Tana River, livelihoods are diverse, with pastoralism and crop farming being the most prominent. Approximately 32.68% of the population relies on pastoralism, while 31.96% engage in crop farming, indicating a nearly equal dependence on livestock and agriculture for sustenance and income. Small-scale businesses also play a significant role, supporting 10.77% of the population. Casual employment accounts for 7.36%, reflecting the prevalence of temporary and low-income jobs. However, unemployment affects 5.92% of the population, highlighting a need for more economic opportunities.

The informal sector, comprising small-scale trading and other informal activities, supports 3.05% of the population. Other notable livelihoods include employed individuals (1.80%), boda boda (motorcycle transport) operators (1.44%), and those relying on family remittances (1.26%). Social grants and pensions account for 1.08% and 0.90%, respectively, while a small percentage (0.18%) engage in fishing and peace-building work.

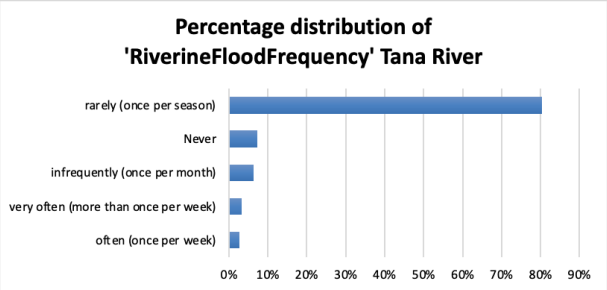
On the other hand, Garissa is heavily dominated by pastoralism, which supports 69.59% of the population. This overwhelming reliance on livestock underscores the importance of traditional pastoral activities in the region. Business is the second most common livelihood, but at 7.68%, it is significantly less prevalent than in Tana River. Crop farming plays a smaller role in Garissa, involving just 5.07% of the population.

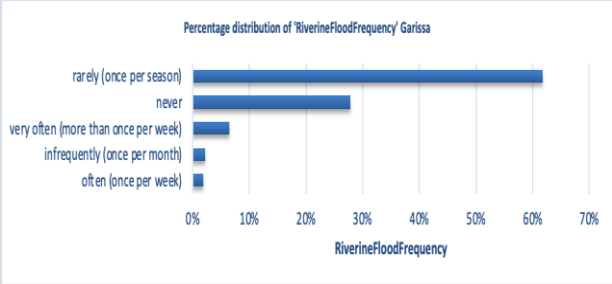
Other livelihood activities in Garissa include unspecified roles (4.30%), unemployment (3.38%), casual employment (3.23%), and informal sector work (3.07%). Both formal employment and social grants each support 1.38% of the population, while remittances from family contribute to 0.61%. Grass harvesting and rent are marginal livelihood sources, each accounting for only 0.15% of the population.

3.2 Frequency of Flooding and Drought Events

3.2.1 Riverine Floods

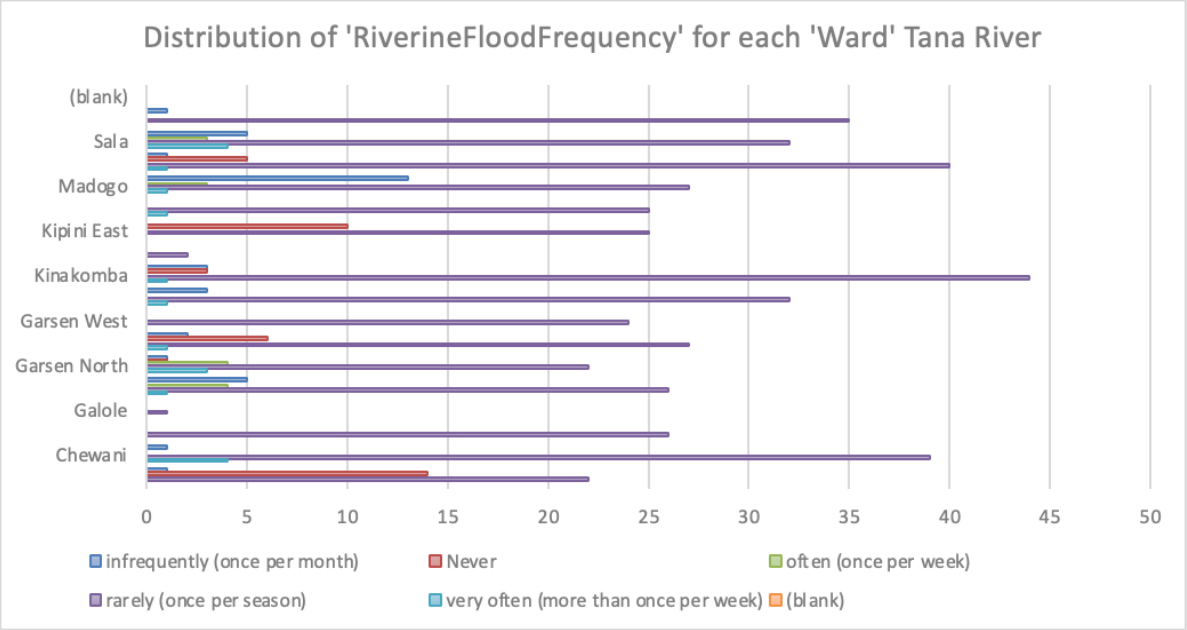
In both **Tana River** and **Garissa Counties**, riverine flooding is a significant challenge, though the frequency and impact vary across wards.

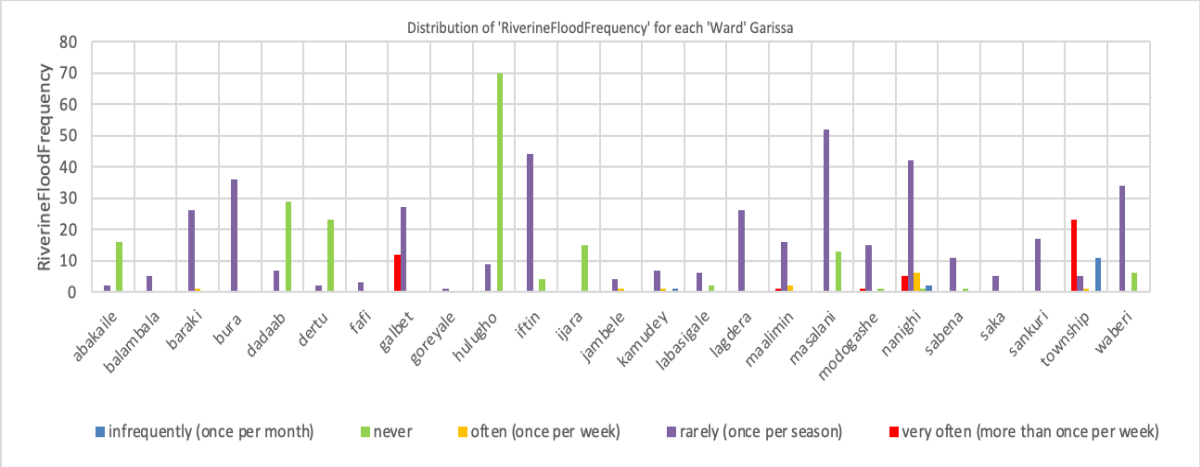




In Tana River, most floods are reported as very frequent (more than once per week), accounting for 80.76% of the total cases. Wards such as Kinakomba (44 cases), Mikinduni (40 cases), and Chewani (39 cases) are the most affected. Rare floods (once per season) account for 2.52%, primarily impacting Sala and Garsen North, while infrequent floods (once per month) represent 6.47%, mostly in Madogo and Sala. Around 7.01% of respondents reported no flooding, and 3.24% had unspecified data.

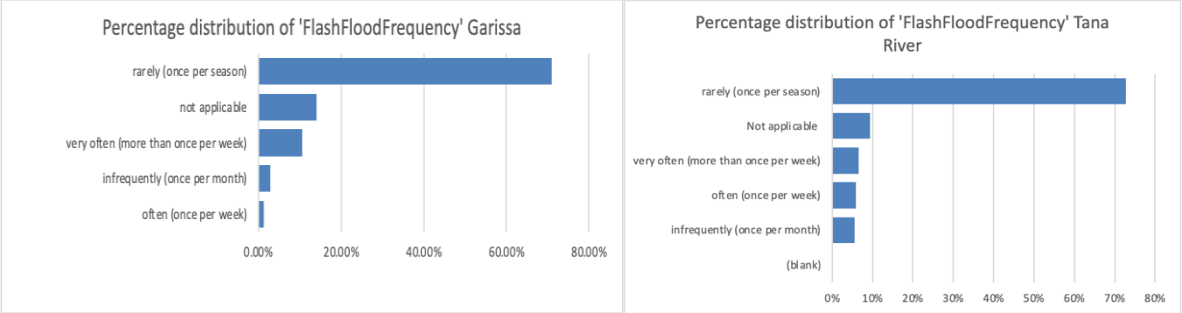
In Garissa, rare flooding (once per season) is the most common, making up 61.75% of cases. Masalani (52 cases), Iftin (44 cases), and Nanighi (42 cases) are the hardest hit. Very frequent floods (more than once per week) account for 6.45%, with Galbet (12 cases) and Nanighi (5 cases) being most affected. No flooding was reported in 27.80% of cases, with Hulugho leading at 70 cases.





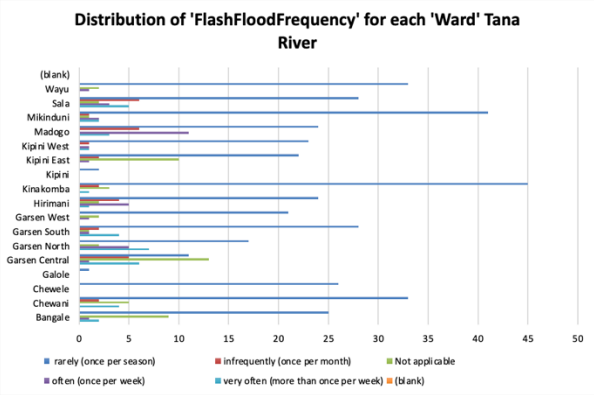
The frequency of riverine floods is closely tied to the rainy season, and the data reflects respondents' understanding of this pattern. In Tana River, very frequent flooding is the dominant issue, particularly in Kinakomba, Mikinduni, and Chewani. In Garissa, rare flooding is most prevalent, with Masalani, Iftin, and Nanighi being the hardest hit. These findings highlight the need for targeted flood management strategies, especially in wards most vulnerable to seasonal floods.

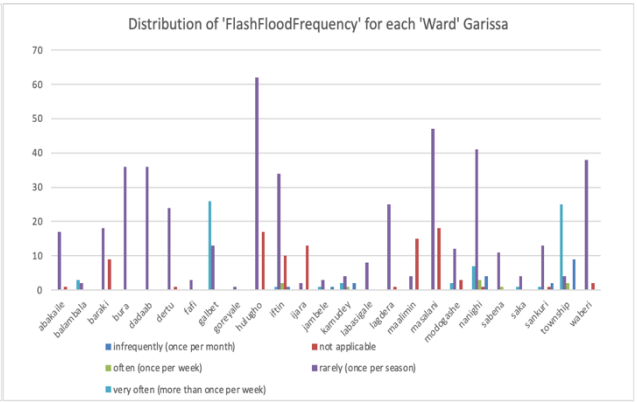
3.2.2 Flash Floods



In both Tana River and Garissa Counties, flash floods are primarily seasonal, occurring rarely (once per season) for most respondents—72.66% in Tana River and 70.97% in Garissa. A smaller proportion in both counties experience frequent flooding, with 6.47% in Tana River and 10.60% in Garissa reporting very frequent flash floods (more than once per week).

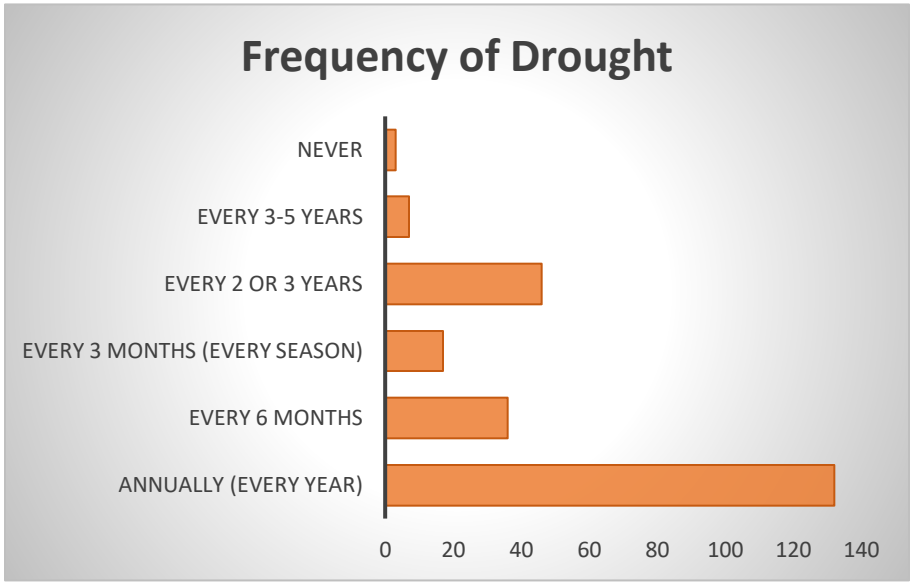
Infrequent (once per month) and weekly floods are reported at lower rates, ranging from 1.38% to 5.94% across the counties. Additionally, 14.13% of respondents in Garissa and 9.35% in Tana River report no exposure to flash floods.

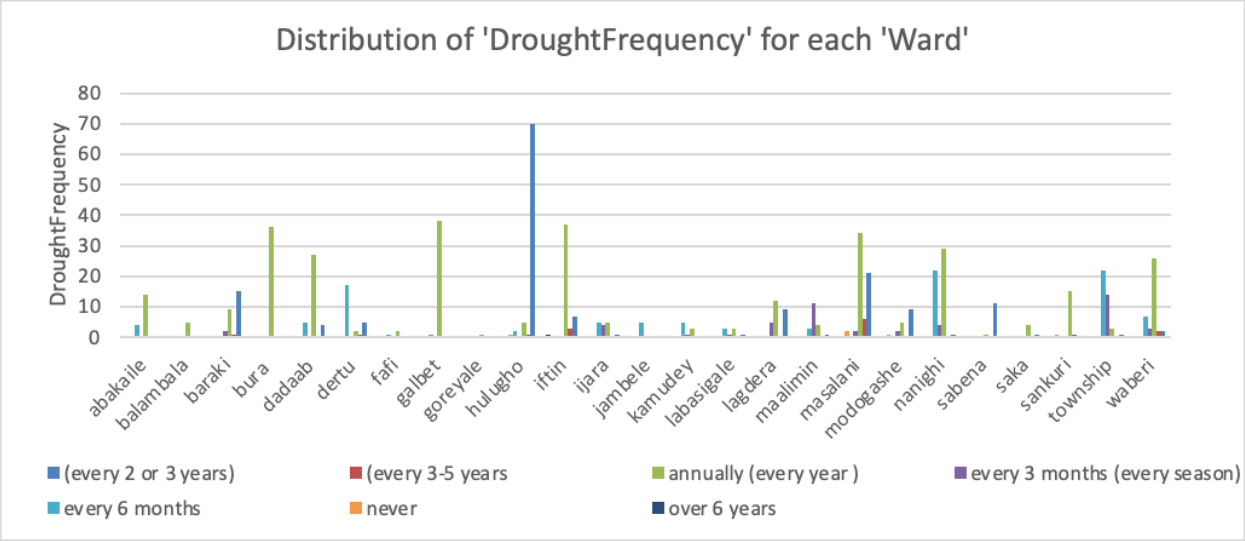




3.2.3 Droughts

A significant number of respondents experience drought annually with a considerable number experiencing drought every six months and after every 2 or 3 years. A smaller number of respondents experience drought every three months. With the least experiencing after every 3-5 years and a very small number stating that they have never experienced drought. This will aid in implementing effective water resource management and other drought mitigation strategies as well as adapting agricultural practices to drought-resistant crops and water-conservation techniques for the communities.





3.3 Impacts of Flash Floods and Riverine Floods in Tana River and Garissa Counties

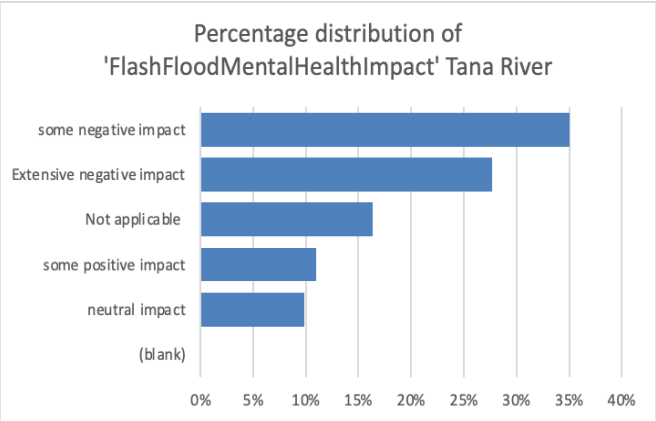
3.3.1 Impacts of Riverine and Flash Floods in Tana River and Garissa Counties

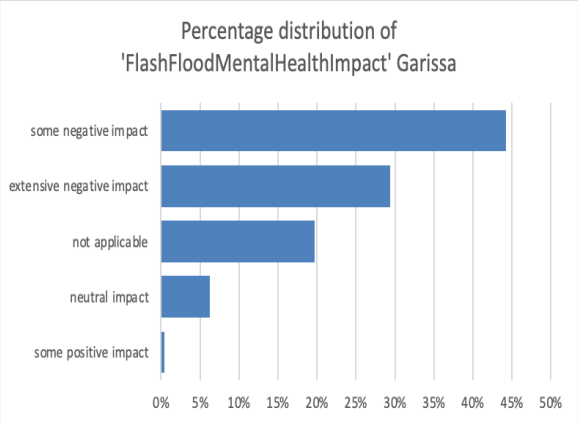
Riverine and flash floods in Tana River and Garissa Counties have profound impacts on the affected communities, particularly across four key areas: mental health, physical health, earnings, and asset loss. These impacts are often shaped by the distinct characteristics of each type of flooding and are experienced differently across gender and age groups.

3.3.1.1 Mental Health Impacts

The mental health impacts of riverine and flash floods are significant, with both types of flooding causing stress, trauma, and anxiety among affected populations. Riverine floods, due to their slow-onset nature, cause sustained psychological distress. Approximately 34.89% of respondents reported extensive negative impacts, with the highest impact seen in individuals aged 31-40 years, followed by those aged 18-30 years. Men and women reported similar levels of distress, with women frequently citing caregiving responsibilities as a source of anxiety, while men reported stress related to loss of livelihoods.

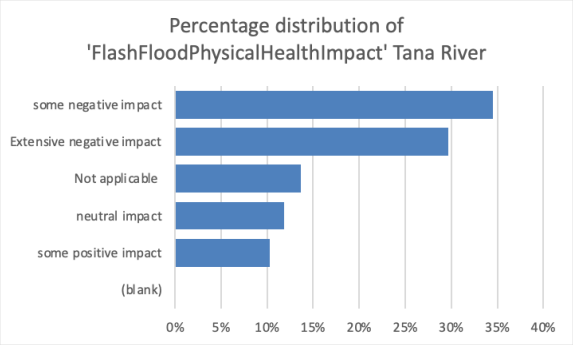
Flash floods, characterized by their sudden and devastating nature, induce acute trauma and fear. A total of 27.70% of respondents reported extensive negative mental health impacts, with the most affected being those aged 31-40 years. Women faced heightened stress from managing displaced families and the destruction of homes, while men struggled with the financial and emotional toll of sudden livelihood losses. Children also reported significant trauma, with disrupted schooling and unsafe environments contributing to their anxiety.

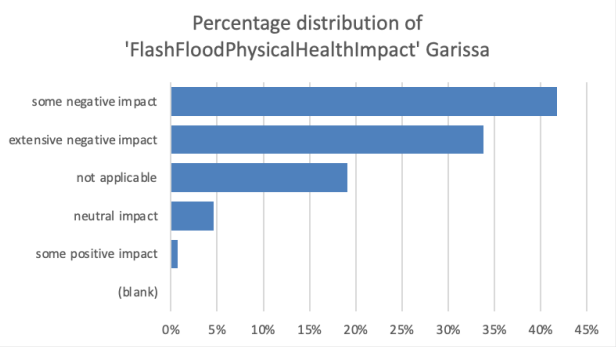




3.3.1.2 Physical Health Impacts

Physical health impacts are pronounced in both types of flooding. Riverine floods expose communities to prolonged health risks, including waterborne diseases like cholera, typhoid, and malaria. In Tana River, approximately 37.05% of respondents reported extensive physical health impacts, with the 31-40 age group most affected. Women were particularly vulnerable due to their caregiving roles and lack of access to maternal healthcare during floods, while older persons and persons with disabilities (PWDs) faced mobility challenges and heightened health risks.





Flash floods also caused severe physical health impacts, with 29.68% of respondents reporting extensive issues. The sudden onset of these floods led to immediate injuries and poor sanitation, increasing the prevalence of diseases such as diarrhea and cholera. Younger adults, particularly those aged 18-30 years, reported the highest levels of physical health impacts. Women, due to their caregiving responsibilities, bore a significant burden, while older persons and PWDs faced challenges accessing emergency healthcare.

3.3.1.3 Earnings Impacts

Floods have devastating effects on household earnings, disrupting economic activities and creating financial strain. Riverine floods caused significant and sustained economic losses, with

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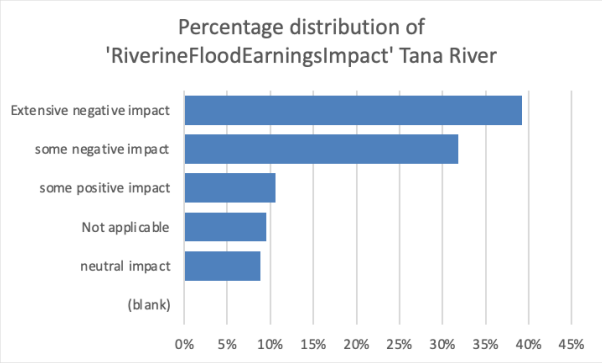
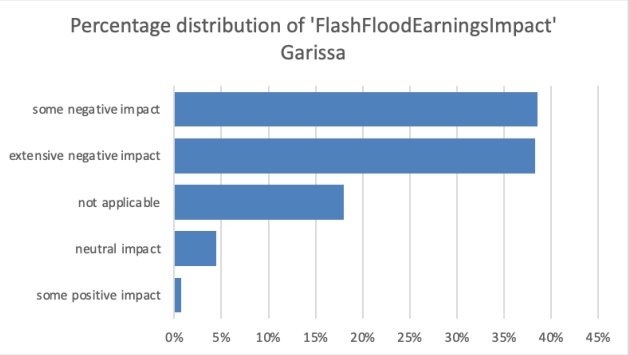
39.21% of respondents reporting extensive negative impacts. Men, who often rely on farming and livestock, experienced the highest losses due to destroyed crops and livestock deaths. Women, many of whom engage in small businesses or petty trade, faced reduced earnings as caregiving responsibilities limited their ability to participate in economic activities. Younger adults and adolescents were sometimes forced into child labor to supplement household income.

Flash floods had an equally disruptive impact, with 32.55% of respondents reporting extensive negative impacts. Farmers lost entire harvests, and small businesses, particularly those run by women, faced abrupt disruptions. Men also reported significant income losses due to the destruction of physical infrastructure, further compounding household financial struggles. Youths faced heightened economic pressures as families sought additional income to cope with losses.



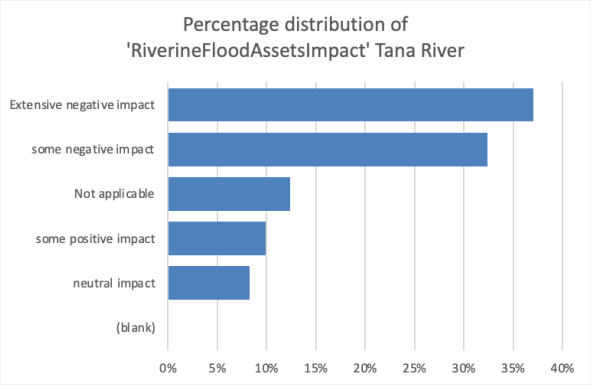


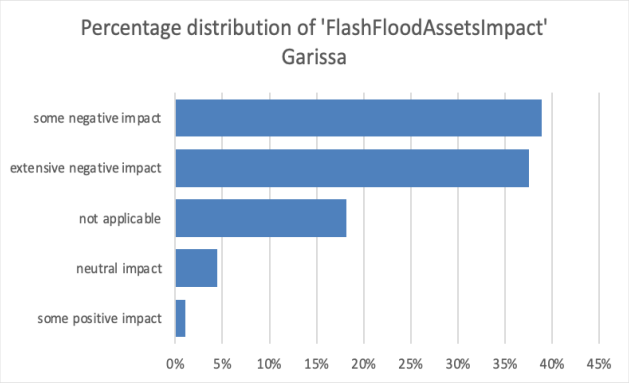
3.3.1.4 Asset Loss

Both riverine and flash floods caused widespread destruction of assets, with severe implications for households and communities. Riverine floods resulted in gradual and extensive asset damage, with 37.05% of respondents reporting significant losses. Men reported the destruction of farmland, tools, and other critical resources, while women faced the loss of household assets such as kitchen tools, livestock, and stored food. Children experienced the loss of educational materials, and older persons and PWDs struggled to salvage belongings due to mobility challenges.

Flash floods, on the other hand, caused abrupt and widespread destruction. About 31.83% of respondents reported extensive asset loss, with women disproportionately affected due to their roles in managing household goods. Men highlighted the loss of livestock and agricultural tools as major setbacks, while children suffered from the destruction of school supplies and displacement-related disruptions.

Flash floods and riverine floods in Tana River and Garissa Counties cause widespread destruction, with distinct impacts on physical health, mental health, earnings, and asset loss, affecting various demographic groups differently.

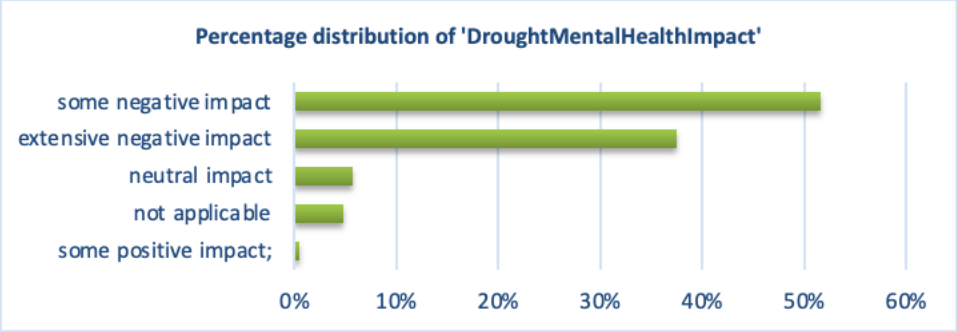




3.3.2 Impacts of Droughts in Tana River and Garissa Counties

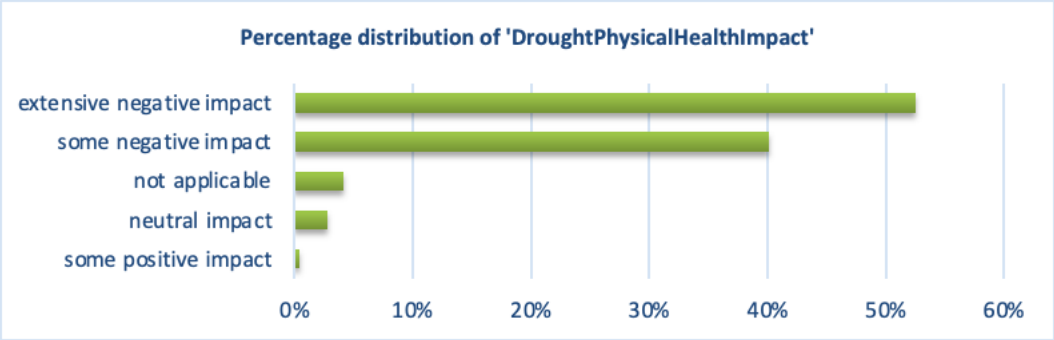
3.3.2.1 Mental Health

Drought conditions have significantly affected mental health, with 37.48% of respondents reporting extensive negative impacts. Stress from resource scarcity, economic uncertainty, and livelihood disruptions has led to widespread emotional strain, particularly among households experiencing food insecurity and forced migration. An additional 51.61% of respondents reported some negative mental health impacts, highlighting the pervasive psychological toll of drought. The burden is particularly heavy for households grappling with the combined pressures of migration, food shortages, and loss of income. Only 0.46% of respondents noted any positive mental health impacts, such as enhanced community cohesion.



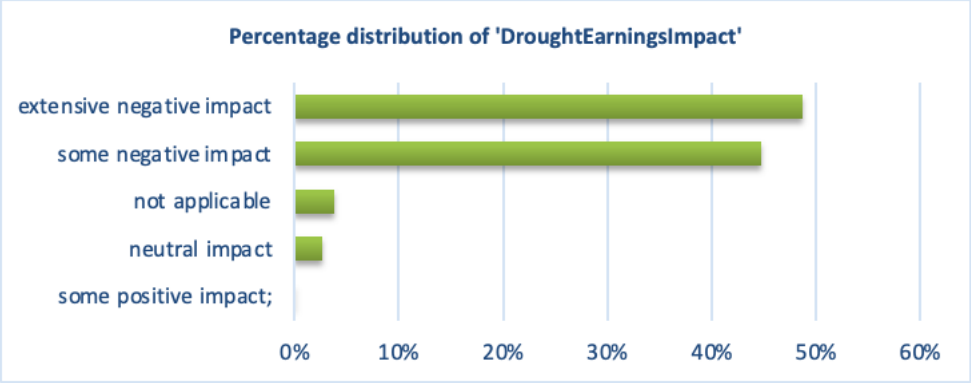
3.3.2.2 Physical Health

The physical health impacts of drought are severe, with 52.53% of respondents reporting extensive negative effects. Crop failures and livestock deaths have reduced access to nutritious food, increasing malnutrition and related illnesses, especially among children. Prolonged droughts have also exacerbated dehydration, poor sanitation, and waterborne diseases. Vulnerable groups, including children, older persons, and Persons with Disabilities (PWDs), are particularly affected. An additional 40.09% reported some negative physical health impacts, while only 0.46% noted any positive outcomes, underscoring the urgent need for food and water security interventions to safeguard health.



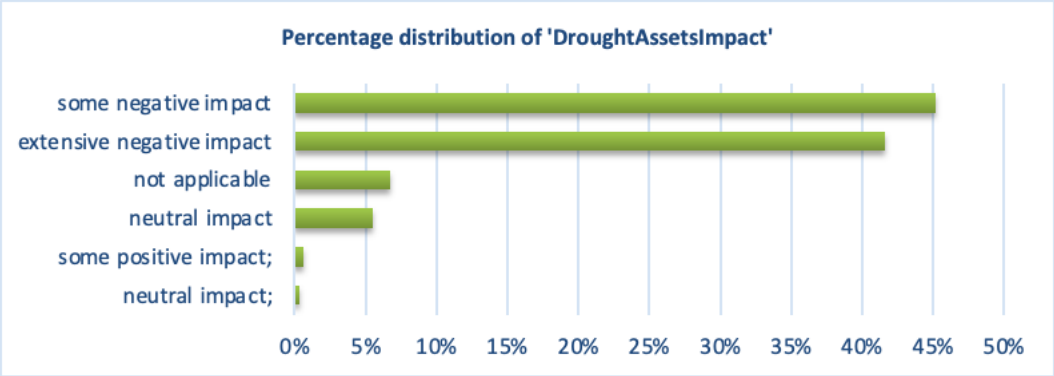
3.3.2.3 Earnings

Economic impacts have been particularly acute, with 48.69% of respondents citing extensive negative impacts on their earnings. Agricultural failures, livestock losses, and reduced employment opportunities are primary drivers of this financial strain. Another 44.70% faced some negative impacts, reflecting the widespread economic distress. A minimal 0.15% noted any positive impacts, underscoring the overwhelming economic challenges.



3.3.2.4 Asset Loss

Asset loss has significantly affected households in drought-stricken areas. Extensive negative impacts were reported by 41.63% of respondents, primarily due to the loss of livestock, farming equipment, and homes. An additional 45.16% experienced some negative impacts, while only 0.61% noted positive impacts, suggesting limited resilience strategies have been adopted. These findings emphasize the critical need for interventions to restore and protect essential resources.

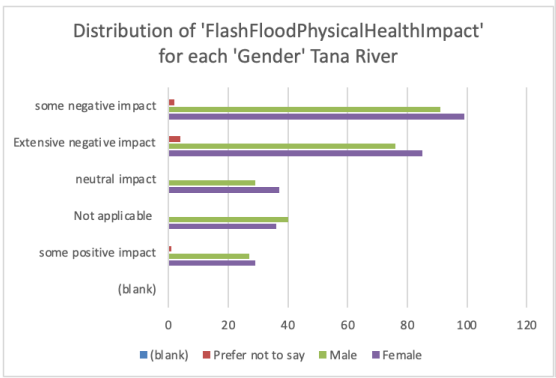


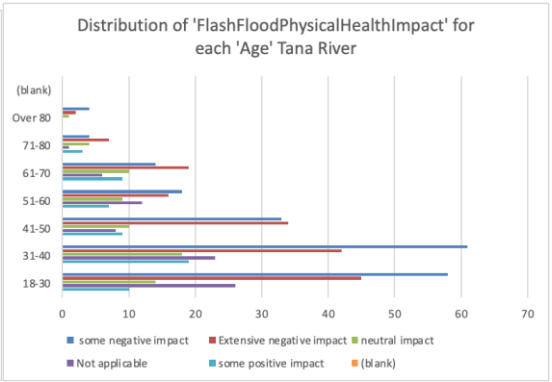
3.3.3 Riverine and Flash Floods: Gendered Impacts in Tana River and Garissa Counties

3.3.3.1 Physical Health

Riverine and flash floods significantly impact physical health in gender-specific ways. Women face increased workloads due to additional household responsibilities during and after disasters, alongside limited access to clean water and sanitation, which raises their risk of waterborne diseases. Additionally, women are at heightened risk of gender-based violence during displacement and relocation.

Men are particularly vulnerable to injuries during rescue and recovery efforts, as well as exposure to environmental hazards and pollutants. Children face increased risks of malnutrition due to disrupted access to nutritious food, heightened vulnerability to waterborne diseases and respiratory infections, and a greater likelihood of injuries during and after flash floods. Older persons experience physical vulnerabilities such as dehydration, and limited mobility, which hinder their access to healthcare. Persons with Disabilities (PWDs) are at higher risk of injury or death during flash floods due to limited mobility and access to safe shelters, as well as increased vulnerability to health complications from a lack of healthcare and assistive devices.





Addressing these impacts requires improving access to healthcare, clean water, and sanitation, while prioritizing protection measures for women, girls, and vulnerable groups during displacement.

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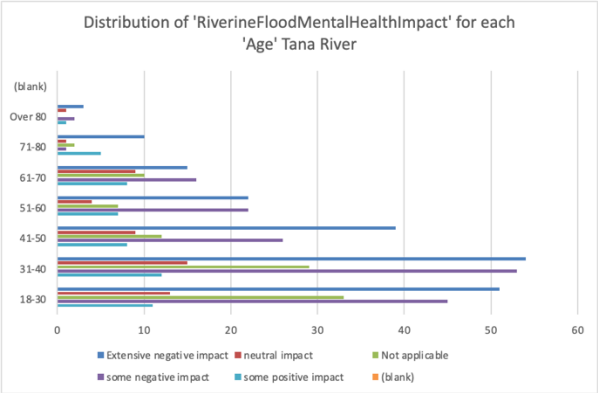
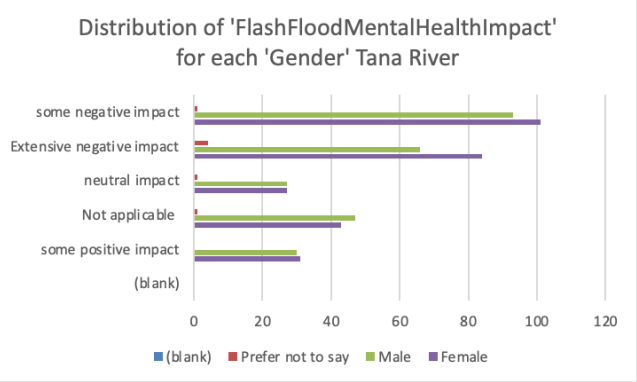
3.3.3.2 Mental Health

The mental health impacts of riverine and flash floods are profound and vary by gender and demographic group. Women often experience increased stress and anxiety due to their caregiving roles, the loss of livelihoods, and fear for family safety. Displacement, loss of social support networks, and the need to manage additional responsibilities amplify their mental health burdens. Men face stress and depression due to their inability to provide for their families and the loss of livelihoods, property, and social status, with some at risk of turning to alcohol and substance abuse.

Children are particularly vulnerable to trauma, anxiety, and depression due to witnessing violence, displacement, and the suffering of family members. School closures, disrupted education, and social isolation further exacerbate their emotional well-being. Older persons often struggle with stress, anxiety, and depression stemming from the loss of independence, loved ones, and social support networks. PWDs face heightened mental health challenges due to isolation, fear, and limited access to support services, which can lead to depression and grief.





3.3.3.3 Earnings

Floods severely disrupt household earnings across gender lines. Men often face significant income losses due to job disruptions, crop failures, and livestock deaths. Illness or injury further reduces their earning capacity, compounding financial instability. Women, who engage in informal businesses and caregiving roles, experience dual economic pressures. The destruction of farms, petty trade opportunities, and small businesses disproportionately affects their earnings, while caregiving responsibilities increase during disasters, limiting their ability to engage in income-generating activities.

Children are indirectly affected, as economic hardships lead to increased child labor, school dropouts, and disrupted education, compromising their long-term earning potential. Older persons face reduced income due to limited ability to work and insufficient access to social safety nets, leaving them more dependent on family members. PWDs encounter significant barriers to employment and income generation, becoming more reliant on others and vulnerable to exploitation.

3.3.3.4 Asset Loss

Riverine and flash floods lead to widespread asset losses, with distinct gender impacts. Men face substantial losses of critical livelihood assets such as farmlands, livestock, and tools, forcing them to sell remaining resources to support their families. Women experience depreciation of household assets, including homes, livestock, and kitchen goods. For women who rely on small businesses or farming tools for income generation, the destruction of these assets leaves them economically vulnerable.

Children lose educational materials such as books and uniforms, and disrupted schooling due to displacement hinders their educational progress. Older persons and PWDs face unique challenges as limited mobility and dependence on others hinder their ability to salvage possessions or access emergency shelters. These groups often lose essential belongings, further deepening their economic and emotional struggles.

Asset losses exacerbate existing inequalities, leaving women, children, older persons, and PWDs disproportionately affected. Recovery initiatives should include financial support for rebuilding assets, livelihood restoration programs, and equitable disaster preparedness measures to reduce vulnerabilities and foster resilience.

3.4 Economic Impact (in Shillings)

Floods and droughts in Garissa and Tana River Counties have caused substantial economic losses, significantly affecting household livelihoods and regional economies. Below is an analysis of the economic impacts of these disasters:

COUNTY	TYPE	Total Economic Losses (Kenyan Shillings)	Average Loss per Household (Kenyan Shillings)
Garissa	Riverine & Flash Floods	110,385,108	169,565
	Drought:	122,525,064	188,211
Tana River	Riverine & Flash Floods	128,732,281	186,119
	Drought:	139,234,009	197,037

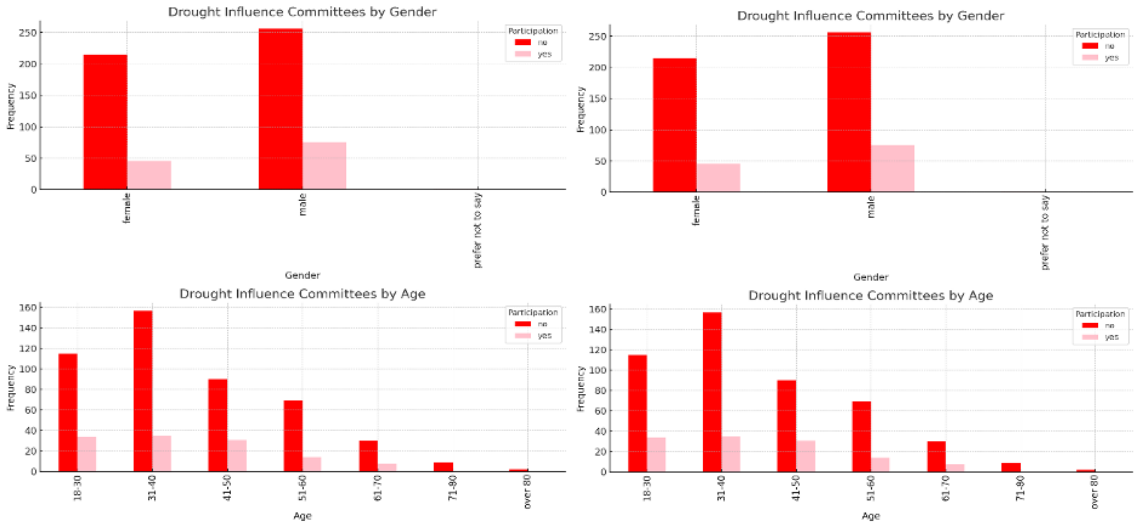
The economic losses from drought were higher than those from floods in both counties, reflecting the prolonged and pervasive impacts of water scarcity on livelihoods. In contrast, floods caused significant short-term destruction but still resulted in slightly lower overall losses. Tana River households faced higher average losses than those in Garissa, likely due to the county's dependency on agriculture and livestock, which are particularly vulnerable to both floods and droughts.

3.5 Participation in Flood and Drought Response Committees

The baseline survey reveals that participation in flood and drought influence committees remains relatively low, with 79.26% of respondents not participating in flood committees and 79.60% not participating in drought committees. However, approximately 20% of respondents indicated some level

of engagement in these decision-making processes, underscoring the potential for increased community involvement in disaster response and preparedness.

Gender-Based Participation: The findings indicate a gender disparity in participation rates, with men showing higher levels of engagement compared to women. For flood-related committees, 23.10% of men reported participating, compared to 17.70% of women. Similarly, 22.90% of men are involved in drought-related committees, compared to 17.30% of women. These differences may reflect gender-specific roles and responsibilities in community decision-making structures.



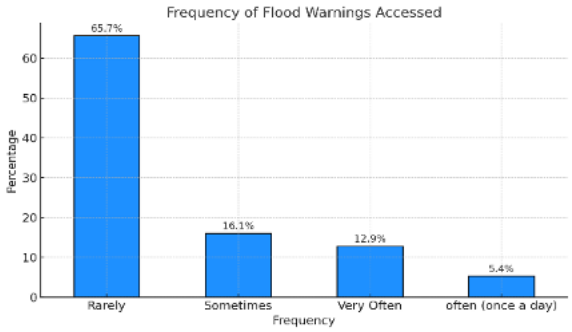
Age-Based Participation: Age is a key factor influencing participation. Younger adults aged 18-30 years demonstrate the highest levels of engagement, with 26.50% participating in flood committees and 22.80% in drought committees. This involvement suggests that the youth are an active and essential demographic in community resilience and disaster management efforts. Participation declines slightly among middle-aged adults (31-50 years), where engagement ranges between 18.50% and 22.70% for flood and drought committees. Older populations, particularly those above 70 years, show minimal or no participation, likely due to physical limitations or reduced roles in public decision-making.

3.6 Access to Flood and Drought Products

3.6.1 Access to Flood Early Warning Products

Access to flood early warning products in Garissa and Tana River counties shows significant variation, with 60-70% of respondents reporting that they receive some form of flood-related early warning information. Among specific flood products, access to flood alerts is notably high, with 90% of respondents indicating receipt. However, the situation is different for more detailed and proactive flood-related products: only 65% reported access to flood advisories, while flood watches and flood outlooks had very low access rates of 5% each. These statistics highlight the need to improve dissemination channels for less frequently accessed products to enhance community preparedness and early action.

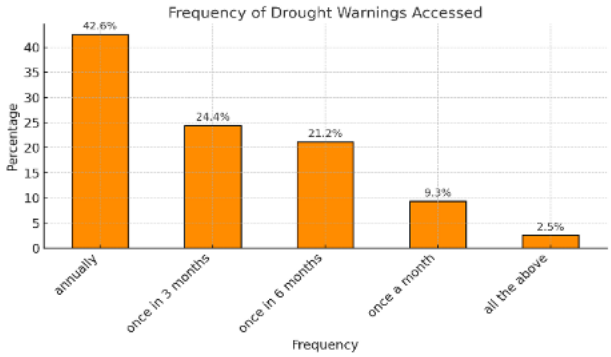
The frequency of receiving flood early warning information varies. Approximately 65.68% of respondents reported receiving updates "rarely" (once a week or less), while only 12.87% received them "very often" (more than once a day), and 16.09% reported receiving updates "sometimes" (a few times a week). This indicates a significant gap in the timely dissemination of flood information, which could hinder adequate preparation for flood events.



3.6.2 Access to Drought Early Warning Products

Access to drought early warning products is generally lower than that for flood products, with 40-50% of respondents indicating they receive drought-related information. Among specific products, drought alerts have the highest access rates (85%), followed by drought advisories (63%). Rainfall anomaly forecasts are accessible to 43% of respondents, indicating moderate reach. However, drought watches, and drought indices have notably low access rates, with only 17% and 4% of respondents reporting access, respectively.

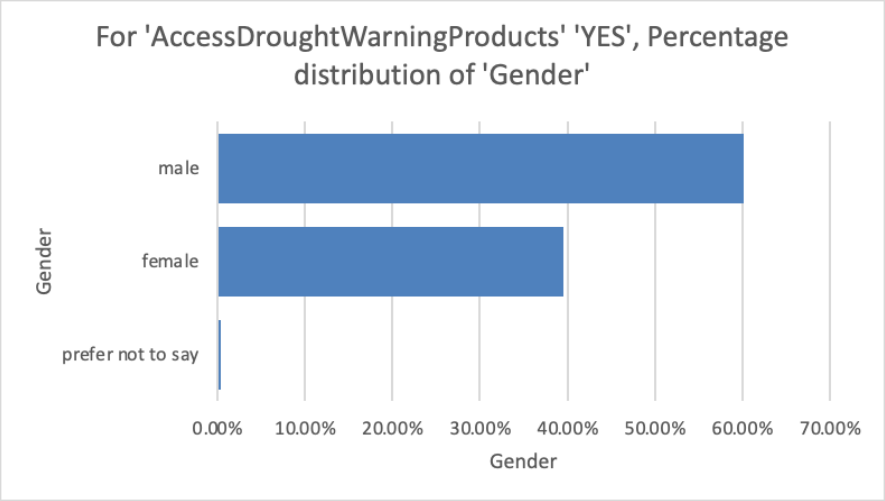
The frequency of receiving drought information is similarly inadequate, with 42.57% of respondents receiving updates annually, and 24.43% receiving updates every three months. Only 9.32% reported receiving updates monthly, emphasizing the need for more frequent dissemination to improve drought preparedness and response.



3.6.3 Role of Gender and Social Factors in Accessing Flood and Drought Products

Gender

Gender disparities are evident in access to early warning systems. For flood-related products, 57.93% of respondents accessing the information were male, compared to 42.07% female. A similar disparity exists for drought-related products, with 60.13% of men reporting access compared to 39.55% of women. These differences can be attributed to cultural norms, caregiving responsibilities, and limited mobility, which restrict women's access to formal communication channels. Women often rely on community-based networks and informal sources for information, which may lack comprehensive or timely updates. Addressing these challenges requires gender-sensitive approaches, such as using women's groups and female-friendly networks for dissemination, alongside training women as community-based early warning disseminators to bridge these gaps.



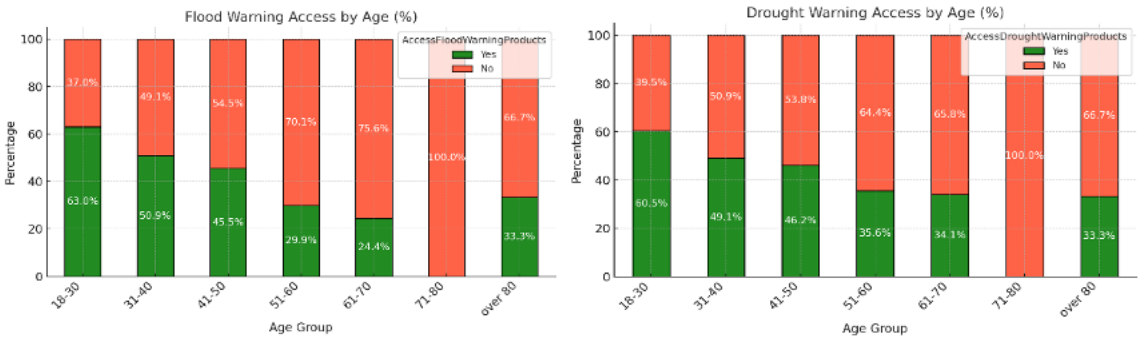
Age

The data on access to flood and drought warning products by age reveals notable disparities among different age groups in Garissa County. For flood warning products, younger individuals aged 18-30 show the highest level of access, with 62.96% reporting access to flood-related information. Access decreases with age, with only 29.89% of individuals aged 51-60 and 24.39% of those aged 61-70 having access. The trend is even more pronounced in older age groups, as no respondents aged 71-80 reported access, and only 33.33% of those over 80 indicated access to flood warnings. This pattern highlights a clear gap in reaching older populations with flood-related early warning systems, potentially due to challenges such as mobility, digital literacy, and reliance on traditional communication channels.

For drought warning products, the trends are similar. Individuals aged 18-30 again exhibit higher levels of access, with 60.49% reporting access, compared to only 49.07% among those aged 31-40. Access continues to decline with age, with just 35.63% of respondents aged 51-60 and 34.15% of those aged 61-

70 indicating access. Older populations (71-80 and over 80) show minimal to no access to drought warning products.

These findings underscore the importance of tailoring early warning systems to the needs of different age groups. Younger individuals may benefit more from digital platforms and mobile applications, while older populations may require simpler, traditional communication methods such as radio broadcasts and community-based dissemination. Efforts should be directed toward bridging the age-related gap in access by enhancing inclusivity in communication channels and incorporating mechanisms that cater to the specific needs of older populations.



Disability

Persons with disabilities face unique barriers in accessing early warning products due to physical limitations, communication challenges, and a lack of inclusive dissemination methods. Visually impaired individuals primarily rely on audio formats, such as radio or community announcements, while hearing-impaired individuals depend on visual aids, such as TV broadcasts or notice boards. Mobility challenges among physically disabled individuals hinder their access to community meetings or information centers.

Education

Education level is a critical determinant of access and comprehension of early warning products. Respondents with higher education levels demonstrated better access to and understanding of technical information, utilizing diverse channels such as online platforms and meteorological service websites. Conversely, those with lower education levels relied heavily on radio, television, and community leaders. To bridge this gap, early warning messages must be simplified and presented using both audio and visual channels/formats in local languages to improve accessibility for populations with lower literacy levels.

Livelihood

Livelihoods heavily influence the uptake of early warning products. Pastoralists and farmers, whose livelihoods are directly tied to weather conditions, exhibit higher reliance on drought advisories, rainfall forecasts, and other relevant information. In contrast, individuals in the informal and salaried sectors have lower reliance due to less direct climate impacts on their income. Tailored strategies are essential, such as utilizing livestock extension officers to disseminate information to pastoralists and agricultural advisories for farmers, ensuring that early warning systems address the specific needs of these groups.

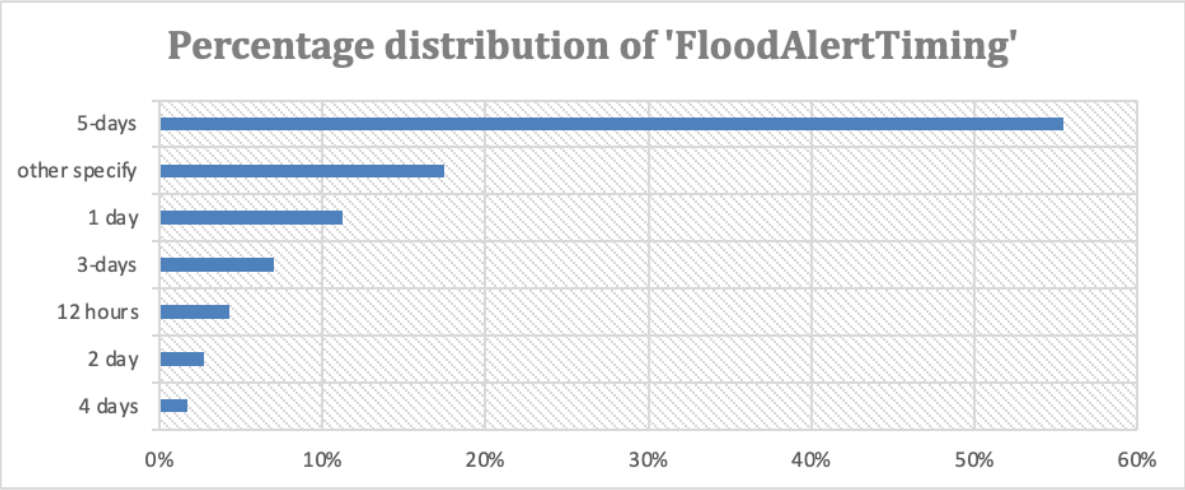
3.6.4 Key Findings and Considerations

1. **Enhance Dissemination Channels**: Increase the frequency and accessibility of flood and drought products through widely used platforms like radio and mobile alerts while integrating newer technologies such as social media and apps.
2. **Address Gender Disparities**: Design and implement gender-sensitive dissemination strategies, including targeted outreach through women's groups and female leaders.
3. **Tailor to Age and Literacy**: Provide early warning information in formats accessible to older populations and those with lower literacy levels, such as simplified language, visuals, and local dialects.
4. **Incorporate Inclusive Practices**: Develop systems that cater to persons with disabilities by incorporating assistive technologies and accessible formats in communication.
5. **Livelihood-Specific Solutions**: Develop sector-specific advisories and collaborate with local extension services to provide actionable information to farmers, pastoralists, and other vulnerable livelihood groups.

3.7 Flood and Drought Information Lead Time

3.7.1 Flood Products

The survey results show that 55.45% of respondents prefer to receive flood warnings at least 5 days in advance, indicating a strong desire for extended lead times to allow for adequate preparation. Additionally, 17.51% of respondents mentioned other preferences, which could include various considerations or alternative lead times. Smaller groups expressed preferences for shorter notice periods: - 11.21% preferred a warning 1 day before a flood. - 7.07% favored warnings 3 days in advance. - 4.30% indicated a preference for alerts 12 hours before the event. - Very few respondents indicated a preference for lead times of 2 days (2.76%) or 4 days (1.69%). Overall, the findings highlight a clear preference for earlier warnings, with the majority favoring lead times of 5 days or more. This emphasizes the importance of having proactive and timely flood warning and response systems in place.



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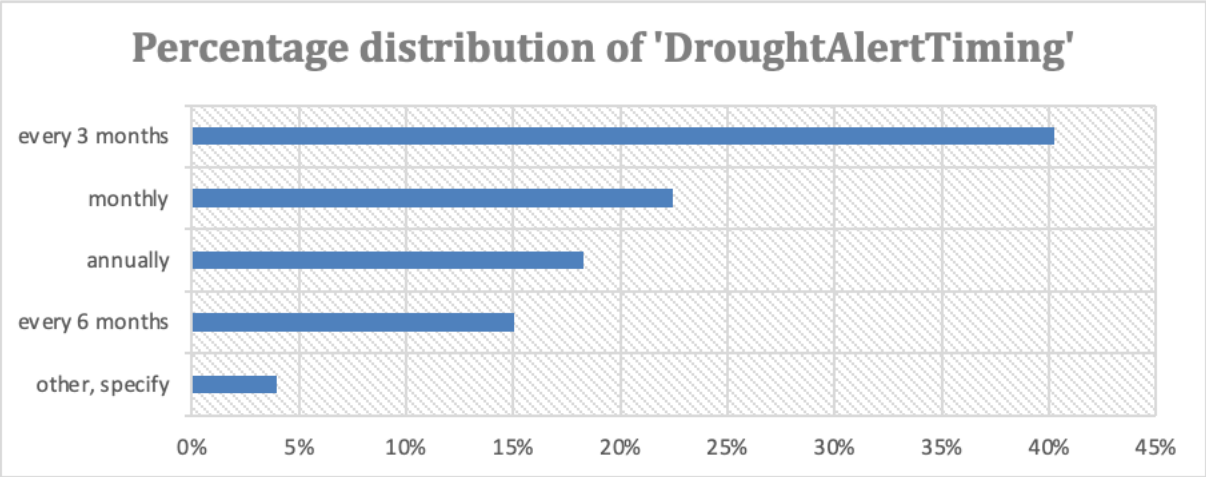
3.7.2 Drought products

The survey results indicate that 40.25% of respondents prefer to receive drought alerts every 3 months, underscoring the importance of quarterly updates for effective planning and decision-making. This preference suggests a need for regular information that aligns with seasonal changes. Additionally, 22.43% of respondents indicated a preference for monthly alerts, indicating a demand for more frequent updates to monitor changing conditions closely. Meanwhile, 18.28% prefer annual alerts, reflecting a reliance on broader, long-term projections. Furthermore, 15.05% of respondents indicated a preference for drought alerts every 6 months, which strikes a balance between seasonal updates and long-term planning. A smaller group, comprising 3.99%, specified other preferences that may include unconventional or individualized timing. Overall, the data clearly shows a preference for regular and timely drought alerts, with the majority favoring either quarterly or monthly updates to effectively address the challenges associated with drought conditions.



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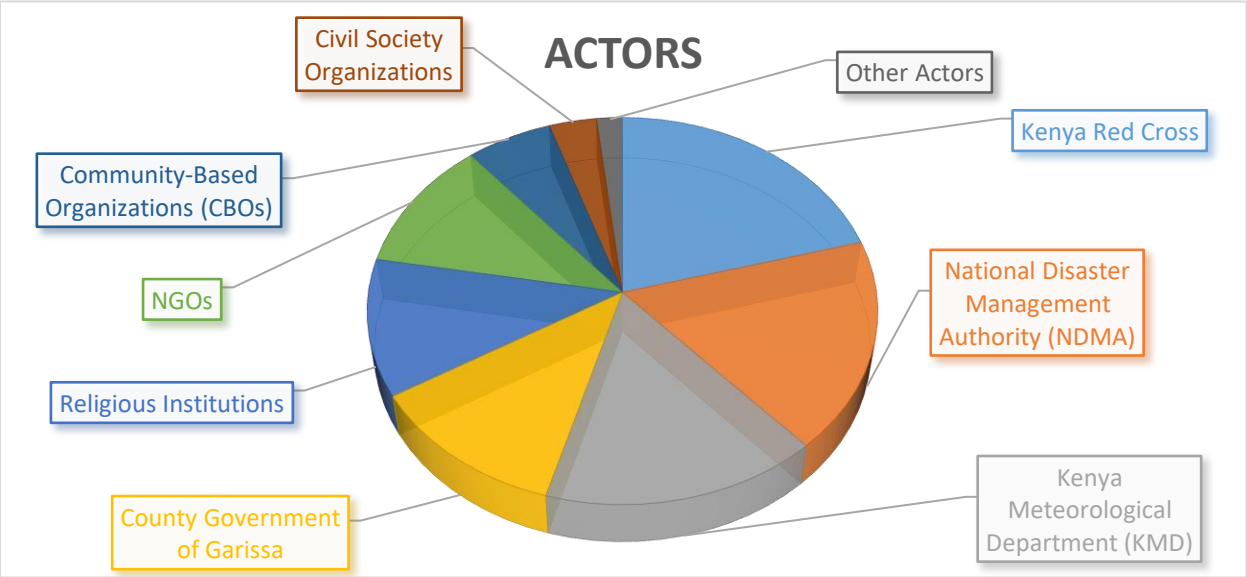
3.8 Actors Supporting Early Warning Information

The baseline survey identified several key actors supporting early warning systems in Garissa and Tana River Counties. The Kenya Red Cross Society emerged as the most frequently cited source of early warning information, reflecting its strong community presence and trust. Leveraging a wide network of volunteers and community-based organizations, the Kenya Red Cross effectively disseminates critical information. Similarly, the National Disaster Management Authority (NDMA) plays a pivotal role in coordinating disaster response and disseminating early warnings through various communication channels, ensuring broad accessibility.



The Kenya Meteorological Department (KMD) is the primary source of weather and climate data, providing essential forecasts and climate predictions that form the backbone of early warning systems, particularly for flood and drought management. County governments in Garissa and Tana River also play a vital role by offering localized early warning information through their departments of Health, Water, and Agriculture, which cater to sector-specific needs within communities.

Religious institutions, notably SUPKEM in Garissa County, leverage their strong social networks and influence to disseminate early warning information. Their trusted standing within communities ensures effective communication of critical messages. Non-governmental organizations (NGOs) such as Mercy Corps, Womankind Kenya, and PGI contribute specialized expertise in disaster response and community development, fostering trust and building strong relationships at the community level. Similarly, community-based organizations (CBOs) serve as trusted messengers, utilizing their deep knowledge of local conditions and vulnerabilities to ensure information is tailored to local needs.

Civil society organizations (CSOs) advocate for the inclusion of vulnerable populations in early warning systems, ensuring their needs are addressed. Additionally, international organizations like the World Food Programme (WFP), United Nations High Commissioner for Refugees (UNHCR), and International Organization for Migration (IOM) provide critical support during emergencies, bolstering local capacities for early warning dissemination. Collectively, these actors contribute significantly to the effectiveness of

early warning systems in Garissa and Tana River Counties, enhancing community resilience and disaster preparedness.

4. Discussion and Conclusions

4.1 Flood and Drought Impacts

Floods and droughts have consistently posed significant challenges to communities in Garissa and Tana River Counties. Riverine and flash floods are associated with immediate destruction, such as extensive asset loss, displacement, and health crises, while droughts lead to prolonged food insecurity, resource depletion, and forced migration (FAO, 2021). Vulnerable populations, including women, children, older persons, and Persons with Disabilities (PWDs), face the brunt of these impacts due to systemic inequalities in resource access and decision-making participation (UNDRR, 2020).

Drought-induced food insecurity is a key challenge in both counties, with households reporting significant reductions in agricultural and pastoral productivity. For example, droughts exacerbate malnutrition risks and reduce access to healthcare services, especially in areas with poor infrastructure (WHO, 2022). Similarly, floods increase exposure to waterborne diseases, such as cholera and diarrhea, as sanitation systems are overwhelmed (UNICEF, 2021). These dual challenges indicate the urgent need for targeted interventions to mitigate health, social, and economic vulnerabilities.

Floods and droughts severely disrupt economic livelihoods, particularly in agriculture and pastoralism, which are the primary sources of income for most households. On average, households in Garissa and Tana River Counties face financial losses ranging between KES 169,565 and KES 197,037 due to floods, and KES 188,211 to KES 197,037 due to droughts. These losses disproportionately impact women, who often shoulder caregiving responsibilities alongside reduced economic opportunities (CARE, 2020). Gender-specific challenges further exacerbate these economic strains, as women and youth have limited access to financial recovery mechanisms like credit or insurance (FAO, 2021).

Despite the negative impacts, isolated benefits have been reported, such as enhanced soil fertility from riverine floods and the adoption of innovative resource management practices during droughts. These findings align with recent studies emphasizing the potential for community cohesion and resilience-building in response to disasters (UNDRR, 2020).

4.2 State of Climate Services

The baseline assessment findings reveal that the available early warning systems and other climate services are underutilized due to structural and social barriers. Studies show that women and marginalized populations, including PWDs, often lack access to timely climate information due to limited representation in decision-making and infrastructural barriers (IPCC, 2022). Digital communication platforms hold promise, but literacy gaps and gender disparities hinder widespread adoption, particularly among older and rural populations (WMO, 2021).

4.3 Gender and Access to Weather and Climate Information Services

The baseline findings reveal critical gender disparities in the access and use of weather and climate information services (WCIS). Women and marginalized groups, such as PWDs and older persons, face significant barriers to obtaining timely and actionable climate information. These challenges are linked to literacy gaps, unequal access to technology, and sociocultural norms that prioritize men's decision-making roles. Research corroborates that men are more likely to access and act on climate information due to their greater mobility, engagement in formal labor markets, and representation in disaster management structures (FAO, 2021; IPCC, 2022).

The underutilization of WCIS by women is further complicated by their caregiving responsibilities, which limit their ability to attend community meetings or interact with digital platforms providing climate data. Meanwhile, men often dominate access to radios, mobile phones, and other tools critical for receiving early warning information. This discrepancy exacerbates the vulnerability of women and children during disasters, as they are often less prepared and lack the resources to respond effectively (CARE, 2020).

4.4 Gender and Participation in Decision-Making Forums

Gender inequalities are also evident in participation within disaster management and decision-making forums. Men predominantly occupy leadership roles in community disaster committees, with women and marginalized groups often excluded or underrepresented. For instance, men's participation in flood and drought decision-making forums is significantly higher than women's, as shown in baseline statistics: 23.1% of men reported involvement in flood-related forums compared to 17.7% of women. Similarly, 22.9% of men participated in drought-related forums compared to 17.3% of women.

This limited representation of women in decision-making restricts their ability to advocate for gender-sensitive policies and to influence resource allocation during disaster response and recovery. Women's exclusion is compounded by sociocultural norms that undervalue their contributions to community resilience and disaster management (UNDRR, 2020). However, studies indicate that integrating women's voices into climate governance leads to more inclusive and effective solutions, highlighting the need for targeted interventions to improve gender equity in these forums (WMO, 2021).

5. Recommendations

To build resilience and reduce the impacts of floods and droughts, the following targeted interventions are recommended:

1. **Strengthen Health Systems**

- Deploy mobile clinics and decentralized healthcare services during disasters.
- Integrate mental health support into disaster response programs, focusing on women, children, and PWDs. This should include community-based mental health services and structured resilience-building programs to support affected individuals in coping with climate-induced stress and trauma.

2. **Enhance Economic Resilience**

- Provide targeted financial aid to rebuild assets and restore livelihoods.
- Establish microcredit schemes and alternative income-generating programs, prioritizing vulnerable groups, including women, youth, persons with disabilities (PWDs), and older persons, to promote inclusive economic recovery.

3. Improve Climate Services

- Expand access to early warning systems through community networks, leveraging radio and digital platforms including the use of community radios, tailored digital tools, and grassroots networks, to ensure that women and marginalized groups receive timely climate information.
- Implement literacy and technology access programs, particularly for women, PWDs, and older persons, to reduce barriers to WCIS utilization.

4. Promote Inclusive Disaster Management

- Increase women's representation in decision-making committees to ensure equitable resource allocation.
- Develop community-driven resilience strategies that incorporate indigenous knowledge and address intersectional vulnerabilities.

5. Invest in Infrastructure and Technology

- Strengthen flood control systems, such as dykes and drainage channels, in high-risk areas.
- Develop inclusive information centers that cater to the needs of PWDs and older populations.

6. Capacity Building

- Conduct training programs to enhance digital literacy and the use of climate information services.
- Provide technical support to farmers and pastoralists to adapt to climate-smart agricultural practices.

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