BARRIERS AND ENTRY POINTS FOR COMMUNITY PARTICIPATION IN EARLY WARNING SYSTEMS

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Abstract
Early Warning Systems (EWS) are crucial for safeguarding communities, but are vulnerable to failure due to a technocratic focus that excludes local communities. This thesis closes the gap between normative participatory principles and practical implementation by exploring the entry points or challenges that affect community participation. Adopting a complexity theory lens, the study conducts a qualitative, instrumental case study to analyze participation in EWS in Homa Bay and Kilifi counties, in Kenya. Data were collected through 15 semi-structured individual and joint interviews and 7 focus group discussions (FGDs). A broad spectrum of stakeholders was consulted, including government officials, Kenya Red Cross Society (KRCS) staff, and community members. The results reveal that participation is primarily geared toward dissemination (Pillar III) and is mostly ad hoc and instrumental. Critical challenges include the lack of DRM planning and institutionalized procedures to include communities. These challenges reinforce unequal power dynamics and frequently regard communities as passive recipients of information. On the other hand, the study identifies important entry points, such as ensuring inclusive and decentralized communication, and leveraging existing community structures. The research highlights the importance of advancing knowledge co-creation processes and the systematic inclusion of vulnerable groups across all four pillars of EWS to establish context-sensitive and transformative EWS.

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Summary

Early Warning Systems (EWS) help reduce the consequences of hazards by generating timely and actionable alerts (UNDP, 2024). Their effectiveness is contingent upon their ability to reach all at-risk people, be understood, and the strength of the local population's preparedness and response capabilities (Baudoin et al., 2016). A lack of community participation in the EWS can contribute to weak disaster response efforts (Sufri et al., 2020a). Thus, including communities across all phases of EWS is crucial (Basher, 2006a; Baudoin & Wolde-Georgis, 2015; Kelman & Glantz, 2014; Marchezini et al., 2018; Mercer et al., 2010; Ryan et al., 2020; Villagran de Leon et al., 2007). Nonetheless, studies highlight that current EWS-related efforts tend to focus on technical considerations, and neglect the engagement of local populations (see, e.g., Baudoin et al., 2016; Kelman & Glantz, 2014; Marchezini et al., 2018; Pfeiffer et al., 2026; Sufri et al., 2020a). Additionally, there is little research on how community participation in EWS occurs in real-world contexts and on which factors can facilitate or hinder it under various circumstances (Pfeiffer et al., 2026; Sufri et al., 2020a). This thesis aims to bridge this gap by offering empirically documented findings on the factors that foster and challenge participation in EWS. This advances the state of knowledge on integrating community participation into EWS, enabling future EWS initiatives to adopt more robust participatory approaches. The thesis adopted a qualitative, instrumental case study of EWS in two Counties in Kenya—Homa Bay and Kilifi—to identify challenges and entry points for community participation. Data were collected through 15 semi-structured individual and joint interviews and 7 focus group discussions (FGDs). Numerous stakeholders were consulted, including government officials, Kenya Red Cross Society (KRCS) staff, and community members. Data were then analyzed using thematic analysis to identify themes.

The findings indicate that community participation in EWS in both Homa Bay and Kilifi is largely limited to dissemination activities, while participation in risk identification, risk monitoring, and the development of preparedness and response capabilities remains sporadic. Participation processes are largely ad hoc and instrumental, with communities often viewed as passive recipients of information instead of active participants in decision-making and knowledge production. Key challenges include inadequate communication and information-sharing systems, limited institutional planning and coordination for participation, resource and livelihood constraints, and a lack of multi-stakeholder collaboration within formal EWS processes. These factors often prevent meaningful and inclusive participation, particularly of vulnerable groups such as women, people with disabilities, and low-income households. The

study also identifies various entry points to strengthen participation across all EWS pillars. These include decentralized and localized communication systems, inclusive and two-way communication approaches, capacity development, stronger institutional coordination, and harnessing existing community structures and trusted local actors. The findings also underscore the importance of including vulnerable groups in the decision-making process and transitioning towards more inclusive participation grounded in the co-creation of knowledge by communities and institutions. On this basis, the thesis recommends strengthening institutional planning for participation across all EWS pillars, improving inclusive communication mechanisms, institutionalizing community-based structures, fostering trust through long-term relationship building, supporting local capacities and livelihoods to enable sustained engagement, and encouraging further research for scalability and generalizability. Overall, the study argues that participatory EWS should move beyond top-down dissemination approaches and towards more context-sensitive, locally embedded, and transformative processes.

Abbreviations

CBO(s)	Community-Based Organization(s)
CCA	Climate Change Adaptation
CMDRR Committee	Community-Managed Disaster Risk Reduction Committee
CT	Complexity Theory
DRM	Disaster Risk Management
DRR	Disaster Risk Reduction
EWS	Early Warning Systems
EW4ALL	Early Warnings For All Initiative
FGD(s)	Focus Group Discussion(s)
KMD	Kenya Meterological Department
KRCS	Kenya Red Cross Society
NDOC	National Disaster Operations Center
NFCS	National Framework for Climate Services (Kenya)
NDMA	National Drought Management Agency (Kenya)
PwD	People with Disabilities
SOPs	Standard Operating Procedures
STES	Socio-Technical-Ecological Systems
WRA	Water Resource Authority (Kenya)

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1. Introduction

Early Warning Systems (EWS) provide timely and actionable alerts that are crucial for protecting lives and livelihoods in the face of impending hazards (UNDP, 2024). For EWS to be effective, alerts must be received and understood by all, including the most vulnerable community members, and communities must possess preparedness and response capacities (Baudoin et al., 2016). Conversely, a failure to integrate local communities in EWS has been correlated with weak disaster response in previous events, including Hurricane Katrina in the US in 2005, Cyclone Nargis in Myanmar in 2008, and the 2014 and 2016 floods and flash floods in Aceh, Indonesia (Sufri et al., 2020a). Therefore, several studies highlight the value of engaging the local population in all stages of EWS to increase their effectiveness (see, e.g., Basher, 2006a; Baudoin & Wolde-Georgis, 2015; Kelman & Glantz, 2014; Marchezini et al., 2018; Mercer et al., 2010; Ryan et al., 2020; Villagran de Leon et al., 2007). However, in practice, EWS are often approached from a technical, single-component perspective, failing to meaningfully integrate communities from the start (Baudoin et al., 2016; Kelman & Glantz, 2014; Marchezini et al., 2018; Pfeiffer et al., 2026; Sufri et al., 2020a). At the same time, research often treats participation as a normative principle, paying less attention to how participatory processes unfold in practice and how they are shaped by different contexts (Parsons et al., 2025; Sartorius et al., 2024; Sufri et al., 2020a). Consequently, there is limited understanding of how participation unfolds in practice and what enables or constrains it across settings (Pfeiffer et al., 2026; Sufri et al., 2020a). Hence, this study aims to address this gap by providing empirically supported insights into the mechanisms that enable and challenge participation in EWS, thus advancing the knowledge on how community participation can be integrated into EWS. Additionally, it proposes a way forward for future initiatives to address these challenges and ensure meaningful participation. Ultimately, this study seeks to inform future researchers and practitioners to develop more robust and context-sensitive strategies for designing and implementing participatory EWS that actually benefit the most vulnerable. The thesis is guided by the following overarching research question: **"How can meaningful community participation be embedded in EWS?"** To answer this question, two sub-questions are explored:

1. What are the challenges for embedding community participation in EWS?
2. What are the entry points for embedding community participation in EWS?

As extreme weather events become increasingly frequent and intense (IPCC, 2022), EWS have become an essential disaster risk management (DRM) and climate change adaptation

(CCA) strategy (Coughlan de Perez et al., 2022; Cuevas, 2012). Their importance has been recognized by various international disaster risk reduction (DRR) agendas, including the 1994 Yokohama Strategy and Plan of Action for a Safer World (ISDR, 1994), the 2005 Hyogo Framework for Action (ISDR, 2005), and the Sendai Framework (UNDRR, 2015). The latter also emphasizes the importance of strengthening people-centered EWS, developed through participatory processes, adapted to local needs, inclusive, and which employ simple and inexpensive tools and processes (UNDRR, 2015). Similarly, the first and second Multi-Hazard Early Warning Conference, which took place in 2017 and 2019, respectively, advocated for the inclusion of civil society organizations and local communities in EWS, including through training, education, and awareness raising (Sufri et al., 2020a). However, participation is not intrinsically transformative. Participatory approaches may assign responsibilities to communities and overshadow the role of governments in DRR if they do not address underlying power dynamics and structural vulnerabilities (Gladfelter, 2018; Scolobig et al., 2015). This emphasizes the need to analyze the dynamics of participation in practice, and the specific conditions under which they unfold.

The existing literature identifies various challenges and entry points for community participation in EWS. Key barriers include the absence of formalized procedures for participation and a lack of inclusion in institutional frameworks (Clegg et al., 2021; Sufri et al., 2020a, 2020b), limited awareness of EWS benefits, and fatalistic values (Sufri et al., 2020b). Limited inclusion of vulnerable groups, integration of local and traditional knowledge, and resource scarcity can also negatively affect community participation (Mustafa et al., 2015; Sufri et al., 2020b). On the other hand, collaborating with key community figures and groups (Clegg et al., 2021; Fletcher et al., 2013; Gianisa & Le De, 2017; Sufri et al., 2020b) and using trusted communication channels (Baudoin et al., 2016) and structures (Sufri et al., 2020b) can foster participation. Having clear governance structures and responsibilities, institutionalizing participation (Clegg et al., 2021; Sufri et al., 2020b), and fostering DRM knowledge acquisition and exchange also promote community engagement (Baudoin et al., 2016; Clegg et al., 2021).

To identify the barriers and entry points for community participation in EWS, this thesis adopts a qualitative, instrumental case study of the EWS in Homa Bay and Kilifi counties, in Kenya. The two counties are exposed to numerous hazards, including floods, droughts, and hailstorms (Linne et al., 2013; Wambua, 2019), making a study of participatory EWS particularly relevant, as participation and inclusiveness are key to developing multi-hazard

EWS (Budimir et al., 2025). Various data collection methods were adopted to explore participation in the EWS from different angles: semi-structured individual and joint interviews with various stakeholder groups and focus group discussions (FGDs) to explore the perspective of community groups, including women, people with disabilities (PwD), and members of local community-managed disaster risk reduction (CMDRR) committees. This data collection endeavor allowed the researchers to gain a broader understanding of how community participation works in practice in the context under investigation, and subsequently identify key enabling factors and challenges to effective participation in EWS, based on which actionable recommendations for practitioners were developed.

Following this introductory chapter, **Chapter 2** presents the methodological approach in further detail. It outlines complexity theory as the theoretical lens and explains the methodology and methods adopted to collect and analyze data. **Chapter 3** outlines the state of the art, highlighting key literature on the topic. **Chapter 4** then introduces the conceptual framework of this study, introducing the concepts of EWS, community participation, community participation in EWS, power, and knowledge co-creation. Thereafter, **Chapter 5** describes the case study context, and **Chapter 6** presents and discusses the results of the data analysis. Lastly, the study's conclusions are drawn in **Chapter 7**.

2. Methodology and Methods

2.1. Theoretical Lens: Complexity Theory

This study uses complexity theory (CT) as a fundamental lens to understand how community participation in EWS unfolds in dynamic, multi-actor environments. Complex systems are characterized by their non-linearity, interdependence, and evolving relationships among their elements (Becker, 2023). Importantly, CT emphasizes emergence, which is the notion that interactions among elements, rather than single or isolated events, produce system-level outcomes (Becker, 2023). Consequently, challenges and enabling factors can be viewed not as static characteristics of individuals or institutions, but rather as emergent characteristics of the system. In this sense, challenges are understood as factors that hinder community participation and entry points as factors that promote it, as understood and presented by the participants of this study. In this thesis, CT focuses on the relational dynamics that shape how participation is incorporated across EWS elements. Adopting this framework allows an in-depth analysis of how these elements interact and influence one another, while unveiling system-level challenges and enabling factors for enhancing and scaling meaningful community participation. As the study follows an inductive logic of inquiry, CT is utilized not as a model to be tested, but as an underlying perspective that shapes the lens taken in interpreting patterns, as well as developing and analyzing data collection materials.

To establish complexity theory in the concrete contexts where EWS operate, this study focuses on socio-technical-ecological systems (STES). STES combines social, technical, and ecological dimensions to understand how complex systems function (McPhearson et al., 2022). This integrated lens is especially useful for this research as it highlights the interdependencies and feedback loops through which system elements shape one another over time. Consequently, it enables exploration of how changes in one element create knock-on effects on stakeholder engagement and community participation pathways. STES strengthens the study's theoretical foundation by: (1) integrating participation into a broader system of multi-sector relations; and (2) facilitating the understanding of challenges and enabling factors as outcomes of interactions across social, technical, and ecological dimensions rather than as sector-specific.

2.2. Methodology

This thesis adopts a qualitative, instrumental case study of the EWS in the Kenyan counties of Homa Bay and Kilifi to identify the barriers and opportunities for community participation in

EWS. A qualitative methodology is particularly appropriate for this research because it enables the study of meanings, perceptions, and lived experiences that quantitative methods alone cannot adequately capture (Tisdell et al., 2015). As this thesis aims to understand not only whether participation occurred but also how it was experienced by various stakeholders—including members of the community, Kenya Red Cross Society (KRCS) employees, and local government officials—a qualitative approach allows access to the contextual understandings and other interpretations that shape participatory processes. According to Creswell (2013), a case study includes the exploration of a contemporary, real-life case within a specific context. This approach allows researchers to generate a contextual and thorough understanding of a research issue (Creswell, 2013). It thus appears suitable for investigating complex social processes, such as community participation in EWS. This case study is instrumental, as it aims to generate insights into an issue, going beyond the particular case investigated (Creswell, 2013), to the extent permitted by the context-dependent nature of participation. In this sense, while the results will be determined by the particular context of these EWS, the analytical insights produced can contribute to theoretical understandings of participatory EWS. The thesis's inquiry is inductive, as data will be gathered to establish patterns and meanings to inform the presentation of challenges and entry points on engaging the community in EWS.

The case study selected for this thesis is the EWS in the two counties of Homa Bay and Kilifi. Multiple factors justify this selection. First, the context of EWS in Kenya is particularly interesting to study community participation. Overall, Kenya is exposed to numerous natural hazards found in different configurations in distinct areas of the country (Ministry of Interior and National Administration, 2025). More specifically, Homa Bay and Kilifi counties are vulnerable to several climate-related hazards, making a study on participatory EWS particularly relevant, as participation and inclusiveness are key to the development of multi-hazard EWS (Budimir et al., 2025). Kilifi County, located in the Kenyan coastal region, experiences droughts and floods (Wambua, 2019), and Homa Bay, located on the shores of Lake Victoria, experiences drought, floods, hailstorms, and strong winds (Linne et al., 2013). At the same time, one of the strategic objectives of the new National Disaster Risk Management Strategy 2025-2030 is to "establish and strengthen institutional mechanisms and capacities for disaster risk management, including early warning systems" (Ministry of Interior and National Administration, 2025, p. 20). Against this background, this research is an interesting academic endeavor with high practical relevance. Second, Kenyan EWS are

characterized by their multi-stakeholder nature, involving national ministries, local government officials, KRCS staff and volunteers at all levels, and a diverse pool of community members and community-led groups. This offers an excellent example for exploring their collaboration through a complexity lens. Additionally, the power relationships and knowledge hierarchies—at the heart of this thesis's conceptual framework—become more visible thanks to this multi-stakeholder structure. Lastly, the collaboration with the UNDRR Regional Office for Africa and, through them, the KRCS allowed access to key EWS stakeholders. KRCS has supported EWS for years and established accountability-based frameworks for community participation (Kenya Red Cross Society, 2019). This allows for the analysis of patterns, challenges, and entry points.

2.3. Data Collection Methods

2.3.1. Introduction

A key characteristic of case studies is that they rely on multiple data collection methods (Gray, 2014). The gathering of different types of evidence allows for the measurement of the same phenomenon in different ways (Gray, 2014), which helps determine if the results are consistent, as well as gain a more thorough understanding of the issue at hand (Morgan, 2022). This ultimately serves to establish the validity of the results (Gray, 2014). This thesis uses a combination of semi-structured interviews with individuals, joint interviews, and focus group discussions (FGDs) to explore participation in the EWS from multiple angles. The following sections discuss each of the three data collection methods in more detail.

2.3.2. Semi-structured individual and joint interviews

Semi-structured individual and joint interviews were conducted to explore stakeholder experiences and identify patterns in community participation in EWS. As a data collection method, interviews aim at understanding "the lived experiences of other people, and the meaning they make of that experience" (Gray, 2014, p. 709). Additionally, joint interviews—which explore two people's perceptions of a phenomenon at the same time—can help to confirm and complement people's experiences (Gray, 2014).

Semi-structured interviews were conducted because they are particularly useful for capturing first-hand knowledge and experiences of key stakeholders. Karatsareas (2022) describes semi-structured interviews as a method that combines a pre-planned interview protocol with the freedom to delve into new subjects with impromptu follow-up questions. The flexible nature of semi-structured interviews allowed the researchers to delve into what participation looks

like in practice, while also paying particular attention to its specific forms and how it is experienced differently among stakeholders. Semi-structured interviews primarily use open-ended questions that encourage participants to elaborate on their ideas and to create narratives from their personal experiences (Karatsareas, 2022). According to Kallio et al. (2016), follow-up questions enable the interviewer to acquire more nuance by building on participants' answers. Utilizing this method allows researchers to focus on the discussion, making sure important subjects are covered, while being receptive to new and interesting insights that are shared throughout the interview (Karatsareas, 2022). These were particularly helpful to explore in-depth individual experiences while recognizing and further exploring certain unexpected themes that emerged during the conversations.

Purposive sampling was used to select participants to capture a range of perspectives. As a result, three stakeholder categories were determined as crucial for exploring participation from various angles and levels through interviews: (1) faith-based leaders, (2) KRCS staff, and (3) local government representatives. These stakeholder groups were selected because they play different but interconnected roles in the local EWS. Local government officials act as intermediaries between the communities and higher-level government bodies and can provide insights into how decisions are made and how policies are put (or not) into action. KRCS staff can offer perspectives on the operationalization of EWS and community engagement practices. Lastly, faith-based leaders—as key actors trusted by community members—can offer more nuanced insights into community lived experiences and their priorities. The perspectives of other actors, such as community members or local disaster management teams, were gathered through FGDs, and were hence not included through interviews. This approach reflects the thesis's goal of unveiling both challenges and enabling factors from different angles.

Close collaboration with the KRCS county coordinators enabled the selection of participants with valuable perspectives who were available to share their experiences. The final sample of interviews was determined when data saturation was achieved across diverse stakeholder groups, with interviews continuing until no new themes emerged. A total of 11 individual interviews were conducted across the two counties: 2 with KRCS local and regional staff members, 8 with local government officials, and one with a community representative. Additionally, two joint interviews were conducted in Homa Bay: the first with a local ward chief and the local DRM chair, and the second with a local ward assistant chief and a faith-based leader. Table 1 offers a more detailed breakdown of the people interviewed.

Interviewees	Homa Bay	Kilifi	Total
KRCS staff	1	1	2
Local government officials	6	5	11
Local faith-based leaders	1	0	1
Local community representative	0	1	1
Total	8	7	15

***Table 1**: Number of interviewees by location and stakeholder type*

The interview guide included a prepared framework of thematic areas and related questions intended to strike a balance between responding naturally to each participant's responses and the circumstances of each interview, while maintaining consistency across conversations. The discussion was centered around a number of open-ended questions from each theme section. These thematic areas emerged from fundamental analytical dimensions in the literature: knowledge co-creation processes, power dynamics, forms of community participation across EWS components, and participation-enabling factors and challenges. The interview guides are provided in **Appendix A**.

The interviews were conducted between March 17, 2026, and March 27, 2026, in Homa Bay and Kilifi Counties and lasted 12 to 35 minutes (see **Appendix B**). To ensure ethical standards in data collection and analysis, various steps were taken, following the guidance of the Social Research Association (2021). First, interviews and FGDs—introduced in the upcoming section—were conducted in accordance with the principle of informed consent. Participants were clearly informed about the purpose of the research project, what their participation entailed, and that they could withdraw their consent at any stage of the process and for any reason. It was specified that (non)participation would not affect people's involvement in KRCS and UNDRR projects. After receiving the information, participants were free to decide whether to proceed with the interview or the FGD, retaining the right to withdraw their consent at any time. The consent forms used can be found in **Appendix C**. Confidentiality and anonymity were ensured by only collecting personal data that is relevant to the research (county and stakeholder type) and anonymizing participants. The data was stored on a local, encrypted, and password-protected hard drive and will remain there until 2033.

2.3.3. Focus Group Discussions

As a second data collection method, FGDs were conducted. FGDs are a qualitative research method widely used to gain a thorough understanding of social issues by gathering information from a specifically selected group of participants (O.Nyumba et al., 2018). O. Nyumba et al. (2018) contend that this method relies on group dynamics to generate insightful data, as participants build on one another's perspectives and share their opinions in a highly interactive setting. Additionally, FGDs provide participants with a platform to create their own narratives on subjects such as inclusion and participation, while also enabling the researcher to collect in-depth data (O.Nyumba et al., 2018).

In this thesis, this method was selected to more closely investigate the inclusion of the perspectives and needs of women and people with disabilities, allowing participants to build on one another's perspectives and share their views. FGDs were also used to explore the experience of community-managed disaster risk reduction (CMDRR) committee members and a community-based organization (CBO). The participants were selected using purposive sampling. Following Krueger's (2014) guidance that participants should share similar characteristics to encourage willingness to interact, homogeneous groups were formed in each county. More specifically, for each county, the following FGDs were conducted: one FGD with 9-12 women from the community and one with 12-13 people with disabilities or their caretakers. Additionally, FDGs were conducted with 8-10 community members involved in CMDRR committees or CBOs. This group size is thought to be both manageable and sufficient to prevent fragmentation, while still being large enough to obtain a range of viewpoints (O.Nyumba et al., 2018). Overall, four FGDs were conducted in Homa Bay and three in Kilifi, for a total of seven FGDs across both sites. Based on the desired objectives for each FGD, local KRCS networks were used to recruit participants. This leveraged existing community ties, making it efficient and effective for identifying relevant participants. The FGDs were conducted between March 18, 2026, and March 26, 2026, and lasted 30 to 82 minutes. A detailed list is provided in **Appendix B**, and the FGD guide is attached in **Appendix A**.

Stakeholder group	**Homa Bay**	**Kilifi**	**Total**
Women	1 (9 participants)	1 (12 participants)	2 (21 participants)
PwD and caretakers	1 (13 participants)	1 (11 participants)	2 (24 participants)
CMDRR Committee members	1 (8 participants)	1 (10 participants)	2 (18 participants)
CBO members	1 (10 participants)	0	1 (10 participants)
Total	4 (40 participants)	3 (33 participants)	7 (73 participants)

***Table 2**: Number of FGDs and participants (in brackets) by location and stakeholder type*

2.4. Data Analysis

To analyze the collected data, a thematic analysis was chosen. Thematic analysis aims to identify and investigate patterns in qualitative data (Ahmed et al., 2025), making it a suitable method for identifying barriers and enabling factors influencing community participation in EWS. This study took an inductive approach to the analysis, letting patterns emerge from the data, rather than determining them in advance based on a theoretical stance (Gray, 2014). In line with Braun and Clarke's (2006) guidance, the recurrence of a theme in the dataset was used as a criterion to recognize it as such; however, its importance was determined by how meaningfully it contributed to answering the research question, rather than by how frequently it emerged.

The thematic analysis followed the six-step approach developed by Braun and Clarke (2006). The researchers first familiarized themselves with the dataset by transcribing data, reading it in its entirety, and annotating some preliminary thoughts. Interview and FGD transcripts were generated using Turboscribe, and analysis was conducted in NVivo to facilitate a systematic approach. After transcription, initial codes were generated in NVivo and then used as a basis for identifying themes (third step). The fourth step involved revising themes and creating a thematic map aligned with the research question. In the fifth step, themes were clearly defined and named. Lastly, an academic report was written that included meaningful examples from the data. The process was iterative: codes and themes were revisited various times to refine the analysis.

2.5. Limitations

2.5.1. Methodological Limitations

Case studies have various methodological limitations. First, clearly defining and operationalizing concepts to achieve construct validity can be challenging, especially when managing complex concepts (Gray, 2014), such as participation. To try to clearly operationalize the concept of participation, the researchers conducted extensive research on existing frameworks. Second, case studies tend to have limited generalizability, as the findings might not be representative of the wider population (Gray, 2014). To potentially control for a contextual factor and enhance generalizability, this thesis collected data in two distinct Kenyan counties. Nonetheless, not all results might apply to contexts outside of (rural) Kenya. Third, reliability, in other words, the possibility of external researchers

replicating the study, can be an issue for case studies (Gray, 2014). To tackle it, procedures were described as precisely and accurately as possible, and materials such as interview guides were appended.

Interviews and FGDs also faced some constraints. The need to rely on external translation during some activities may have affected the researchers' ability to grasp the nuances of participants' answers. Moreover, the KRCS, as a mediator, may have been subject to its own biases in supporting the sampling of participants. To mitigate this bias, researchers engaged in open conversations with the KRCS staff about the selection process, ensuring that the sampling would align with the objectives of data collection. The link between the research being carried out, the KRCS as a mediator, and the upcoming UNDRR project may have influenced the way interviewees expressed themselves, for instance, refraining from fully expressing critical points regarding the KRCS's engagement with communities. To minimize artificiality, researchers clearly communicated to participants that critique is valuable for both the research and future projects. However, since KRCS staff were present during interviews and FGDs to support with translation, the risk of artificial responses persisted.

2.5.2. Biases and Values

To enhance the reliability of data collection and analysis, two triangulation measures were adopted. Aside from collecting data through various methods, investigator triangulation (Gray, 2014) was embraced to minimize researcher bias and fully take advantage of the team nature of the research. During the data collection stage, this was achieved by ensuring that two observers were always present in field settings. In the data analysis, it was achieved by initially conducting coding independently, and only subsequently harmonizing the results.

Researcher triangulation, together with reflexivity, also helped identify and minimize biases. An example of a possible bias is the *availability heuristic*, which, as explained by Johnson and Levin (2009a), leads people to place excessive weight on recent experiences in their conclusions. As researchers collected and analyzed data over a very short time span and in quick succession, availability heuristics likely influenced the patterns that researchers subconsciously looked for in interviews, FGDs, and in the data analysis. Reflexivity and researcher triangulation helped reduce the influence of such mental shortcuts by critically discussing each step taken. However, eliminating this type of bias altogether is not possible.

Cultural differences can also generate challenges. To mitigate that in data collection, interview and FGD guides were shared with the local team in advance for their review to

ensure appropriateness, and participants were free to express themselves in their preferred language (English, Swahili, or their local language). Moreover, the researchers informed themselves on local norms and customs, to make sure their behaviors and communication style when meeting participants complied with local customs. Nonetheless, differing interpretations of concepts and culturally different communication styles may have influenced the data collected and its analysis.

3. Conceptual Framework

3.1. Rationale

This thesis's conceptual framework is organized around four interconnected concepts that interact to address the research question. First, EWS provides an overview of the subject matter, establishing the importance of participation in this field. Second, community participation provides the analytical vocabulary for characterizing various forms of engagement, going beyond normative ladders to evaluate who participates, when, and how in a context-sensitive approach. Third, power helps explain why participatory processes frequently fall short of their transformative potential, as it determines how decisions are made, whose opinions are valued, and whose knowledge matters. Fourth, knowledge co-creation operationalizes meaningful participation by presenting how different knowledge systems can be successfully integrated. Together, these concepts enable this thesis to go beyond simply asking whether participation occurs to explore what enables or challenges its meaningfulness.

3.2. Early Warning Systems

Early warning systems (EWS) constitute "integrated systems designed to provide timely and actionable warnings of impending hazards such as cyclones, floods, droughts, heatwaves or wildfires," empowering people to reduce risk and anticipate the consequences of hazards (UNDP, 2024). By enabling communities to safeguard their lives, livelihoods, and property through timely and accurate information, EWS reduces disaster-related injuries, fatalities, and economic damages (Kanta Kafle, 2017; Sufri et al., 2020a; UNEP, 2012). Major international frameworks for disaster risk management, such as the Yokohama Strategy, the Hyogo Framework for Action, and the Sendai Framework for Disaster Risk Reduction 2015-2030, have consistently highlighted the significance of EWSs (Sufri et al., 2020a).

As described by UNDRR (2017), effective EWSs consist of four interdependent components. The first component encompasses disaster risk knowledge, generated through systematic data collection and assessment. This allows stakeholders to adequately prepare and lead an effective response (Sufri et al., 2020a). The second component spans detection, monitoring, analysis, and forecasting of hazards and their impacts (UNDRR, 2017)—henceforth referred to as *monitoring* for conciseness. The third component consists of disseminating and communicating reliable, prompt, precise, and actionable alerts (UNDRR, 2017) (henceforth: *dissemination*). For warnings to be effective, they must be clear and actionable so that those at risk can respond appropriately (Sufri et al., 2020a). Lastly, the fourth component includes

preparedness and response capability (UNDRR, 2017). To enable prompt and coordinated responses to impending hazards, this includes preparedness planning, frequent drills, education, and training (Baudoin et al., 2016; Sufri et al., 2020a).

Research increasingly highlights that effective EWS must integrate "scientific, managerial, technological, and social or human" dimensions (Sufri et al., 2020b, p. 2692). However, in reality, many EWS initiatives continue to place a strong emphasis on data systems or technology infrastructure, paying little attention to the social processes necessary to ensure that warnings lead to targeted action (Basher, 2006b; Kanta Kafle, 2017; Seng, 2012; Sufri et al., 2020b). An effective EWS must do more than issue warnings; it must also ensure that those at risk are effectively triggered to respond appropriately and promptly (IFRC, 2020; Lassa, 2008). To achieve this, the participation of local communities in the design and operation of the system is crucial (UNISDR, 2006). This trend is also reflected in the broader CAA field, where it is recognized that inclusive and meaningful participation leads to adaptation strategies that are more tailored to the context, socially just, and sustainable (IPCC, 2023). Consequently, some scholars urge us to move away from "technocratic, one-size-fits-all approaches" towards initiatives that "value diversity, strengthen local institutions, and prioritize social learning and capacity-building" (Nirmani, 2025, p. 3353). However, a systematic literature review by Sufri et al. (2020a) revealed that communities are insufficiently engaged across the four EWS components and that there is a lack of integration of indigenous and traditional knowledge with scientific knowledge. These issues are further explored in the upcoming sections on community participation in EWS, power, and knowledge co-creation.

3.3. Community Participation

There is no clear-cut definition for *community participation*, and various terms are used to describe processes that engage local communities (Samaddar et al., 2021) (e.g., local participation, public participation, community engagement, community-based EWS, etc.). Thus, this thesis adopts a broad understanding of participation as the involvement of individuals and heterogeneous communities in EWS-related processes, including decision-making. In doing so, this thesis engages with all relevant literature on participatory processes, not only studies that use the exact term *"community participation"*.

Various scholars have tried to capture the multifaceted nature of participation. Arnstein (1969) developed one of the most well-known categorizations: her ladder of citizen

participation, which ranges from manipulation—described as a form of non-participation—to citizen power. Her linear framework can be easily interpreted normatively as a hierarchy of increasingly genuine participation (Cornwall, 2008). Reality, however, is more complex. According to Cornwall (2008), the different steps of the ladder can take place simultaneously, and "higher" steps might result from the state relinquishing its responsibilities rather than an effort to empower communities (Cornwall, 2008). Therefore, some scholars moved away from Arnstein's linear and normative understanding and describe participation, for instance, through three analytical dimensions: *who* participates, *when*, and *how* (their degree of influence) (Sarzynski, 2015; Uittenbroek et al., 2019), adopted in this thesis. This approach allows for the recognition that different types of participation are required to achieve different objectives and, more generally, in different contexts (Davidson, 1998; Sarzynski, 2015; Uittenbroek et al., 2019). The upcoming section discusses community participation in EWS more specifically.

3.4. Community Participation in EWS

Understanding the role of community participation in EWS requires moving beyond rigid models toward a more context-sensitive analytical approach. In this sense, participation should not be a checkbox item or a stand-alone effort added to a technocratic process. Instead, it should be considered when a particular EWS is being conceived, with a specific focus on who participates, what activities they are involved in, and what their roles are. Despite the acknowledgement of this desirable scenario, there is currently a lack of investigation into these participatory elements and the entry points and challenges to achieving meaningful participation (Clegg et al., 2021). This thesis argues that participation must always be carefully considered and defined, taking into account the goals, context, and project phase. Without this kind of reflection, participatory approaches risk being symbolic and superficial, rather than meaningful and transformative.

There are multiple identified advantages to integrating community participation approaches in EWS projects. Meaningful community participation increases on-ground knowledge of climate impacts, lowers the risk of policy implementation failure, allows for the consideration of a greater range of adaptation options, and builds community and government trust (Bell et al., 2017; PCE, 2015; Rouse & Blackett, 2011; van Aalst et al., 2008). According to Samaddar et al. (2019), participation can also resolve disputes among stakeholders, ensure more acceptable decision-making processes, and increase community self-reliance.

Importantly, within participatory approaches, it is crucial to give special attention to the most vulnerable groups to avoid maladaptation (Bulkeley et al., 2014; Holland, 2017; Naess, 2013).

In practice, community participation in EWS should incorporate various crucial principles. These include, first, fully comprehending the local context in which hazards occur; second, incorporating various types of knowledge—including scientific, experiential, and local knowledge; third, building partnerships with various stakeholders; and lastly, applying a multi-hazard approach (Sufri et al., 2020a). These principles translate into working with the community to identify local risks, monitor environmental indicators using both traditional and expert-driven methods, shape warning communication so it is understood and trusted by all, and co-design practical, contextually appropriate response actions (IFRC, 2020). Additionally, communities must have a deep understanding of the EWS for the system to operate successfully (Sufri et al., 2020a). Hence, to achieve effective EWS, communities must actively participate in all four components of EWS, rather than solely receiving warnings at the end of the chain (UNISDR, 2006; WMO, 2025). Evidence from previous disasters unveils that ineffective EWS are frequently associated with inadequate community participation across all the EWS elements (Sufri et al., 2020a). In this line, key international frameworks for disaster risk reduction—such as the Sendai Framework for Disaster Risk Reduction 2015-2030 and the Early Warnings for All Initiative (EW4ALL)—highlight the necessity of bolstering people-centered EWS and involving a wide variety of stakeholders, including women, youth, people with disabilities, and other marginalized groups (Sufri et al., 2020a).

Although the importance of community participation across the four EWS pillars is broadly recognized, the systematic review by Sufri et al. (2020a) unveils that, in practice, community engagement in EWS is frequently uneven and limited. The study demonstrates that EWS projects often report community participation; however, the latter is rarely comprehensive in practice. According to Sufri et al. (2020a), participation is often concentrated in the dissemination and response elements. Community participation in the elements of risk knowledge, monitoring, and warning system design is much less common, though equally crucial. Activities such as including the community in determining what to monitor or participatory hazard mapping are rarely documented and never routine (Sufri et al., 2020a). These trends can be better understood by examining the underlying power relations and whose knowledge is accepted as legitimate, which influence the scope and depth of participation within EWS. These concepts are covered in more detail in the following sections.

It is critical to acknowledge that participatory interventions, well-intentioned as they may be, may yield unintended consequences if they neglect the structural aspects of vulnerability. When participatory approaches do not adequately reconcile the demands they place on communities with the need to hold governments accountable for safeguarding their most vulnerable citizens, they may inadvertently normalize vulnerability and individualize responsibility in the name of empowerment (Gladfelter, 2018). Participation can thus become a government's justification for abandoning marginalized citizens, placing the responsibility for protection from state actors on communities (Gladfelter, 2018). This critique emphasizes that meaningful participation cannot be merely simplified to methods for obtaining local input. On the contrary, participation must be transformational and confront the fundamental power dynamics that generate vulnerability in the first place. This requires an in-depth exploration of the power dynamics, which will be discussed in the next section.

3.5. Power

A key notion in understanding how community participation is embedded in EWS is power. However, the current EWS literature fails to examine power and its effects on participation (Kamruzzaman, 2020). Power can be described as the capacity of actors to influence decisions, control resources, shape interests, and define whose interests and knowledge are represented (Dahl, 1957; Lukes, 2005). In participatory processes, power is distributed (often unevenly) among institutions, experts, community organizations, individuals, and formal authorities (Samaddar et al., 2019). Power shapes what kinds of participation are encouraged or restricted through both visible (such as who is invited, who speaks, who makes decisions), hidden (such as norms, underlying hierarchies, routines), and invisible (shaping the psychological and ideological boundaries) mechanisms (Gaventa, 2006). While there are intentional strategies to more evenly redistribute influence, such as transparent communication tools and knowledge co-creation (Stringer et al., 2006), the aforementioned power mechanisms can constitute obstacles to meaningful participation (Sheppard et al., 2011).

In practice, it appears that communities have limited power to define participation processes. Actors with technical, financial, legal, or administrative power frequently dictate the type and extent of participation (Samaddar et al., 2019). Consequently, researchers, implementing agencies, and donors often pre-structure participation frameworks, leaving no space for communities to define what participation means to them (Samaddar et al., 2019). Additionally, Samaddar et al. (2019) argue that numerous participatory frameworks rely on

abstract standards like “fairness” or “representation”: concepts that are highly context-specific and subject to interpretation. For these reasons, participation risks serving as a governance tool that legitimizes pre-established agendas rather than redistributing decision-making power (Samaddar et al., 2019). This dynamic can eventually lead to mistrust and disengagement from the community (Samaddar et al., 2019). Hence, this thesis aims to unveil the underlying power structures that create this imbalance.

Bertana’s (2020) analysis further enhances this understanding by emphasizing how power operates beyond visible decision-making. Adopting Luke’s three-dimensional framework of power, Bertana (2020) reveals how participatory processes can reinforce preexisting hierarchies while appearing cooperative and consensual. In the case explored, community members contributed both financially and physically, but they were not included in key design and implementation decisions. Power was exerted through establishing agendas and influencing views of inevitable outcomes and acceptable alternatives. Hence, the lack of overt conflict did not indicate meaningful participation. This demonstrates that the extent of influence may be structurally limited even when participation is officially present.

These insights challenge outcome-based conceptions of participation that focus solely on metrics such as counting the number of people participating. While these factors are helpful indicators of engagement, they do not capture the deeper power imbalances present in institutional authority or knowledge hierarchies. Hence, in addition to outcome-based metrics, effective participation must also take into account process conditions, such as who sets goals, who manages information flows, and whose knowledge is considered valid (Samaddar et al., 2019).

Rather than being a fixed characteristic of actors, power operates as an embedded, relational dynamic within the context of participatory EWS. Through a complexity lens, power is continuously reshaped across project phases and arises from interactions between actors and knowledge systems. This relational and systemic understanding of power makes it possible to look at community participation as an indicator of deeper institutional, social, or technical patterns. Understanding community participation as a manifestation of these deeper systemic dynamics allows for a more critical evaluation of EWS. As participation can signal underlying institutional logics and epistemic hierarchies, it is important to examine whether participatory EWS actually increases community agency or risks reproducing preexisting inequalities under the pretext of resilience and inclusion (Gladfelter, 2018). To achieve this, a reflexive exploration of power is necessary.

3.6. Knowledge Co-Creation

A key dimension of meaningful participation lies in how knowledge is produced and legitimized among actors. Knowledge co-creation refers to the collaborative generation of knowledge among institutions, community members, experts, government agencies, NGOs, etc. (Stringer et al., 2006)—in which multiple knowledge systems—such as traditional and scientific knowledge (Kelsey, 2003)—are deemed equally valuable. Numerous scholars state that knowledge co-creation is a fundamental condition for effective participation, as it enables communities to have agency over problem framing, priorities, and solutions.

However, effective knowledge co-creation faces multiple barriers, often deeply rooted in power asymmetries among stakeholders. A major barrier is the continued use of technical language by experts and institutions, which can alienate community members and result in a large communication gap (Qureshi et al., 2022). Established hierarchies of expertise that value expert knowledge over indigenous and experiential understanding often reinforce this language barrier (Klenk et al., 2017). Such hierarchies can be seen in the practices of "extraction" of local knowledge, in which opinions from the community are collected to support project objectives without giving them actual control over problem formulation or decision-making (Klenk et al., 2017). Meaningful knowledge co-creation can also be hampered by institutional barriers, including funding constraints, vested interests, and stakeholder power dynamics (Warwick-Booth et al., 2024). These barriers are often exacerbated by deeper sociocultural factors—including gender, class, and other systemic forms of discrimination—that predetermine whose voices are heard and valued in a collaborative setting (Qureshi et al., 2022). Therefore, without intentional and transparent measures to overcome these barriers, knowledge co-creation risks perpetuating current injustices in EWS.

Through the lens of complexity theory, knowledge co-creation shows that no single actor can fully understand or describe STES. Instead, a more accurate interpretation of reality can be achieved by including diverse perspectives. In this sense, knowledge co-creation can help generate EWS that are both context-sensitive and leave no one behind. In the context of this thesis, understanding whether and how knowledge is co-created in the Kenyan EWS will enable the examination of participation across different EWS pillars and the identification of enabling factors and challenges.

4. State of the Art

A targeted, non-comprehensive thematic review was conducted to identify challenges and entry points for participation in EWS in the literature. Various barriers to community participation in EWS were identified. A first challenge for community participation is the lack of standard operating procedures for their inclusion in EWS. A failure to formally integrate community participation into EWS hinders the sustainability and effectiveness of participation, as responsibilities and roles may remain unclear (Clegg et al., 2021; Sufri et al., 2020a, 2020b). Fatalistic worldviews and religious beliefs can also dissuade the community from participating in EWS. Sufri et al. (2020b) point out that, in Aceh, numerous people believe that natural hazards are an expression of Allah's will and should thus not be managed. This makes them reticent to engage in disaster management efforts, such as EWS. Similarly, if the community is unaware of the importance of EWS activities, local ownership will likely remain low, thereby posing challenges to the system's sustainability (Sufri et al., 2020b). Willingness of the population to engage can be low if activities such as monitoring are perceived as time-consuming and community members fear they might interfere with their daily lives (Clegg et al., 2021). Moreover, in their systematic literature review, Sufri et al. (2020a) unveiled that EWS initiatives often fail to engage all vulnerable population groups and inadequately integrate local or indigenous knowledge, with negative consequences for inclusiveness and ownership. Lastly, a lack of resources can hinder the sustainability of community participation. When NGOs or government projects end, sustaining community participation can be complicated due to inadequate financial, human, and technical resources (Mustafa et al., 2015; Sufri et al., 2020b).

A series of entry points for fostering community participation was also identified in the literature. First, Clegg et al.'s (2021) literature review highlights that trust between the different actors involved in EWS is instrumental in fostering community participation. In contexts where traditional and religious leaders play a prominent role in the community, collaborating with them can help build trust and positively leverage customary and religious values, thus enhancing the community's willingness to partake in EWS (Clegg et al., 2021; Fletcher et al., 2013; Gianisa & Le De, 2017; Sufri et al., 2020b). Similarly, where established community groups exist, working with them ensures there is a trusted mediator and facilitates coordination (Budimir et al., 2025; Clegg et al., 2021). Moreover, using trusted communication channels (Baudoin et al., 2016; Budimir et al., 2025) and resources and locations, such as faith-based infrastructure (Budimir et al., 2025; Sufri et al., 2020b)—both

when engaging the community and as elements of the EWS—can also facilitate community participation. In this line, supporting data sharing among stakeholders enhances meaningful participation (Budimir et al., 2025) by promoting trust and reinforcing the effectiveness of the project's channels and resources. A second factor that positively impacts participation is the presence of clear structures and procedures for community engagement. For this to happen, it is important to clarify each stakeholder's responsibilities and develop clear communication protocols, for example, through agreements and memoranda (Clegg et al., 2021). At the same time, to ensure effectiveness and sustainability, initiatives promoting community participation should not remain stand-alone efforts, but rather institutionalize participatory approaches in national and local EWS policies, strategies, and institutions (Clegg et al., 2021; Sufri et al., 2020b). A third factor that can positively influence participation is fostering the creation of a network among the participants, which can be done, for example, by creating committees, organizing knowledge-sharing events, and using social media platforms to facilitate interaction (Clegg et al., 2021). Lastly, Baudoin et al. (2016) highlight the importance of providing education on DRM, enabling the local community to develop the capacity and tools needed to truly own the DRM process. This also contributes to strengthening their overall resilience, which, in turn, constitutes an entry point for embedding community participation (Budimir et al., 2025).

Despite the growing recognition of the importance of community participation in EWS, significant gaps persist in the existing literature. Firstly, although the literature outlines several challenges and entry points, from the thematic review, it appears that few studies have specifically investigated the factors influencing community participation in EWS (see, Baudoin et al., 2016; Budimir et al., 2025; Sufri et al., 2020a, 2020b). In their literature review, Sufri et al. (2020a) highlight the need for future studies to further explore this topic. Secondly, existing studies, such as those by Sufri et al. (2020a) and Clegg et al., mainly draw on literature reviews rather than on primary empirical research conducted in active EWS projects. Consequently, there is limited understanding of how these challenges manifest in real-time project implementation and of the lived experiences of the various stakeholders. Thirdly, existing research has inadequately addressed the influence of power dynamics on participation outcomes (Kamruzzaman, 2020).

This thesis thus aims to advance this stream of knowledge by employing an empirically grounded methodology within a specific case study context. In contrast to previous research that predominantly utilizes secondary data or more broad assessments, this thesis prioritizes

the collection of primary data to unveil context-specific dynamics influencing participation. By doing so, this thesis responds directly to calls for more nuanced, context-sensitive analyses of participation and identifies how challenges and entry points manifest in practice. Furthermore, this thesis aims to transcend mere identification of challenges and entry points by examining how these elements can be translated into actionable recommendations to enhance participatory EWS. Particular emphasis is placed on incorporating vulnerable groups and integrating local and indigenous knowledge, thereby addressing significant gaps identified in previous studies (Baudoin et al., 2016; UNDRR, 2015). The findings seek to enhance academic discourse and practical applications by producing evidence-based recommendations for policymakers and practitioners aiming to develop more inclusive and context-sensitive EWS frameworks.

5. Context

5.1. Motivation

A case study approach was adopted to enable an in-depth, empirically grounded analysis and generate context-specific, actionable recommendations. The selection of the case study was guided by five main criteria. First, the project should focus on EWS and include a community participation component. Second, the project should provide access to a diverse range of stakeholders to capture a variety of perspectives. Third, the organization leading the project should have an established institutional structure and a systematic approach to project management, ideally with prior experience in research processes, to ensure effective collaboration. Lastly, logistical considerations should be considered to ensure that data collection can be carried out in person.

The chosen case studies in Homa Bay and Kilifi counties fulfill these criteria and offer a particularly interesting and suitable context for this research. Additionally, exploring how participation is manifested within both counties provides a relevant opportunity to move beyond vague and theoretical calls for participation toward empirically grounded and actionable insights into the challenges and entry points for embedding community participation in EWS.

5.2. Hazard and Vulnerability Profile

5.2.1. National Level (Kenya)

This section outlines the hazard and vulnerability profile for Kenya, and the counties of Homa Bay and Kilifi. Kenya is exposed and vulnerable to various natural hazards, which are projected to intensify with climate change. The country's diverse climates, ranging from arid and semi-arid regions to temperate mountain regions and tropical coastal regions, result in a wide range of risks (TWGAA, 2024). The risks include: droughts; riverine, coastal, and flash floods; landslides; soil erosion; storms, thunderstorms, and lightning; cyclones; lake backflows; disease outbreaks; earthquakes; and forest fires (TWGAA, 2024; World Bank Group, 2021). Floods and droughts represent the two most significant threats in Kenya (TWGAA, 2024). Droughts affect the most people, impacting around five million Kenyans annually (TWGAA, 2024). Moreover, they cause the greatest economic damage—an eight-per-cent GDP loss every five years—mainly through impacts on crops and livestock production, hydropower, fisheries, and industry, as well as damage from forest fires (World Bank Group, 2021). On the other hand, floods cause the most fatalities in Kenya (World Bank

Group, 2021). Climate change is increasing the frequency and magnitude of these hazards (World Bank Group, 2021). At the same time, human activities—such as urbanization, poor land use planning, deforestation, and watershed degradation—further amplify their likelihood and impacts (World Bank Group, 2021). This exacerbates the vulnerability of key sectors, including agriculture, health, and forestry, as well as already vulnerable socioeconomic groups, such as low-income households living in hazard-prone areas and women, who currently have limited access to financial opportunities and decision-making processes (World Bank Group, 2021).

The sections below outline the main hazards and vulnerabilities for Homa Bay and Kilifi Counties, as presented in the Homa Bay Participatory Climate Risk Assessment Report (County Government of Homa Bay, 2023) and the Kilifi County Participatory Climate Risk Assessment Report (County Government of Kilifi, 2023).

5.2.2. Homa Bay County

Homa Bay County is located in western Kenya, on the southern shore of Lake Victoria. The two main hazards in Homa Bay are floods and droughts, but the county also experiences extreme temperatures, heatwaves, hailstorms, extreme rainfall, and pest and disease outbreaks. Droughts affect the entire county and are caused by reduced and inconsistent rainfall and prolonged periods of elevated temperatures. Floods, on the other hand, affect 25 out of the 40 wards and can manifest as pluvial, riverine, or lakeshore flooding.

Livelihoods in Homa Bay are threatened by these hazards. Local communities depend predominantly on nature-based activities—including agriculture, fishing, mining, and quarrying—with 74 per cent of the labor force engaged in agriculture. As a result, their livelihoods are highly susceptible to hazards that degrade natural resources, disrupt productive activities, and damage infrastructure, leading to income losses, food scarcity, and increased exposure to diseases, among other effects. Women, PwD, children, the elderly, youth, and resource-poor households are identified as the most vulnerable population groups. This vulnerability stems from their limited access to and control over key resources and assets, as well as their underrepresentation in decision-making. For instance, cultural inheritance and land ownership practices prevent women from enjoying land ownership rights, while patriarchal values hinder their full participation in decision-making.

5.2.3. Kilifi County

Kilifi County is located on the oceanic coast of Kenya. Droughts and floods are identified as Kilifi's main hazards; additionally, the county is stricken by disease outbreaks and human-livestock conflict. Indeed, most wards are prone to droughts, which cause water shortages and negatively impact agricultural yields, livestock, and energy and manufacturing production. Floods are mainly experienced in wards around the Galana River and in the South of the County. They often destroy infrastructure and crops in the lowlands, leading to the loss of life and livestock. Floods can also lead to cascading hazards such as infectious and vector-borne disease outbreaks. Lastly, Kilifi has been experiencing conflicts between humans and wildlife. The report explains that resource and water scarcity can lead wildlife, including elephants and hippos, to move closer to inhabited areas, destroying crops and sometimes causing close encounters with the local population. The frequency and impacts of these hazards are expected to worsen due to climate change and unsustainable land-use and resource-management practices.

Livelihoods in Kilifi are vulnerable to the presented hazards. Most of the county's population (78.5 per cent) relies on rain-fed agriculture for their livelihoods. Other economic activities in the county include fisheries, small-scale trade, and the exploitation of natural resources. The county's absolute poverty rate is substantially higher than the national average (71.7 per cent versus 47 per cent, respectively). The most vulnerable population groups are women, PwD, children, the elderly, ethnic minorities, small-scale farmers and fishermen, and petty traders. Women, for instance, are more vulnerable to droughts and floods as they are responsible for collecting water for their families and evacuating children and elderly people during flood events. Moreover, due to cultural norms, women have limited access to resources, including land, and hold less power in decision-making. The vulnerability of PwD, on the other hand, is mostly shaped by the barriers they face in accessing education and health services.

5.3. Early Warning Systems

5.3.1. National Level

EWS are a key component of Kenya's national disaster risk management framework (Munyaka, 2025), and their importance is recognized in key DRM policies and strategies. First, from various perspectives, EWS enhancement is stipulated in three of the five policy objectives of the 2017 National Disaster Risk Management Policy. The policy document highlights gaps in accurate climate data, especially in remote areas, and the need to develop people-centered, multi-hazard EWS that enable effective early action (National Disaster Risk

Management Policy, 2017). The National Disaster Risk Management Strategy 2025-2030 (Ministry of Interior and National Administration, 2025) also identifies strengthening EWS as pivotal to achieving its strategic DRM objectives. Lastly, the Kenya Anticipatory Action Roadmap 2024-2029 (TWGAA, 2024) acknowledges the persistence of data and information gaps and recognizes EWS as the first of its seven pillars.

At the national level, EWS in Kenya involve multiple government stakeholders. The Ministry of Interior and Coordination of National Government and the State Department for Special Programmes coordinate overall DRM activities, including the operation of the EWS (National Disaster Risk Management Policy, 2017). The National Disaster Operations Center (NDOC) is also tasked with hazard monitoring and the coordination of response and DRR activities (National Disaster Risk Management Policy, 2017). Another key actor in Kenyan EWS is the Kenya Meteorological Department (KMD), which has the mandate to generate national and subnational weather forecasts, agrometeorological bulletins, and early warnings for extreme weather events (Ministry of Interior and National Administration, 2025; World Bank Group, 2021). However, when it comes to drought risk, the National Drought Management Authority (NDMA) coordinates all drought risk-related activities (NDMA, 2026). The Water Resource Authority (WRA) also plays a role, as it has river and climatic monitoring stations that collect data for flood and drought early warnings (WRA, 2024). Some non-state actors are also involved in the provision of climate information and early warnings and collaborate through the National Framework for Climate Services (NFCS) (TWGAA, 2024). At lower administrative levels, additional stakeholders come into play, which will be discussed in more detail in the county and local-level section that follows.

5.3.2. County and Local Levels, Including Participation Mechanisms[1]

From the interviews and FGDs conducted in Homa Bay and Kilifi Counties in March 2026, the researchers developed the following understanding of the EWS setup at the county and local levels, which involves numerous stakeholders across the four pillars. Regarding risk identification (EWS Pillar I), both counties carried out a participatory climate risk and vulnerability assessment (Interview 1; FGD 2; County Government of Kilifi, 2023).

[1] For this section, and the rest of the document, references to the data collected are made using the number assigned to the interview, joint interview, or FGD. The full list of interviews, joint interviews, and FGDs with details on the date, location, and stakeholder type can be found in Appendix B.

Moreover, surveys and interviews are sometimes conducted to gather the community's perspectives on existing risks and vulnerabilities to be addressed (Interview 2). KMD and WRA appear as the two main actors in monitoring (EWS Pillar II), as they continuously collect meteorological, water, and climatic data (Interview 4). However, in parallel, CMDRR committees and local populations monitor water levels, hippopotamus movements, and indicators informed by traditional knowledge (Interview 3; FGDs 3, 7).

Dissemination (EWS Pillar III) seems to involve the most stakeholders. KMD and WRA were said to launch the first alert for incoming weather-related hazards (Interview 4). Based on data collected by KMD, the DRM County Department issues early warning advisories (Interview 10), while the NDMA sends drought-related bulletins with recommendations to each County Government department (Interview 11). When KRCS receives warnings of impending hazards from KMD and WRA, it adapts them to the local context and translates them into local languages so they can be understood by communities (Interview 4 and 8). They then disseminate the warnings to the population through text messages (so-called TERA messaging), WhatsApp channels, and sometimes public meetings—denominated public barazas (Interview 4 and 8). Local chiefs also take part in dissemination efforts, sharing information at public barazas and communicating with faith-based leaders to ensure everyone in the community receives the message (Joint Interview 1 and 2; Interview 5). Once they receive the message from KRCS, the local chief, or the radio, CMDRR committees, the local CBO (Aluora Makare in Homa Bay), women's groups, and the beach management units, share the alert door-to-door and through phone calls and WhatsApp channels (Interview 4 and 8; FGD 2, 3, 6, and 7). PwD also spread the message within their networks (FGD 5).

To enhance preparedness and response capabilities (EWS Pillar IV), KRCS, CMDRR committees, CBOs, women's groups, youth leaders, and relevant government departments, routinely carry out sensitization workshops, capacity development, awareness activities and trainings, as well as advocacy programs with the communities (Interview 3, 4, 5, 6, 8, 9, and 11; Joint Interview 2; FGD 2, 3, 6, and 7). Many of these participatory activities are carried out during cultural and religious gatherings, political rallies, or parent-teacher meetings, as they offer the opportunity to reach large numbers of people at once (Interviews 6, 7, and 11; FGD 3). Communities also participate in community dialogue days to collect the community's views on various issues (Interview 2). The interviews and FGDs highlight that a significant share of the local population demonstrates preparedness and response capacity, as evidenced by their independent engagement in early actions (EAs) such as trench digging,

early harvesting, and the timely evacuation of children and household items to safe areas (FGD 1, 3, 4, 6, 7). Nonetheless, some community members remain unaware of the importance of risk mitigation and early action, highlighting the need for continuous sensitization (Interview 4, 5, and 8; FGD 7).

6. Results and Discussion

6.1. Homa Bay County

6.1.1. Challenges

EWS in Homa Bay County face numerous community participation challenges, which are clustered into eight main themes: resource and institutional constraints, multi-stakeholder collaboration, inadequate communication and information sharing with communities, inaccurate forecasts, factors that prevent or discourage people from attending participatory activities, individual and household-level resource constraints, people left behind, and behavioral and cultural barriers. These themes are analyzed in the following paragraphs.

The first theme pertains to ***resource and institutional constraints*** that county government departments and the KRCS encounter when working with communities. A key piece of feedback from Interview 1 indicates that, at the county level, inadequate funds are allocated to DRM. Even though disaster prevention is included in the annual development plan (County Government of Homa Bay, 2024), these priorities are not reflected in its implementation, as during the budget cycle politicians modify their priorities and fail to allocate funds to disaster prevention (FGD 2). Because of the lack of funding, Interviewee 1 disclosed that county government departments tend to neglect planning and focus on responding to hazards when they materialize. The lack of a comprehensive, structured DRM process hampers the formal integration of community participation into EWS-related activities. Moreover, the limited funds available to the KRCS also restrict the number of SMS alerts that the organization can send through the TERA system, as each SMS costs one to two Kenyan Shillings (Interview 4). This incurs high costs when messages must be sent to a large portion of the population. As an example, the KRCS recently sent close to 17 million SMSs, with estimated costs ranging from 17 to 34 million Kenyan Shillings (Interview 4). A second, and related, dimension of this theme encompasses staff and resource constraints to reach the population on the ground. Establishing a routine presence across the county requires significant time, staff, vehicles, and funds, making it hard for organizations to reach all people in at-risk areas and involve them in EWS-related processes (Interview 1 and 3). As a result, organizations need to make choices regarding who to include. This selection is sometimes affected by biases, as organizations might consult people who are easier to reach and more articulate, but have not directly experienced a disaster, and leave out the most affected people (FGD 2). This bias can prove

problematic, as people who have not experienced the disaster are unable to accurately capture the perspectives of those who have (FGD 2).

The next theme comprises challenges linked to ***multi-stakeholder collaboration***. The current setup of institutional processes requires messages to pass through various government agencies and administrative levels before reaching the local population (Interview 4). These slow bureaucratic channels can prevent community participation from taking place in a timely manner and across EWS phases. Moreover, it proves problematic when there are time-sensitive alerts, as it leaves little to no time for communities to give feedback, reach out with questions and concerns, and prepare adequately for the impending hazard (Interview 4). Lastly, EWS require multi-stakeholder collaboration, which can pose challenges, as different government departments with differing expectations and approaches need to cooperate (Interview 2). This adds an extra layer of complexity when designing an EWS that embeds community participation.

The third theme concerns the ***inadequate communication and information sharing with communities***. First, as an underlying factor, people who have not received the necessary information to understand the hazard risks and the importance of EWS appear less willing to participate in or act on early warning messages (Interviews 2 and 4; Joint Interview 1; FGDs 2 and 3). Second, if organizations fail to understand the local context and adapt early warning messages and overall communication accordingly, they risk alienating people from EWS. One way this failure materializes is through the neglect of language barriers. Not everyone in Homa Bay County speaks English or Swahili, but early warning messages and meetings are not always translated into the local language (Interview 4; FGD 1, 2, and 3). This prevents some people from understanding early warning messages and from engaging in participatory processes held in a language they don't speak (Interview 4; FGD 1, 2, and 3). Similarly, there is usually no sign language interpretation to enable people with hearing impairments to participate in meetings, workshops, and other activities (FGD 1). Third, the information provided in early warning messages is sometimes not comprehensive (FGD 1). This lowers trust in EWS and, consequently, communities' willingness to engage with them. For example, forecasts may accurately predict local dry weather in a specific lowland area, yet fail to account for the risk of flooding triggered by heavy rainfall in higher-elevation areas (FGD 1). Consequently, communities do not prepare for the hazard event, and when it materializes, their trust in the EWS decreases. Lastly, there are no established mechanisms for communities to provide feedback on early warning messages, including whether affected communities

understand them and find them useful, which poses challenges to addressing the issues outlined in this theme (Interview 4).

The fourth theme builds on the previous points by addressing the specific challenges posed by ***inaccurate weather forecasts***. In Homa Bay County, inadequate equipment and knowledge lead to weather forecasts that are often inaccurate and vague, as they are usually fortnightly or weekly rather than daily or hourly (Interview 1). However, laypeople struggle to understand why forecasts can be inexact (Interview 1). This is exemplified by a government official, who stated that communities sometimes say, "the weatherman lied to us" (Interview 1). Consequently, when people perceive the system as inadequate, their trust in it erodes, and they are less likely to see value in it, ultimately reducing their willingness to engage with the EWS.

The fifth theme clusters ***factors that prevent or discourage people from attending participatory activities***. One such factor is to balance attendance with day-to-day responsibilities. Some people find it challenging to carry out their economic and livelihood activities while also finding time to participate in EWS-related activities (FGD 1). Moreover, caretakers of young children and PwDs are often unable to or uncomfortable leaving them at home alone to attend a meeting or workshop (FGD 1). So, particularly if the event is not communicated with sufficient advance, these caretakers are unlikely to be able to attend (FGD 1). Second, the need to travel long distances to participate in activities also acts as a barrier. When the meeting venue is too far to be reached on foot, no vehicle is organized for transport, and no transport reimbursement is offered, people are usually discouraged from attending (Interview 3; FGD 1, 2). This challenge is especially felt by PwD, who are often unable to travel distances that appear walkable to others, and usually cannot afford to cover the travel costs (FGD 1). Lastly, communities expect to receive handouts for their participation—partially because this is common practice at political rallies (Interview 7, 11)—and consequently, people's willingness to attend events without handouts is low (Interview 3; Joint Interview 1; FGD 2).

The sixth cluster of challenges includes ***individual and household-level resource constraints and poverty,*** which hinder participation in EWS. For instance, despite being aware of the risks posed by hazard events, women in low-income households report lacking the financial means to take protective action and ensure adequate preparedness and response capabilities (Interview 2; FGD 4). Furthermore, women's groups, which play a key role in EWS by

actively disseminating early warning messages and sensitizing the community to various risks, lack institutional support, causing them to weaken over time and undermining their efforts to increase community resilience (FGD 4).

The seventh theme is about ***people left behind.*** According to a participant of Joint Interview 2, vulnerable groups are often consulted to identify challenges in the community, but not to decide how to address them. Moreover, Interviewee 1 mentioned that children are usually not considered in participatory processes, and a participant of FGD 2 pointed out that girls are also normally left out. On the other hand, Interviewee 1 stated: "We have seen a very strong participation and even strong voicing of issues affecting persons with disabilities", suggesting that representatives of PwD at the county level are actively engaged in participatory processes. This differs from the village or ward levels, where PwD reported significant mobility barriers and challenges with communication channels that are not inclusive (FGD 1).

The last theme concerns ***behavioral and cultural barriers***, which can make it difficult to engage the local population. To ensure participation, community members need to be interested in the planned activities. However, conflicting cultural views and traditions can create negative attitudes toward EWS processes (Interview 1 and 2; FGD 2, 3, and 4). If they are not open to change, providing information on why EWS are important does not increase their willingness to participate (Interview 4; FGD 2). Similarly, some people are accustomed to relying on the government and organizations such as KRCS to support them during emergencies, so they feel there is no reason or urgency to take preventive action (Interview 4; Joint Interview 1).

6.1.2. Entry Points

The findings from the interviews and FGDs in Homa Bay reveal various entry points for enhancing community participation in EWS. These entry points were clustered into nine themes: decentralize dissemination, mobile-based messaging, localize information, engage the community in decision-making, leave no one behind, leverage existing structures and capacities, multi-stakeholder collaboration, capacity development, and support with resources. Communication-related themes are presented together, given their strong conceptual overlap, while the remaining themes are discussed individually (each in its own paragraph) to mark their distinct roles in shaping participation in EWS.

The first set of entry points address the way information is communicated to and within communities. These approaches respond directly to challenges related to ***inadequate communication and information***. The first theme refers to the need for ***decentralized dissemination***. This includes strategies to spread information through localized and community-driven systems (Joint Interview 1). Some examples include the use of local languages (Joint Interview 2; FGD 2), trusted community members (Interview 2), and existing social structures—such as barazas, community groups, markets, and door-to-door outreach (Interview 1; FGD 1 and 3)—to enhance local effectiveness and inclusivity.

The second theme calls for utilizing and improving ***mobile-based messaging*** systems to spread information. It involves keeping community contact lists up to date to reach everyone (FGD 1), using existing platforms like TERA to send messages (FGD 1, 2, and 3), implementing follow-ups after the first warning to ensure understanding and action (FGD 2), and introducing a feedback function for the community to make recommendations and express any concerns (FGD 1).

The third theme pertains to the ***localization of information***. In other words, to ensure the adaptation of information to local contexts, facilitating understanding and relevance. This requires translating and interpreting messages into local languages (Joint Interview 2; FGD 2), delimiting and simplifying content for clarity (FGD 3), and adapting information for specific audiences—e.g. Gen Z or PwD—through using appropriate formats and styles (FGD 2 and 3). These strategies underscore the critical importance of combining various communication channels, both digital and face-to-face, to ensure early warning messages are accessible to everyone, contextually suitable, and understood.

Beyond communication, multiple additional themes emerged that address other key dimensions of participation. These are presented in the following paragraphs.

The fourth theme refers to ***engaging the community in decision-making***. It is essential to deliberately ensure the inclusion of community representatives in the design and implementation of EWS and enable community-led meetings. This includes systematically gathering community perspectives to inform decisions, through one-to-one interviews and questionnaires in local languages, ensuring everyone—including those less likely to speak in public forums—can share their views (Interview 1 and 2; Joint Interview 2). These strategies

should aim to integrate knowledge and help community members feel heard, thereby promoting greater participation (FGD 3).

Similarly, theme number five talks about ***leaving no one behind***. This theme calls for ensuring an inclusive engagement through guaranteeing that diverse and frequently marginalized groups—such as women, children, youth, and PwDs—are actively represented and their necessities are integrated throughout all the EWS pillars (Interview 1 and 2; FGD 1 and 2).

The sixth theme of entry points promote ***leveraging existing structures and capacities***. This theme refers to adopting an asset-based approach through utilizing community resources (Interview 1) and already established community systems and capacities. It highlights the value of using trusted actors (faith-based leaders, clan elders, head teachers, and ward chiefs), platforms (churches, schools, and women groups), and other technical and financial resources to extend the reach and sustainability of activities (Interview 1 and 2; FGD 1, 2, and 3). Importantly, this allows for an identification of the community not "as people who are needy" but "as people who are resourceful" (Interview 1). A crucial aspect of this approach is the engagement of KRCS staff and volunteers who come from the affected communities (Interview 2). Involving them increases trust and acceptance and creates a sense of ownership. In this sense, communities are more inclined to engage with programs delivered by people they see as part of their local fabric (Interview 2).

The seventh theme states that ***multi-stakeholder collaboration*** is crucial to strengthening participatory EWS through coordination, information sharing, and joint action (FGD 2). It includes strategies such as a real-time data sharing tool (Interview 4), cooperative research and learning (FGD 1), and resource and stakeholder mapping and mobilization (Interview 2).

Theme eight calls for ***capacity development,*** which comprises activities that enhance communities' knowledge and skills to engage effectively with EWS and respond to them. It encompasses promoting disaster management awareness and IT training (Joint Interview 1; FGD 4). A key element mentioned in the interviews was strengthening community-based monitoring, so that people can interpret local indicators, such as river gauges and flood markers, and take timely action without relying exclusively on external alerts (Interview 4).

The ninth theme argues for the need to ***support the communities with resources***. Essentially, it entails guaranteeing the provision of financial, material, and/or technological resources to

support effective participation. This includes transport facilitation to attend meetings and activities (FGD 1 and 2), providing food for attendance (Interview 11; Joint Interview 1), the use of new technologies for community coordination (FGD 2), and the provision of equipment (e.g., megaphones or notice boards for dissemination and accessibility of information (FGD 2 and 3), and assistive devices (e.g., wheelchairs or crutches) (FGD 1). To achieve this, an increase in overall EWS funding is required.

6.2. Kilifi County[2]

6.2.1. Challenges

EWS in Kilifi County face numerous community participation challenges, which are clustered into eight main themes: lack of institutional capacities, CMDRR committee challenges, inadequate communication and information, people left behind, behavioral and cultural barriers, inaccurate forecasts, individual and household-level resource constraints, and balance of responsibilities. These themes are defined in the following paragraphs.

A ***lack of institutional capacities*** can hinder community participation in EWS processes. First, although the county government has a DRM policy in place (UNDP KENYA, 2024), a KRCS officer claims insufficient funds are allocated to its implementation (Interview 8). According to the same officer, the county government often requests contributions from external partners, yet the financing gap persists (Interview 8). Given the limited funds, county government planners tend to focus on response, neglecting other fundamental DRM phases (Interview 10). In turn, the absence of an institutionalized DRM process hampers planning for community participation. A second institutional challenge, closely related to planning, is the unclear division of responsibilities between different county government departments. This often leads non-DRM departments to assume that the Disaster Management Unit (DMU) is responsible for managing and financing all EWS-related activities (Interview 8). However, the DMU lacks the financial resources and staff to do that (Interview 8 and 10). Moreover, such a situation would be undesirable, as cross-departmental collaboration is critical to ensuring effective EWS for all types of hazards (Interview 8). As a consequence of unclear responsibilities and collaboration structures, systematically planning and executing

[2] To ensure organic results, the researchers did not refer to the themes identified for Homa Bay county when analyzing the data from Kilifi County. Similar codes might have thus been clustered under different themes in the two counties, to best reflect the weight different issues were given in that county.

participatory activities become difficult. A third institutional challenge is the shortage of resources and staff. The number of DRM officers is insufficient to physically reach people in all at-risk areas with sensitization activities and alerts (Interview 7, 10, and 11). At the same time, utilizing existing administrative networks on the ground has its constraints, as those staff are not trained in DRM and face constraints in dealing with EWS matters (Interview 10). This prevents organizations from including all vulnerable people in EWS for different hazard types. Lastly, resource shortages hinder the tailoring of participatory mechanisms to different hazard types (mainly, cyclic versus non-cyclic), causing sensitization for non-cyclic hazards to be somewhat sidelined (Interview 10).

The second theme comprises ***CMDRR committee challenges***. The first constraint relates to staffing. A few years ago, the KRCS ran a project in some sub-counties to support CMDRR committees (Interview 8). CMDRR committees that were not part of that project tend to have fewer members than those that were (2 to 3, versus nine to eleven per ward), which significantly limits their capacity (Interview 8). Moreover, even when they are fully staffed, CMDRR committees do not include representatives from each village, as they are organized at the ward level (Interview 7 and 8). This creates difficulties in reaching all areas (Interview 7). According to the KRCS officer interviewed, the Kilifi County DRM Policy approved in 2024 foresees village-level CMDRR committees (Interview 8). However, these committees have not been set up yet (Interview 8). In addition to staffing constraints, CMDRR committees also experience resource deficiencies (Interviews 7 and 8; FGD 7). Volunteers must rely on their personal mobile airtime to spread information (FGD 7). Consequently, during periods of recurring hazards, they might run out of airtime, affecting their ability to disseminate alerts and their personal communications (FGD 7). Additionally, CMDRR committees do not own any vehicles and receive no travel support (FGD 7). This makes it challenging to reach everyone in time during emergencies (Interview 8; FGD 7). Lastly, taking the time to engage in EWS activities can negatively impact volunteers' livelihoods, creating an additional burden (Interview 10).

The third theme pertains to ***inadequate communication and information,*** both during sensitization efforts and emergencies. Effective communication is crucial: the collected data highlighted that community members who are less informed about the existing hazards and the importance of EWS are less willing to participate in EWS processes (Interviews 5, 6, and 10). However, communication flows currently face various constraints. First, communication is rarely tailored to PwD. Gatherings lack sign language interpretation, so people with hearing

impairments do not attend, missing out on important sensitization information and alert messages (FGD 5). Additionally, early warning messages have no voice message option, so people with visual impairments cannot understand them (FGD 5). Consequently, community members must physically reach PwD to share the alerts with them, putting them at increased danger (FGD 5). Second, people living in remote areas are often left out as well (FGD 5). Public gatherings often take place too far for them to attend, causing them to miss out on the information discussed (FGD 5). Lastly, communication with the communities appears to be mostly unidirectional. Indeed, there are no established mechanisms for the local population to provide feedback on the alerts received and, more broadly, on the EWS (Interview 7). This makes it hard to integrate their perspective and routinely adapt EWS to their needs.

Another theme clusters issues on ***people left behind***. Some population groups appear neglected by the current EWS participation system. For instance, children, PwD, and people living in remote areas are not usually considered when organizing public meetings and decision-making processes (Interview 6; FGD 5). Particularly, PwD-inclusivity policies often fail to translate into practice (FGD 5). The participants in FGD 5 mentioned that the relevant international agreements signed by Kenya and the National Disability Act of 2025 have not yet been implemented. On paper, PwD should have representation in all government assemblies; yet, they are not represented in the Kilifi County Assembly (FGD 5). Moreover, even when there is a representative, their function usually remains symbolic, and their recommendations are rarely adopted (FGD 5). Lastly, interviewees pointed out that community members with low literacy and education levels find it challenging to participate and are sometimes left out (Interview 6; FGD 5).

The fifth theme encompasses ***behavioral and cultural barriers***. Reliance on traditional practices can make it difficult to gain acceptance of EWS processes when the two do not align (Interviews 8 and 11; FGD 6). This resistance can be strengthened by the opinion of traditional Kayah elders (Interview 8). If their traditional knowledge conflicts with the information shared through institutional channels, they will recommend that the community disregard the latter (Interview 8). Hesitation to participate in EWS can be further reinforced by cognitive biases such as *positive illusions* (Interview 5), which lead people to believe a hazard will not materialize (Johnson & Levin, 2009b). Moreover, the absence of handouts at *barazas* and CMDRR meetings can disappoint community members' expectations and lead to low participation rates (Interviews 5, 7, and 11). This causes people to miss out on information that could enhance their resilience, preparedness capacity, and awareness of an

impending hazard. Cultural gender norms can also create challenges. Men's refusal to attend gatherings convened by women can delay the dissemination of alerts (FGD 6). Lastly, a preference for receiving post-disaster aid over engaging in preparedness activities reduces some community members' willingness to participate in EWS processes (Interview 10). This dependency is often associated with unrealistic expectations of what the government and other organizations can do in terms of disaster prevention and response (Interview 6 and 8).

The sixth theme concerns the consequences of ***inaccurate forecasts*** for participation. Generating forecasts at a local level is technically challenging, and the results can be inaccurate (Interview 7; FGD 7[3]). However, some community members expect forecasts to be certain prognostications and are disappointed when the predictions do not materialize (Interviews 7 and 8). This can lead to a loss of trust in EWS and willingness to engage in them (Interviews 7 and 8). To mitigate this challenge, the government and KRCS try to educate communities about how the forecasts are generated, but it usually takes time for people to adapt (Interview 7; FGD 7[4]).

The seventh theme encompasses ***individual and household-level resource constraints.*** Since not everyone has access to a mobile phone, some people are left out of digital information and alert channels, including TERA messaging, WhatsApp groups, and other social media platforms (Interview 6; FGD 6). Moreover, people who cannot afford to pay for transport to reach public meetings are not able to participate in them, missing out on important sensitization processes and alerts (Interview 6).

The last theme comprises challenges in ***balancing responsibilities***. Integrating day-to-day duties with participation in EWS processes can be difficult (FGD 6). Women are responsible for all household and livelihood activities, including caring for children and crops, as well as housework (FGD 6). Thus, they struggle to find time to attend women's group meetings, public meetings, and other community gatherings (FGD 6). Prioritizing participation in EWS activities can put a significant strain on their livelihood, decreasing women's willingness and ability to do so (FGD 6).

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[3] Information shared by Interviewee 8, a KRCS volunteer, as they provided interpretation support in FGD 7, to contextualize the answers of some participants.

[4] Information shared by Interviewee 8, a KRCS volunteer, as they provided interpretation support in FGD 7, to contextualize the answers of some participants.

6.2.2. Entry Points

The findings from the interviews and FGDs in Kilifi reveal multiple entry points for strengthening community participation in the context of EWS. These entry points are clustered into nine themes, including: capacity development, decentralized communication, leverage existing structures and capacities, support livelihoods and facilitate participation, leave no one behind, enhance institutional capacities, relationship building, favourable policy framework, and use of radio for dissemination and education. These themes are presented individually in the following paragraphs to reflect their contributions to enhancing participation in EWS.

The first theme refers to ***capacity development***. It includes awareness-raising meetings, training activities, and sensitization sessions aimed at improving understanding of EWS processes (Interview 6, 8, 9, 10, and 11; FGD 5, 6, and 7). An important insight emerging from the data is the role of lived experience in shaping engagement. Participants explained how communities with prior exposure to disasters tend to be more aware, have a better risk perception, and are more willing to participate in preparedness and response activities (Interview 10; FGD 7).

The second theme focuses on ***decentralized communication***. Communication processes should become less centralized to make EWS more accessible and widespread in communities. It includes holding meetings in villages and sub-locations (Interview 5; FGD 5, 6, and 7), conducting additional outreach activities (Interview 9), and translating information into local languages to ensure that messages are understood and spread at the grassroots level (Interview 6 and 9). Moreover, it is important to contextualize communication to local livelihoods, ensuring relevance to community practices. For example, agricultural advisories linked to early warning information may need to consider both local practices and weather patterns to encourage changes towards more appropriate crops (Interview 11).

Theme number three highlights the importance of ***leveraging existing structures and capacities***. This approach focuses on utilizing the institutional and social resources that are already available to strengthen EWS implementation. It stresses the importance of working with established figures—such as local leaders, politicians, and agricultural extension officers—and groups—such as CMDRR committees and faith-based groups—to improve coordination and outreach (Interviews 5 and 9; FGD 6). It also points out how public barazas and cultural meetings (e.g., funerals and weddings) can be used to enhance dissemination (Interview 5; FGDs 6 and 7). Through these existing structures and networks, knowledge

integration and message dissemination are strengthened in ways that are grounded in the local community.

The fourth theme relates to ***supporting livelihoods and facilitating participation***. This highlights the need to reduce economic barriers to participation in EWS-related activities. It includes facilitating transportation to EWS-related events (Interview 7), offering food for work or incentives to attend meetings (Interview 11), and training in income-generating activities that allow community members to get involved without compromising their livelihoods (Interview 10; FGD 6 and 7).

The fifth theme emphasizes the principle of ***leaving no one behind***. It focuses on ensuring that vulnerable and marginalized groups are included in the design and implementation of EWS. One way to do this is to promote messages that are accessible to everyone, for instance, by using Braille (FGD 5). Additionally, it is necessary to ensure that women, PwD, children, and youth are represented and actively involved in decision-making structures (such as CMDRR committees) and in community-led processes (FGDs 5 and 6).

Theme six concerns ***enhancing institutional capacities***. This involves ensuring that relevant structures, such as CMDRR committees, get long-term funding (Interview 7) and strengthening institutional coordination through county-level DRM committees (Interview 8). These structures facilitate cross-sectoral collaboration through formalizing each department's (health, agriculture, livestock, etc.) role and responsibility. This also supports financing communication systems, like SMS-based messaging, to reach more people (Interviews 10 and 11).

The seventh theme encourages ***relationship building***, emphasizing the role of trust and social connections in enabling EWS participation. According to participants, developing friendships and utilizing community volunteers are key to securing trust and ensuring communities share and act on information and warnings (Interview 7 and 9; FGD 7).

The eighth theme focuses on the need for a ***favorable policy framework***. This highlights the importance of formal arrangements to support the institutionalization and implementation of participatory EWS and DRR. It underscores the mainstreaming of DRR and EWS into county-level policies, as well as the formal recognition of multi-level disaster management structures (Interview 8). According to Interviewee 8, such frameworks are key for legitimizing community-based mechanisms and unlocking government support.

Lastly, the ninth theme highlights the role of ***radio*** as a key channel ***for dissemination and education***. Participants emphasized the importance of utilizing local and national radio stations for disaster management dissemination and education (Interview 9). A key action would be to ensure that widely followed programs—such as the BBC climate desk—are timely and coordinated with official KMD forecasts to ensure effective dissemination (Interview 8).

When combined, the entry points—both from Homa Bay and Kilifi—highlight the need for a multi-dimensional and integrated approach to strengthen participation in EWS. It is crucial to address these elements in a contextual, holistic, and comprehensive manner, ensuring that EWS are not only technically robust but also locally embedded. The next chapter draws on these insights to ultimately present targeted recommendations on how to operationalize and scale these entry points in practice. This integrated analysis of the results was made possible through utilizing CT, which allows to move beyond listing individual challenges and entry points towards recognizing them as emergent outcomes of systemic interactions across dimensions. This helps to shift the focus from what participation looks like to why it unfolds the way it does.

Figure 1 and **Figure 2** provide an overview of the themes identified in the two counties and presented in the previous sections.

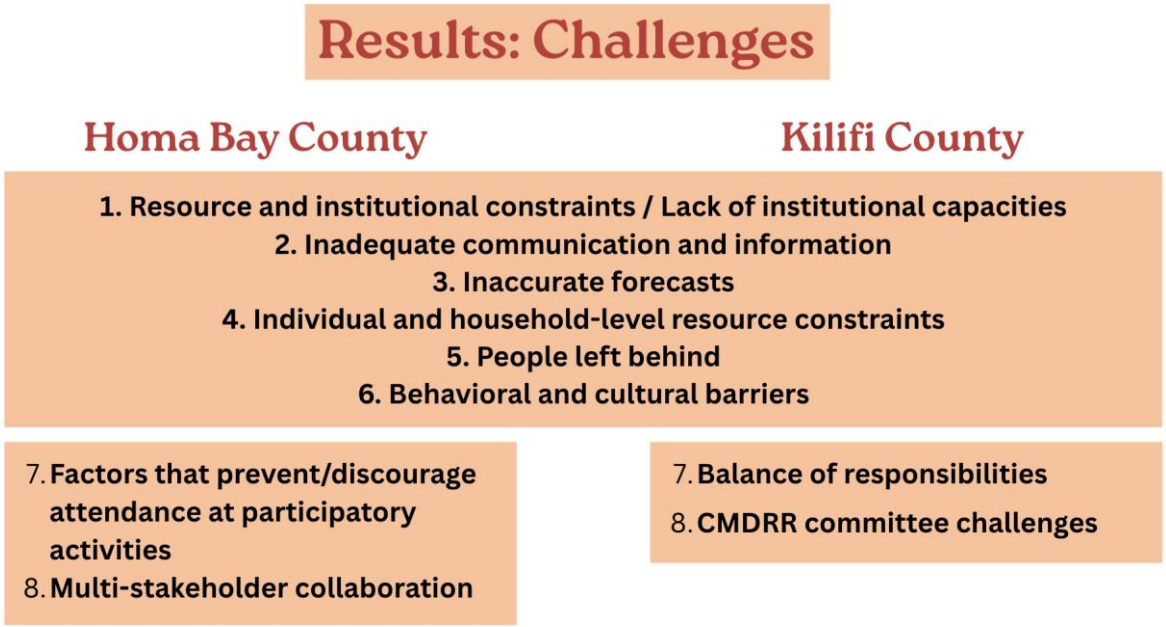

Figure 1*: Overview - Challenges for Participation in Homa Bay and Kilifi Counties*

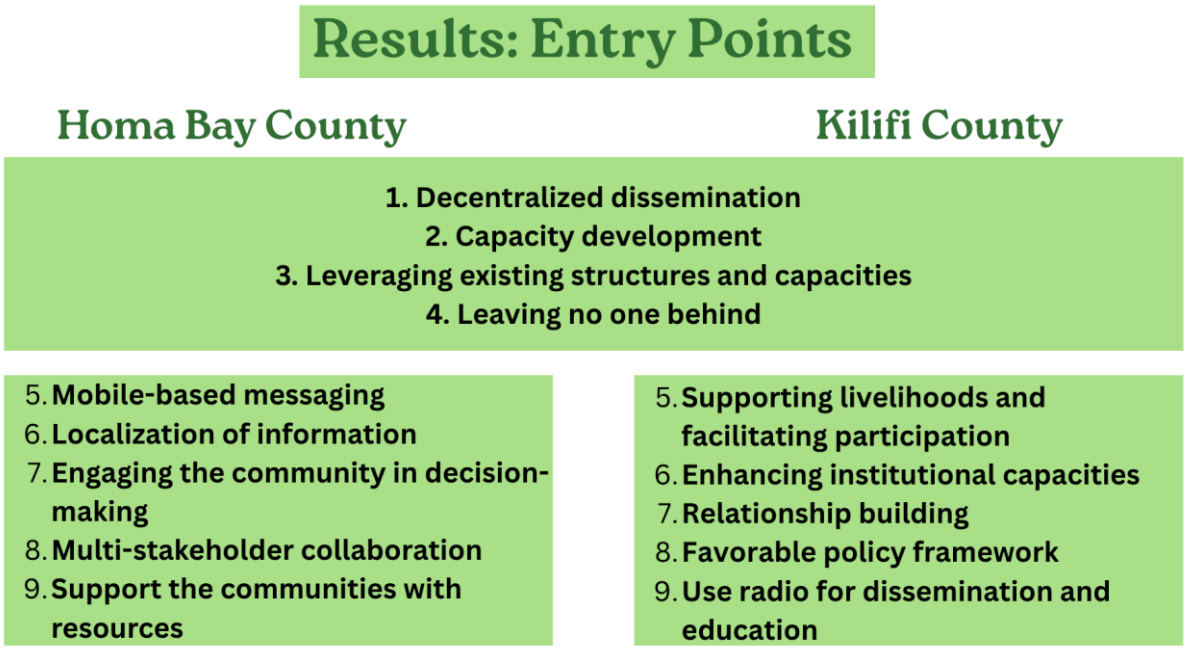

Figure 2: *Overview - Entry Points for Participation in Homa Bay and Kilifi Counties*

6.3. Discussion

In this section, the findings from Homa Bay and Kilifi are discussed in relation to the analytical dimensions of participation—who participates, when participation occurs, and how participation unfolds (Sarzynski, 2015; Uittenbroek et al., 2019)—as presented in the **Conceptual Framework**. The analysis merges findings from both counties, aiming at identifying common patterns and differences. When linking challenges and entry points, an effort was made to align specific challenges with their corresponding entry point where possible. However, this was not always straightforward, as many entry points cut across multiple dimensions and are therefore discussed together in the last section (The When, How, and Who). In this manner, the discussion brings together the empirical findings from this study with the literature, allowing for a more nuanced interpretation of EWS participation in practice. This approach enables a comprehensive understanding of participation as a multidimensional, holistic process shaped by underlying power relations and knowledge co-creation structures.

6.3.1. The "When" of Participation

The "*when"* of participation in the context of this thesis is understood in terms of the four pillars of EWS. Of the challenges identified in the case study, two seem to directly influence when participation occurs. First, *resource and institutional constraints* on both counties

appear to lead departments to focus on disaster response, sidelining other DRM phases and failing to develop comprehensive DRM plans (Interviews 1, 8, and 10). Consequently, community participation in institutional EWS appears as mostly ad hoc and instrumentally linked to the goal of reaching a broad public during emergencies. In line with the findings of Sufri et al. (2020a), EWS Pillar III shows the highest level of community participation, followed by Pillar IV, then Pillars I and II. Second, the situation is exacerbated by challenges in *multi-stakeholder collaboration.* Aligning priorities of different actors can be difficult and complicate the design of participation (Interview 2). In Kilifi, the unclear division of DRM responsibilities among county government departments further constrains comprehensive planning (Interview 8), while slow, bureaucratic communication and collaboration channels in Homa Bay (Interview 4) allow only last-mile, last-minute community engagement in the dissemination of alerts. This setup is likely to reproduce existing inequalities and vulnerabilities, as there are no established structures to integrate those currently left out of decision-making processes. This aligns with the challenge identified by Clegg et al. (2021) and Sufri et al. (2020a, 2020b), in which a lack of standard operating procedures for integrating community participation into EWS hinders its implementation.

The entry points from the results—*multi-stakeholder collaboration* (Interviews 2 and 4; FGD 1 and 2) and *enhancing institutional capacities* (Interviews 7, 8, 10, and 11)—aim at addressing these challenges through more structured and effective collaboration mechanisms. An example would be the establishment of a real-time data sharing tool (Interview 4), which aligns with Budimir et al.'s (2025) call for enhanced data sharing among stakeholders. Another strategy can be to strengthen institutional coordination through county-level DRM committees (Interview 8). Together, these measures can promote the institutionalization of cooperation structures, both among county government departments and with communities, consequently allowing for systematic planning of participation across different stages and EWS Pillars. This result supports the previous findings by Clegg et al. (2021) and Sufri et al. (2020a, 2020b), who highlighted the importance of developing standard operating procedures for the community's inclusion in EWS.

6.3.2. The "Who" of Participation

Various challenges and entry points directly influence the analytical dimension of *who* participates. First, the *who* of participation can be influenced by *cognitive and behavioral barriers*. A learned dependency on the government and other relief organizations was found to reduce some people's willingness to engage in preventive action, including EWS

(Interview 4, 6, 8, and 10; Joint Interview 1). Similarly, interest in participating can also be hampered by cognitive biases such as positive illusions (Interview 5).

Second, the *resource and institutional constraints* in both counties, which materialize in staff shortages, prevent organizations from reaching all at-risk populations (Interview 1, 3, 7, 8, 10, and 11). CMDRR committees, lacking volunteers from all villages, are in the same situation (Interviews 7 and 8). This situation can potentially exacerbate existing power and exclusion dynamics, as people who are closer to decision-making processes might have an easier time having their concerns heard and knowledge integrated into EWS, while already marginalized groups are left behind. Two entry points were mentioned to start addressing these shortcomings and reach more people. The first is *enhancing institutional capacities*, especially for sending SMS alerts (Interviews 6, 10, and 11; FGDs 1, 2, 3, 5, and 6). The second is to adopt the *radio* as a channel *for dissemination and education* (Interviews 8 and 9). However, these interventions alone would probably not suffice to address asymmetric power dynamics, as they mainly envision communities as recipients of information. Ensuring the implementation of the 2024 DRM policy (approved in 2024), which foresees the establishment of CMDRR committees at village level, could strengthen these efforts.

A third challenge influencing who participates in EWS is *inadequate communication and information sharing with communities*. Unaddressed language barriers were especially emphasized by participants from Homa Bay County (Interview 4; FGD 1, 2, and 3), while a lack of accessible information for PwD was mentioned across both counties (FGD 1, 5). It is interesting to note that these issues were mostly raised in FGDs with the local population. On the contrary, government officials and KRCS staff often identified low levels of education and awareness as challenges to effective communication (Interviews 2, 4, 5, 6, 10; Joint Interview 1), whereas community members mentioned this more sporadically (FGDs 3, 5). This contrast reveals existing knowledge hierarchies, in which government and institutional actors frame communication challenges as matters of community weakness, while community members identify systemic barriers.

The fourth category of challenges influencing who participates in EWS encompasses *individual- and household-level constraints*. Participants in both counties noted that lower-income households often cannot afford to suspend livelihood activities to participate in EWS activities, especially without handouts or travel support (Interview 3; FGD 1, 2, and 6). This aligns with the finding by Clegg et al. (2021) that community members are less willing to engage in activities when they perceive them as interfering with their daily lives. Moreover,

the results reveal that mobility barriers and time poverty disproportionately impact specific population groups. These include PwD, especially those with mobility impairments (FGD 1); people living in remote areas, who struggle to attend gatherings in distant villages (FGD 5); and caretakers of young children and PwD, who are often bound to stay at home with them (FGD 1). Women are also particularly affected, as they tend to experience severe time poverty stemming from their disproportionate responsibility for care work, domestic chores, and livelihood activities (FGD 6).

In addition to individual-level barriers, it seems that insufficient measures are currently in place to ensure that no one is *left behind.* Participants reported that various groups, including PwD, children, girls, and people living in remote areas, are often not considered in participatory processes (Interview 1 and 6; Joint Interview 2; FGD 2 and 5). Moreover, there was no specific mention of efforts to promote women's participation, considering the significant time poverty and cultural barriers they face. This is particularly concerning as both Homa Bay and Kilifi counties identify women and PwD as among the most vulnerable groups (County Government of Homa Bay, 2023; County Government of Kilifi, 2023). Thus, their direct or indirect exclusion from EWS processes can lead to the exacerbation of existing vulnerabilities, the marginalization of their perspectives and knowledge, and the solidification of existing power structures.

It is important to note that the challenge of individual-level constraints was framed differently by different actors. Community members mainly emphasized mobility as a barrier, especially for PwD and people living in remote areas (FGD 1, 2, 5). On the other hand, the expectation of handouts for participation was mostly mentioned by government officials (Interview 3, 5, 11; Joint Interview 1), and less by community members (Interview 7; FGD 2). Moreover, to overcome these barriers, community members mainly called for travel facilitation (FGD 1, 2, 7) and broader economic empowerment through training and skill transfer (FGD 6, 7). The provision of handouts to reward attendance was only mentioned by a government official (Interview 11). To overcome these barriers and ensure the most vulnerable groups can participate in EWS-related processes, the principle of *leaving no one behind* is the key entry point. This principle should be embraced when designing participation in EWS at all stages. As the results show, the principle involves adopting inclusive communication methods and ensuring the active representation of vulnerable groups in all processes, so that their needs can be identified and addressed (Interview 1; FGD 1, 2, 5).

Cultural barriers were identified as a sixth factor that shapes who is interested in participating in institutionalized EWS. When cultural views and traditions conflict with the technical knowledge at the base of institutionalized EWS, some community members tend to distance themselves from EWS processes (Interview 1, 2, 8, 11; FGD 2, 3, 4, 6). The case study highlights that this tendency is exacerbated when traditional elders encourage the community to prioritize local knowledge over the EWS (Interview 8). This situation highlights the importance of recognizing different knowledge systems as equally valuable and integrating them into EWS, including through the participation of traditional leaders. This resonates with the findings of Sufri et al. (2020b), who also highlighted that local beliefs can hinder participation, and that involving traditional leaders is crucial to leverage local beliefs positively and foster long-term sustainability and ownership. Efforts in that direction seem to be underway in both counties (Interviews 1, 8, 9, and 10). As Interviewee 9 explained:

> We ensure that indigenous local knowledge of forecasting is blended in our modern science. You know, if you want to get somebody to understand you, to trust you, first and foremost, you embrace what he knows best. That is their traditional beliefs. So through them, when you blend them, when you're doing the forecast, we ensure also our modern science is also blended with theirs. And then we come with the forecast so that they can understand us better.

Nonetheless, the frequency with which conflicting knowledge systems were cited as a barrier to participation suggests that more efforts are needed to bridge this divide and increase communities' trust in institutional EWS. This result strengthens Sufri et al.'s (2020a) finding that current EWS inadequately integrate local and indigenous knowledge. However, addressing this challenge can be difficult because numerous barriers hinder meaningful knowledge co-creation, as outlined in the Conceptual Framework. For example, Qureshi et al. (2022) highlight the failure to simplify and contextualize technical language as a key challenge of knowledge co-creation. This appears closely related to the theme of *inadequate communication and information*, which emerged from the case study. Moreover, Warwick-Booth et al. (2024) identified institutional factors, including funding constraints, as another obstacle to knowledge co-creation. This also seems relevant for the context of this study, as *resource and institutional constraints* and a *lack of institutional capacities* were recognized as challenges for community participation in Homa Bay and Kilifi counties, respectively. Lastly, Qureshi et al. (2022) also revealed that sociocultural factors that influence whose voice is heard and valued can cause knowledge co-creation to perpetuate current injustices. This ties in well with the challenges expressed by vulnerable groups—especially women and PwD—to

participating in EWS and the gendered cultural norms that shape them. These examples emphasize the profound interconnectedness of various dimensions of community participation, and stress the need to address them holistically.

6.3.3. The "How" of Participation

The dimension of participation "how" refers to the level of influence that communities can exercise in EWS processes. Results from both Homa Bay and Kilifi indicate that, despite current efforts to engage communities in EWS, participation is often limited to passive forms, such as receiving information. This is partially driven by ongoing issues with inadequate information and communication, and by trust issues stemming from inaccurate forecasts. Crucially, these patterns are symptomatic of deeper power relations that determine whose voices are heard and whose knowledge is integrated into EWS processes.

Inadequate information and communication pose a crucial challenge to meaningful participation and directly limit communities' ability to influence decisions. Both counties reported that information was not communicated in accessible ways due to language barriers and a lack of contextualization and nuance (Interview 4; FGD 1, 2, 3, and 5). This effectively excludes community members from deeper forms of engagement within EWS. Furthermore, this is exacerbated by the lack of feedback mechanisms or dialogue spaces in communications (Interviews 4 and 7). Due to the lack of channels for posing questions or providing input, communities have limited power to influence EWS processes. In this sense, participation becomes one-directional, solidifying a top-down model of communication. This, in turn, reinforces asymmetric power relations in which information flows from institutions to communities without reciprocal exchange. As a result, communities are mostly regarded as passive recipients. In this sense, knowledge production is centralized, with local and experiential knowledge not fully integrated. This constrains processes of knowledge co-creation that are crucial to develop contextually relevant and effective EWS.

The extent of communities' influence in EWS is further determined by trust. In both counties, trust in EWS is affected by concerns about the *inaccuracy and unreliability of weather forecasts* (Interviews 1, 3, and 7; FGDs 1 and 7). Unreliability, in this context, refers to weather forecasts which fail to include potential hazard risk predictions—such as flooding in lowland areas caused by heavy rains in highland areas—even when an accurate weather forecast is delivered (FGD 1). This can exacerbate the gap between technical systems and local communities, reducing the likelihood that communities will willingly act on or respond

to warnings due to decreased trust. This, in turn, discourages active participation in EWS processes.

Despite these challenges, results from both counties also unveil existing participatory practices that serve as a starting point for more meaningful participation. In both counties, their respective county governments are working towards actively engaging communities in risk identification and analysis through community-led participatory risk assessments (Interview 1; FGD 2; County Government of Homa Bay, 2023; County Government of Kilifi, 2023). Similarly, surveys and interviews conducted by government agencies to better understand local vulnerabilities represent an effort to incorporate community perspectives in decision-making processes (Interview 2). Examples of community-led monitoring of water levels, bird and cattle behavior, and changes in tree leaves in both counties (Interview 6; Joint Interview 1; FGD 5, 6, and 7) highlight the existence of locally grounded knowledge systems. However, these are not yet systematically integrated into formal EWS processes. On the other hand, efforts are being made where certain models of community-led monitoring are currently institutionalized; these include river level and rain gauging and drought field monitoring (Interviews 3, 9, and 11). Moreover, training for actors such as CMDRR members, youth leaders, and women's groups in both counties reveals ongoing efforts to develop local capacity (Interviews 3 and 11; Joint Interview 2; FGD 7). Nevertheless, gaps persist in access to these trainings, as women's groups in Kilifi have complained that they do not enjoy the same training privileges as CMDRR members, despite both carrying out the same DRM activities (FGD 6). Ultimately, these ongoing initiatives are often uneven in their impact, as they do not always translate into influence over EWS functioning.

The results, however, also suggest entry points to advance participation toward more influential forms. For instance, in Homa Bay, the use of *mobile-based messaging* systems with integrated feedback and follow-up functions was identified as a way to improve understanding and engagement (FGD 1 and 2). Strategies, such as feedback mechanisms, can help rebalance power relations by facilitating two-way communication and creating spaces for dialogue in which community members can contribute their knowledge. This supports knowledge co-creation processes, where local and technical knowledge can be combined to generate more relevant and actionable early warning information. Follow-up messaging deepens understanding and encourages action, sustaining engagement over time.

6.3.4. The "When", "How", and "Who"

The previous sections provided insights into the three dimensions of participation individually. However, the findings also reveal a set of cross-cutting factors that simultaneously shape all three. This emphasizes that participation processes in EWS are not determined by isolated challenges or entry points, but by complex processes that determine who is involved, at what stages, and to what degree of influence.

A key cross-cutting challenge is the *inadequate communication and information*, identified in both counties. One-way communication processes limit the magnitude of influence communities can exert (how), and limit who can participate, especially where language and other discriminatory barriers (Interview 4; FGD 1, 2, 3, and 5) are not addressed. Additionally, low awareness and access to information (Interviews 2, 4, 5, and 6, and 10; Joint Interview 1; FGD 2, 3, and 5) decrease the prospect of participation across different EWS stages (when), particularly in early phases such as risk identification and monitoring. In this sense, inadequate communication and information represent a systemic barrier that affects inclusion, timing, and influence, and limits opportunities for knowledge integration.

Numerous entry points were identified which could enhance participation in all three dimensions. *Decentralized dissemination* and *localization of information* (Interview 1, 4, 5, 6, 9, and 11; Joint Interview 1 and 2; FGD 1, 2, 3, 5, 6, and 7), brought up by both counties, facilitate broadening who participates by making information more accessible and contextually relevant, as well as enable engagement in earlier EWS stages (when) and promote meaningful understanding and interaction (how). These approaches bridge the gap between passive and active participation by making communication more accessible and relevant to local communities and their realities. Similarly, *engaging communities in decision-making* processes (Interviews 1 and 2; Joint Interview 2; FGD 3) is identified as a key entry point in Homa Bay that affects all dimensions. This intentional involvement of community members in the design and implementation, and in all stages of EWS (when) widens participation (who) and amplifies influence (how). This increases ownership and strengthens the integration of local knowledge, leading to more contextually grounded and effective EWS.

Moreover, both counties recognized *leveraging existing structures and capacities* as a valuable entry point (Interview 2, 5, 7, and 9; FGD 1, 2, 4, 6, and 7). This relates to an entry point identified by the literature, where the importance of trust is highlighted through the use of established community groups (Budimir et al., 2025; Clegg et al., 2021), trusted communication channels (Baudoin et al., 2016; Budimir et al., 2025), and resources and locations (Budimir et al., 2025; Sufri et al., 2020b). This theme further demonstrates how

participation can be strengthened across dimensions. Existing community groups and their successful arrangements—such as local institutions and trusted actors—can be utilized to reach more people (who), ensure more interactive forms of participation (how), and achieve engagement across different EWS phases (when). According to Clegg et al. (2021), the creation of participant committees and knowledge-sharing events is crucial to ensure successful participation. However, the findings from this study challenge the assumption that new structures are needed; instead they emphasize the importance of learning and leveraging from existing ones (such as CMDRR committees and public barazas). Similarly, *multi-stakeholder collaboration* in Homa Bay (Interviews 2 and 4; FGDs 1 and 2) and *the enhancement of institutional capacities* in Kilifi (Interviews 7, 8, and 10) illustrate the value of coordinated structures that can deliberately establish spaces for participation across levels and sectors. These mechanisms can help to formalize roles, clarify responsibilities, and ensure that a diverse pool of actors (who) is involved not only as recipients of information but also as valuable contributors (how) across all EWS phases (when). Clegg et al. (2021) also recognized these practices as an entry point to enhance community participation.

In line with Baudoin et al.'s (2016) findings, *capacity development* also materializes as a key cross-cutting entry point in both counties of this study (Interview 4, 6, 8, 9, 10, and 11; Joint Interview 1; FGD 4, 5, 6, and 7). Through fostering knowledge and skills within the local community, it allows for an increased number of community members to participate (who), it increases the ability of communities to interpret information, act on it, and hence have a more influential perspective (how), and it supports active engagement at different EWS stages (when). In this sense, capacity development proves crucial for mobilizing participation towards more proactive and rigorous forms.

In Kilifi, *relationship building* (Interviews 7 and 9; FGD 7) further emphasizes the value of trust and social connections as enablers in all dimensions of participation. Strong relationships within communities and between communities and institutions help to enable inclusion (who), sustain engagement over time (when), and nurture the underlying conditions for more open dialogue and knowledge exchange (how) "because through friendship there will exist no gap of knowledge" (Interview 9). Likewise, a *favorable policy framework* (Interview 8) provides an enabling environment that allows for participation across dimensions through institutionalizing roles and legitimizing community-based structures, hence creating opportunities for more coherent, stable, systematic, and meaningful engagement. This aligns with findings for the need to institutionalize participatory approaches in EWS policies, to

ensure participation effectiveness and sustainability, from Clegg et al. (2021) and Sufri et al. (2020b).

Lastly, one challenge identified by the literature, but not in this study, is the lack of resources for the long-term sustainability of participation, as recognized by Mustafa et al. (2015) and Sufri et al. (2020b). One potential explanation is that participants from this study were primarily concerned with the initial development, operationalization, and institutionalization steps of participatory EWS processes. For this reason, local dialogues may not yet have fully formulated considerations for sustaining participation over time. Nonetheless, despite not being explicitly defined in terms of sustainability, many of the identified entry points—such as localization of information and leveraging existing structures and capacities—can contribute to foster the long-term sustainability of participation through strengthening local ownership.

6.4. Recommendations

The results and discussion of this study contributed to the development of a list of recommendations for practitioners and researchers. These insights, however, are mainly context-specific, as the study provides a detailed exploration into community participation in EWS in Homa Bay and Kilifi. This means that the recommendations are based on rural contexts characterized by their local livelihoods and specific community structures. Thus, some of the recommendations outlined below might be transferable, but caution is advised in generalizing these strategies beyond similar contexts. To support practitioners in prioritizing actions, the recommendations below are organized into short-term measures—achievable within existing resources and institutional structures—and long-term measures, which require a major shift in funding capacities or policy change.

6.4.1. Short-term measures

A. Increase reach through diversified communication channels

Participation in EWS can be enhanced by expanding outreach through multiple communication channels, such as SMS-based messaging systems, radio, and village-level CMDRR committees.

B. Promote localized, two-way communication systems

Communication systems must be localized for context and designed to enable two-way interaction. This involves adapting messages to local languages, livelihoods, literacy levels, and ensuring inclusive messaging. Moreover, communication should be made more

interactive by incorporating feedback mechanisms and open dialogue spaces to enable continuous exchange between communities and institutions.

C. Invest in capacity development for meaningful participation

Capacity development efforts should not only aim to raise awareness of risks and EWS but also support skill development to enable participation. This includes developing communities' capacity to understand EWS forecasts and the pillars of EWS, and to engage in community-led monitoring. Of equal importance is ensuring that training is accessible to everyone and that it includes the representation of diverse groups.

6.4.2. Long-term measures

D. Enhance EWS planning

Participation must be systematically integrated across all EWS pillars. This involves institutionalizing cooperation with communities through developing SOPs that clearly specify when, who, and how participation should take place. Additionally, structured collaboration processes and a clear division of responsibilities among actors must be implemented to facilitate coordination. Favorable policy frameworks should institutionalize community-based structures with emphasis on ensuring effective operationalization and implementation of adopted participatory policies.

E. Strengthen inclusive participation

To enhance inclusive participation, existing barriers should be addressed, for instance, through targeted inclusion strategies such as decentralized meetings and processes, transport facilitation, childcare support, handout provision, and more flexible participation formats for those experiencing time poverty and other constraints. Furthermore, efforts should be undertaken to ensure the intentional representation and integration of all vulnerable groups in decision-making processes, so that they can exert meaningful influence. Income-generating opportunities for households should be considered in training to strengthen livelihoods. Thereby enabling community members to more actively participate in EWS processes.

F. Build trust in EWS

Building trust in EWS indicates ensuring sustained relationship-building between communities and institutions. This requires working with trusted focal points—such as traditional elders—and within existing structures through mapping and assessing existing capacities and then leveraging and formalizing their role in EWS. Equally important is promoting inclusive knowledge co-creation and integration. This encompasses the

strengthening and institutionalization of community-led local knowledge-based systems for the identification and monitoring of risks and vulnerabilities. Moreover, increasing the accuracy and reliability of the forecasts and effectively communicating the link between weather patterns and hazard manifestations is crucial for building trust.

G. Encourage further research

This study contributes to the literature by identifying previously unaddressed challenges and entry points and by incorporating reflections on power and knowledge hierarchies within participatory EWS processes. Future research should explore whether the challenges, entry points, and recommendations elaborated in this study can be applied across contexts, particularly regarding scalability and generalizability.

7. Conclusion

EWS are a fundamental DRM tool, and their effectiveness depends upon the meaningful integration of communities across their four pillars: disaster risk knowledge, risk monitoring, dissemination, and preparedness and response capability (UNDRR, 2017). The importance of people-centered EWS is recognized in various international frameworks (ISDR, 1994, 2005), including the Sendai Framework (UNDRR, 2015). Previous disaster experiences also highlight that technical accuracy is insufficient to ensure EWS effectiveness if alerts are not understood or trusted by the local populations (Sufri et al., 2020a a). Nonetheless, current EWS rarely involve communities meaningfully, often adopting a technical, single-component perspective (Baudoin et al., 2016; Kelman & Glantz, 2014; Marchezini et al., 2018; Pfeiffer et al., 2026; Sufri et al., 2020a a). Moreover, limited research investigates how participation in EWS unfolds in concrete settings and which factors can help or hinder it in different situations (Pfeiffer et al., 2026; Sufri et al., 2020a a). To bridge this gap, this thesis explored how meaningful community participation can be embedded in EWS in practice. It did so by carrying out a qualitative instrumental case study of EWS in two Kenyan Counties—Homa Bay and Kilifi—focused on identifying challenges and entry points for participation.

The results highlight numerous challenges and entry points for community participation in EWS. These factors can manifest for the different stakeholders involved across different stages of EWS and at different levels (individual, local, county, national). Nonetheless, each of them influences one or multiple of the three dimensions of participation: *when* participation happens, *who* is involved, and *how*.

Regarding the ***when*** of participation, key challenges include institutional and resource constraints. These materialize into a lack of DRM and community participation planning, and issues with multi-stakeholder collaboration. These prevent organizations from reaching all at-risk populations and involving them in a systematic fashion. Consequently, this study reveals that community engagement in EWS remains largely ad hoc, instrumental, and linked to dissemination activities (EWS Pillar III). Entry points to address these challenges—and foster meaningful community participation across all EWS Pillars—include the development of formal structures for multi-stakeholder collaboration and the institutionalization of community participation in EWS.

Second, the ***who*** of participation appears mostly affected by staffing shortages, inadequate communication, and socioeconomic and cultural barriers. These challenges prevent

organizations from including all at-risk people on the ground, making it especially difficult for vulnerable groups to participate, and failing to integrate local knowledge in EWS. Efforts to address these challenges must actively engage vulnerable groups, address underlying vulnerabilities and power dynamics, and involve locally established actors and structures to increase trust in EWS and enable knowledge co-creation practices.

Third, the ***how*** of participation unveils that communities are often regarded as passive recipients of information rather than active participants. This one-directional flow—exacerbated by language barriers, lack of contextualization, and a lack of trust in the accuracy of forecasts—strengthens unequal power dynamics. To move toward more influential participation, this study stresses the importance of systematically integrating knowledge co-creation processes, delivering training accessible to everyone, to develop local capacities, and setting up two-way communication channels.

The findings also highlight that various challenges and entry points simultaneously and dynamically shape multiple dimensions of participation. Some examples are the decentralization and localization of communication and efforts to build trusted relationships with communities, which can have positive effects across all dimensions of participation as well as on other challenges and entry points. In alignment with this thesis's complexity theory perspective, this recognition emphasizes the interconnectedness of the different challenges, entry points, and dimensions, and the need to holistically address the complex processes at play.

This study contributes to the existing literature by utilizing a power dimension framework to explore EWS participation. It contests the linear "ladder of participation" by illustrating that a holistic approach to power dynamics and knowledge hierarchies is required across all four EWS pillars. In doing so, this thesis recognized several challenges and entry points unaddressed by the literature, contributing to the existing research on participation in EWS. Furthermore, by recognizing that participation, in this context, is mainly encompassed within dissemination (Pillar III), this thesis provides a list of recommendations to enhance community participation in risk knowledge (Pillar I), monitoring (Pillar II), and preparedness (Pillar IV). The proposed recommendations serve as a starting point to develop more robust, context-sensitive strategies that align with the EW4ALL initiative.

Limitations of this thesis—introduced in the Methodology chapter—include its contextual specificity, methodological constraints, and limitations arising from conducting research in an

intercultural context. As the case study investigated two primarily rural Kenyan counties, the results might not be fully generalizable to socioeconomically and culturally different contexts, including non-Kenyan contexts and urban contexts in Kenya. Nonetheless, the inclusion of two counties in significantly different regions of the country does provide a first test of the generalizability of the results. Second, the researchers relied heavily on the KRCS for selecting study participants and conducting data collection, as they had limited knowledge of the contexts and networks on the ground. Consequently, there is a risk that the data collection process may have introduced biases that researchers could not identify or control. In this regard, the presence of KRCS staff during interviews and FGDs might have consciously or subconsciously influenced how participants expressed their perspectives. Moreover, the reliance on language interpretation for some interviews and focus group discussions might have caused some nuances to be lost in translation. Lastly, the different cultural and knowledge backgrounds of participants and researchers, including their understanding of hazards, EWS, and participatory processes, might have influenced the way communications unfolded and researchers analyzed them.

Future research could investigate the challenges and entry points for community participation in EWS across different socioeconomic, cultural, and geographical contexts to identify which factors—especially entry points—are most context-specific and which are more generalizable. This could then inform a broader pool of practitioners, working on EWS in diverse contexts. Studies could also investigate the longer-term sustainability of community-based mechanisms, such as CMDRR committees, as they report facing resource challenges in fulfilling their mandates. Lastly, researchers could investigate how emerging technologies can be leveraged to promote the inclusion of vulnerable and marginalized population groups in EWS rather than increasing divides.

Community participation is crucial to ensure effective EWS. This thesis highlights that embedding community participation in EWS requires shifts in power dynamics towards recognizing the value of local knowledge, fostering inclusivity, and addressing existing vulnerabilities. As climate-related hazards intensify, transitioning from technical, top-down EWS to inclusive ones that align with communities' context and needs should not remain simply a theoretical idea, but become a paramount actionable strategy.

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Appendix A

A1. Interview Guides

Introduction (Everyone)

Introducing ourselves

- Hi, nice to meet you!
- I am [Gabriela/Ismea], and together with [Gabriela/Ismea] we are studying Disaster Risk Management and Climate Change Adaptation at Lund University, in Sweden
- We appreciate you being here and participating in our thesis research

Research Purpose

- The purpose of our field research is to understand what the challenges and enabling factors are for communities in Kenya to participate in Early Warning Systems (EWS)

The interview process

- The interview will last about 45 to 60 minutes
- We will record the audio with a recording device. We will also locally record it on our phones as backups. We will start recording right after you finish introducing yourself. Do we have your consent to start recording after you introduce yourself?
- We have around 15 questions. To make sure we fit into the allocated time, we would appreciate it if you remained mindful of the length of your answers.
- I will be leading the interview, while my colleague [Gabriela/Ismea] takes notes.
- We want to make sure that this is a relaxed and low-pressure environment, where you feel comfortable.
- There are no right or wrong answers to the questions
- It is okay not to have the answer to a question
- It is okay if you do not feel like answering a question
- Everything you feel like sharing in your answers is valuable for us.
- If anything is unclear, do not hesitate to ask us so that we can clear up any confusion.
- If at any time during the interview you feel uncomfortable for any reason, please let us know!
- Finally, we want to remind you that your participation is voluntary. We will now go through the consent form, the right to withdraw, and data storage standard practices.
- So, we have given you a consent form, you have read it and signed it, but to refresh:
    - You are welcome to stop the interview at any time, for any reason, without having to give an explanation and without consequences.
    - If, for any reason, you wish to withdraw from the process, you can let us know at any time, even after the interview is done. We will then delete any information we have collected from you so far.
    - Once your data has been processed, it will be stored on an encrypted and secure local hard drive, disconnected from any cloud services, for seven years and then deleted.
    - This is standard practice under international research guidelines.
    - Do you have any questions before we start?

Questions for Local Government Representatives / KRC Staff

Context

To begin with, we want to ask you about your connection to the EWS.

1. Tell us about yourself and your role in the EWS?
2. [How are you / how is your office] involved in the EWS' design and/or implementation?
3. What are the main objectives of EWS in [Kilifi/Homabay]?

Thank you for sharing this. We now want to explore how the EWS was designed and implemented, and how the local community participated in the process.

Understanding of Community Participation

We will start with three questions on community participation in the project.

4. Describe what "community participation" means to you in EWS.
5. Do you think community participation in EWS is important? Why (not)?
6. In your view, what should be the goals of community participation in EWS?

How Participation has taken place

Now, we want to look into how participation has taken place in the project.

7. In which way has the community been engaged in EWS?
    a. If need be, probe:
        i. Were community representatives involved in identifying local risks?
        ii. Helping monitor things like river levels?
        iii. Helping decide how warnings should be shared?
        iv. Planning what to do when a warning comes?
8. If the answer only refers to non-decision-making involvement (such as receiving training etc.): Could you give us some examples of how the local community has participated in decision-making in EWS?
9. What mechanisms were used to engage with the community (committees, workshops, trainings, surveys, etc)?

Inclusion and Representation

10. Do you think the local community would want to participate (more)?
    a. Why (not)?
11. Who do you think is important to include in EWS activities? *[Socioeconomic groups, stakeholder types, women, youth, elderly, PWDs, local leaders, etc.]*
12. Do you feel that all of them were included in the EWS?
    a. If yes: What factors made it easy for each of them to participate?

b. If not: What could be done to ensure they are all represented in the future?

Barriers and Enablers

13. What makes it difficult to include (more) community participation?
14. What would make it easier to include (more) community participation?

Reflections and Recommendations

15. Is there anything you want to add?

Informal debrief.

Questions for Local Community Representatives

Context

1. Can you tell us a little about yourself and your role in this community
    a. Probe: What do you do for your livelihood? How long have you lived in this community? Are you involved in any community groups or local activities?

-- start recording --

Awareness of CBEWS Project

2. Can you tell us how you first became aware of the EWS being implemented here?
    a. Probe: Who informed you about it? Was it through a community meeting, a neighbor, a community leader, media, or another channel...?
3. What was the interaction or communication like?
4. How did you get involved in the EWS?

Community Participation

5. In what ways have you been involved in the EWS?
    a. Probes
        i. Were you involved in identifying local risks?
        ii. Did you help monitor hazards (e.g., river levels?
        iii. Did you help decide how warnings should be shared?
        iv. Were you involved in planning what to do when a warning is issued?
6. If they don't mention decision-making: Could you give us some examples of ways you have, or you were able to specifically participate in decision-making in the EWS?
    a. If answer is still too vague: Could you tell us what mechanism was used to involve you in the project (i.e. formal letter, workshops, consultations, other interviews, etc.

Decision-Making Influence

7. Did you feel that your perspectives were valued?

8. Are there any decisions/activities you felt strongly about?
    a. Probe
        i. Could you share which activitie(s) and how did you feel about it/them?
        ii. If negative: Were you able to oppose/challenge them?

Enablers and Barriers to Participation

9. What things made it possible for you to participate?
10. Would you have wanted to participate (more)? Why (not)?
11. What made it difficult for you to participate (more)?
    a. Probe:
        i. Time constraints
        ii. Lack of information
        iii. Cultural or social barriers
        iv. Distance or logistics

Inclusion

12. Who do you think is important to include?
13. Do you feel all of them are represented in decision making processes?
    a. If not: How do you think their participation could be included in the future?

Perceived Outcomes and Impact

14. Has the EWS brought any changes to your life or livelihood?
    a. If yes, which ones?

Reflections and Recommendations

15. In your opinion, what does meaningful participation look like?
16. What could KRCS do to strengthen community participation in the future?
17. Is there anything you want to add?

Informal debrief.

A2. FGD Guide

Introducing ourselves

- Hi, good [morning/afternoon/evening] and welcome to our session. Thanks for taking the time to join us to talk about the inclusion of [women/people with disabilities] in EWS
- I am [Gabriela/Ismea], and together with [Gabriela/Ismea] we are studying Disaster Risk Management and Climate Change Adaptation at Lund University
- We really appreciate you being here and sharing your knowledge with us.
- This is really valuable for our master's thesis.

Research Purpose

- The purpose of our field research is to understand what the challenges and enabling factors are for communities in Kenya to participate in Early Warning Systems (EWS).
- The results will be used both for our thesis and to inform an upcoming UNDRR project.
- You were selected because we would like to understand how you feel about the inclusion of [women/people with disabilities] in EWS to learn from it.

The Focus Group Discussion Process

- My role as moderator will be to guide the discussion.
- We have 6questions we would like to discuss with you.
- The session will last between 60 and 90 minutes.
- First of all: please put your phone on silent, or, if possible, turn it off. If you must respond to a call, please do so as quietly as possible and rejoin us as quickly as you can.
- You've probably noticed the microphone. We're tape recording the session because we don't want to miss any of your comments. People often say very helpful things in these discussions, and we can't write fast enough to get them all down. To make sure we can catch everything, please speak one person at a time.
- We want to make sure that this is a relaxed and low-pressure environment, where you feel comfortable. If at any time during the discussion you feel uncomfortable for any reason, please let us know!
- If anything is unclear, do not hesitate to ask us so that we can clear up any confusion.
- Finally, we want to remind you that your participation is voluntary. We will now go through the consent form, the right to withdraw, and data storage standard practices.
- So, we have given you a consent form, you have read it and signed it, but to refresh:
    - You are welcome to stop the interview at any time, for any reason, without having to give an explanation and without consequences.
    - If, for any reason, you wish to withdraw from the process, you can let us know at any time, even after the FGD is done. We will then delete any information we have collected from you so far.
    - Once your data has been processed, it will be stored on an encrypted and secure local hard drive, disconnected from any cloud services, for seven years and then deleted. This is standard practice under international research guidelines.

Ground Rules

- We will call each other by our first names in this session. However, we will not share any names in our thesis, to ensure confidentiality. We assigned a code to each of you and will use that instead of your name, so nothing that you say here today can be traced back to you.

- We want to emphasize that there are no right or wrong answers, only different points of view. Your experience is valid, and we are curious to hear about it.
- You don't need to agree with what others say, but you must listen respectfully as they share their views. After they are done, you are welcome to reply.
- You can talk to each other, build on each other's points, and share your thoughts.
- Do you have any questions before we start?

Introduction Round

That being said, let's begin! We've placed name cards on the table in front of you to help you and us remember each other's names. Let's start by doing a brief round of introductions.

1. Tell us your name, how you are involved in the EWS (what your role is/in which activities you participated), and especially if you are not involved, how you heard about it.

Guiding Questions

2. What made you decide to participate in the EWS?
    a. Probe: Did you see personal benefits in participating? Benefits for the broader community? What is the motivation behind participating.
3. Looking back, what are some things that made it possible for you to participate in the EWS?
    a. Probe: you can think about both your personal situation (*e.g., had a family member that took care of children when going to workshops)*, and things that were done by the project that maybe helped you (*e.g., offer childcare to people participating in workshops*)
4. Looking back, what are the challenges that you encountered when participating?
    a. Probe: If you feel like you did not encounter any challenges, you can also bring examples of challenges that were experienced by other [women/people with disabilities] you know (without saying their names).
5. What do you think about the way the needs/priorities of [women/people with disabilities] from the community were included in the EWS?
6. How do you feel about the way the perspectives/values of [women/people with disabilities] from the community were taken into consideration when decisions on the EWS were made?
7. Suppose that you were in charge and could make one change that would strengthen meaningful community participation in EWS. What would you do?

Appendix B

List of Data Collection Activities

HOMA BAY		
Activity	**Stakeholder**	**Date**
Interview 1	Government official	17.03
Interview 2	Government official	17.03
Interview 3	Government official	17.03
FDG 1	Community members - PwD	18.03
Joint Interview 1	Government officials	18.03
FGD 2	Community members – CBO Members	18.03
FGD 3	Community members – CMDRR Committee Members	18.03
Joint Interview 2	Government official and community member	18.03
FGD 4	Community members - Women	18.03
Interview 4	KRCS Staff	19.03
KILIFI		
Activity	**Stakeholder**	**Date**
Interview 5	Government official	25.03
Interview 6	Government official	25.03
Interview 7	Community Member – CMDRR Chief	25.03
FGD 5	Community members – PwD	26.03
FGD 6	Community members – Women	26.03

FGD 7	Community members – CMDRR Committee Members	26.03
Interview 8	KRCS Staff	26.03
Interview 9	Government official	27.03
Interview 10	Government official	27.03
Interview 11	Government official	27.03

Appendix C

C1. Interview Consent Form

Interview Consent Form

PURPOSE: We are Gabriela and Ismea, master's students of the Disaster Risk Management and Climate Change Adaptation program at Lund University, currently carrying out interviews to inform our thesis. Our field research aims to understand what the challenges and enabling factors are for communities in Kenya to participate in Early Warning Systems (EWS). Through this, we hope to develop a set of recommendations to inform future researchers and practitioners to develop more robust and context-sensitive strategies for designing and implementing participatory EWS.

This research's data collection is carried out in collaboration with the United Nations Office for Disaster Risk Reduction Regional Office for Africa (UNDRR) and the Kenya Red Cross Society (KRCS). Staff from both organizations are supporting us with contacts, logistics, translation, and transportation. However, this research is independent from the KRCS and UNDRR. Our research and the interview you participate in will not directly influence aid or assistance from either the KRCS or UNDRR. The results of this research are intended to inform future EWS and EA projects, as the perspectives and preferences of beneficiaries regarding participation and inclusivity have not been studied before.

BY PARTICIPATING IN THIS INTERVIEW, I UNDERSTAND THAT:

- My participation in this research study is voluntary.
- I am free to withdraw from the interview at any time.
- I can refuse to answer any question, without giving any reason and with no consequences.
- Only the researchers will have access to the raw interview material.
- I am free to withdraw from the study after the interview; however, not after the thesis has been approved for publication.
- I am welcome to contact the researchers and the collaborating agencies (UNDRR and KRCS) at any time to ask for clarifications or additional information, using the contact information at the bottom of this form.

CONSENT STATEMENT

Please tick one box per statement. You are free to consent to or reject each statement individually.

	YES	NO
I agree to my role and, if applicable, the organization I am currently working for, being disclosed in the study.	☐	☐

I agree to quotes from my interview being included in the final thesis document and potential future publications.	☐	☐
I agree to being referred to and/or mentioned by name in the thesis or in quotes.	☐	☐
I agree to the interview being audio-recorded and transcribed.	☐	☐

DATA SECURITY

Interview contents and consent forms will be stored on a password-protected, local hard drive, disconnected from cloud services for seven years and then deleted.

PARTICIPANT NAME	
DATE	
SIGNATURE	

CONTACT INFORMATION

Researchers: Gabriela Ana Cestino Lopez (ga0085ce-s@lu.se), Ismea Guidotti (is7622gu-s@lu.se)

Thesis Supervisor: Mo Hamza (mo.hamza@risk.lth.se)

C2. FGD Consent Form

FGD Consent Form

PURPOSE: We are Gabriela and Ismea, master's students of the Disaster Risk Management and Climate Change Adaptation program at Lund University, currently carrying out FGDs to inform our thesis. Our field research aims to understand what the challenges and enabling factors are for communities in Kenya to participate in Early Warning Systems (EWS). Through this, we hope to develop a set of recommendations to inform future researchers and practitioners to develop more robust and context-sensitive strategies for designing and implementing participatory EWS.

This research's data collection is carried out in collaboration with the United Nations Office for Disaster Risk Reduction Regional Office for Africa (UNDRR) and the Kenya Red Cross Society (KRCS). Staff from both organizations are supporting us with contacts, logistics, translation, and transportation. However, this research is independent from the KRCS and UNDRR. Our research and the FGD you participate in will not directly influence aid or assistance from either the KRCS or UNDRR. The results of this research are intended to inform future EWS and EA projects, as the perspectives and preferences of beneficiaries regarding participation and inclusivity have not been studied before.

BY PARTICIPATING IN THIS INTERVIEW, I UNDERSTAND THAT:

- My participation in this research study is voluntary.
- I am free to withdraw from the FGD at any time.
- I can refuse to answer any question, without giving any reason and with no consequences.
- Only the researchers will have access to the raw FGD material.
- I am free to withdraw from the study after the FGD; however, not after the thesis has been approved for publication.
- I am welcome to contact the researchers and the collaborating agencies (UNDRR and KRCS) at any time to ask for clarifications or additional information, using the contact information at the bottom of this form.

CONSENT STATEMENT

Please tick one box per statement. You are free to consent to or reject each statement individually.

	YES	NO
I agree to my role and, if applicable, the organization I am currently working for, being disclosed in the study.		
I agree to quotes from my FGD being included in the final thesis document and potential future publications.		

I agree to being referred to and/or mentioned by name in the thesis or in
quotes.

I agree to the FGD being audio-recorded and transcribed.

DATA SECURITY

FGD contents and consent forms will be stored on a password-protected, local hard drive, disconnected from cloud services for seven years and then deleted.

DATE:

PARTICIPANT NAME	SIGNATURE

CONTACT INFORMATION

Researchers: Gabriela Ana Cestino Lopez (ga0085ce-s@lu.se), Ismea Guidotti (is7622gu-s@lu.se)

Thesis Supervisor: Mo Hamza (mo.hamza@risk.lth.se)