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ADVANCING HOUSEHOLD RESILIENCE TO RECURRING SHOCKS: MONITORING AND EARLY WARNING OF MANMADE AND NATURAL DISASTERS IN ULANG COUNTY, SOUTH SUDAN

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ABSTRACT

South Sudan is the newest country in the world - it has been experiencing recurrent conflict and climatic shocks such as flooding and hunger, creating a protracted humanitarian situation where 9 million people – three-quarters of South Sudan's population – are projected to require humanitarian and protection assistance in 2024. Two million people remain displaced due to decades of conflict, intercommunal violence and extreme effects and events of climate change, such as flooding and dry spells (OCHA 2024). Lack of coherent early warning identifiers and adequate monitoring mechanisms exacerbate acute shocks and chronic stresses due to both manmade and natural calamities amongst vulnerable communities in Ulang County. This paper aims at ascertaining the existing mechanisms and indicators that the community utilize for monitoring and early warning of habitual natural and man-made disasters. This study used both quantitative and qualitative data collection techniques. Quantitative data were gathered through a household survey using a structured questionnaire from 120 displaced households had been affected by floods and episodes of inter-communal violence. The household survey used two-stage cluster sampling with probability proportionate to size (PPS) to identify respondents. The qualitative data were collected through focus group discussions with men and women representatives located along the Sobat river. Key informant interviews with local leaders at County, Payam and Boma level were equally conducted to gather comprehensive information, and gain a better understanding of the context and draw sound recommendations and conclusions. Descriptive and comparative methods were used in the bid to grasp the prevailing early warning identifiers and the monitoring systems or mechanisms in place for repeated flooding, inter-communal violence and revenge killings. The research findings uncovered that 55.8% of respondents are aware of both traditional early warning indicators to climate-related shocks as well as to inter-communal violence. Community Managed Disaster Risk Reduction (CMDRR) committees have been established to bolster preparation against disasters and facilitate early response. The CMDRR structure has enabled timely preparedness and provides leadership for any response or post-disaster activities prior to receiving assistance from humanitarian actors. On the other hand, inadequate monitoring systems and tools amongst the duty bearers and limited capacity of the County leadership and other public institutions both at State and County level make the monitoring and early warning of recurrent disasters less effective. Furthermore, funding constraints remains one of the major challenges cited by humanitarian actors that often curtails their efforts in collaborating with government counterparts in tackling disaster risks in a more sustainable manner.

Key words: Resilience, monitoring, early warning, disaster, Ulang county, South Sudan

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INTRODUCTION

Local conditions in South Sudan during the 10-plus years that have elapsed since its independence on July 9, 2011, have led to the deaths of hundreds of thousands of civilians, including a high proportion of women and children, and the displacement of millions more. Large-scale, systematic violence intensified after a new conflict erupted in December 2013. Violent conflict and an array of rapid and slow onset climate disasters have coalesced to create widespread catastrophic circumstances. While political violence has declined after the so-called Revitalized Peace Agreement (A-RCSS; Revitalized Agreement on the Resolution of the Conflict in South Sudan) was signed in 2018, communal violence has not abated [1]. South Sudan has witnessed decreases in rainfall by 10-20 % and increases in temperatures by more than 1^{o}C since the middle of the 1970s. The country's rainy season, which begins in March/April and continues until November, has increasingly become unpredictable [2].

South Sudan is simultaneously drowning and drying as the climate crisis tightens its grip. An unprecedented flooding crisis has swallowed large swathes of the country while other parts are grappling with devastating drought. The multiplying shocks have made it impossible for smallholder farmers in many areas to grow enough food. Additionally, with a heavy reliance on imports, many people across South Sudan are unable to afford basic food items and must rely on humanitarian assistance [3]. The unprecedented, multi-year flood sweeping the country is exacerbating already high levels of hunger caused by ongoing conflict and the global food crisis. Central parts of the country, which are the most heavily impacted by multiyear flooding, are the areas with the highest levels of food insecurity [4].

South Sudan has been listed as the fifth-most vulnerable country to climate change [5], and has suffered non-international armed conflict since 2013. This, in turn, has contributed to it becoming one of the most food-insecure countries in the world [6], a situation which has been exacerbated by consecutive seasons of severe flooding in multiple states.

Despite a peace agreement signed in 2018, the number of armed groups operating in South Sudan has increased. These militias often have poor control of their troops and make little effort to protect civilians or facilitate humanitarian actions: South Sudan has very high levels of violence against aid workers. Additionally, the transitional government has failed to unite the military or make progress on other key issues. Until stability is restored, there is a risk that South Sudan reverts to war. Floods in late 2022 and early 2023 affected more than 900,000 people and led to outbreaks of cholera and malaria. These floods, coming a year after even larger

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ones in 2021, highlight a constant threat to a country lacking the infrastructure to respond [7].

Although most political violence abated when the most recent peace agreement was signed in September 2018, conflict-related sexual violence (CRSV) has persisted. Violence toward civilians remains pervasive, including targeted attacks, gender-based violence, kidnappings, and murders. Additionally, water-borne diseases, malaria, malnutrition, and diarrhea are widespread in the regions affected by flooding and are affecting primarily women and children [8].

High hopes for the young nation were dashed two years later (2013), when South Sudan again plunged into violent conflict. The Sudan People's Liberation Movement (SPLM), the ruling party, imploded in a power struggle between President Salva Kiir, a member of the Dinka ethnic group, and his former Vice President, Riek Machar, a Nuer. The majority Dinka and the minority Nuer are the two largest groups in South Sudan and have a history of bloody feuding. As the national army was divided along Dinka-Nuer ethnic lines, soldiers from each faction turned against each other in Juba, the nation's capital. The fighting between those loyal to Kiir (SPLM-in-government, or SPLM-IG) and Machar's supporters (SPLM-in-opposition, or SPLM-IO) soon spread across the country giving way to a deadly pattern of revenge and counter-revenge attacks. Government forces targeted civilians in areas of high Nuer concentration, claiming that their aim was to push back against rebel fighters. The failure of several initial attempts to secure an effective peace agreement among the various parties within the government resulted in renewed fighting in mid-July 2016 [9].

The UN Office for the Coordination of Humanitarian Affairs (OCHA) estimates that 2.2 million people have been displaced in the country since 2013 and more than 2.3 million South Sudanese refugees are hosted in the neighboring countries. Continued conflict and instability in South Sudan, combined with flooding, have resulted in large-scale internal and cross-border displacement. Above normal rainfall for the fourth consecutive year in 2022 led to prolonged flooding, which affected areas that had not flooded in previous years. Since July 2022, an estimated 1 million people were affected by severe flooding in 36 counties across South Sudan and in the southern part of the Abyei Administrative Area. People in Northern Bahr el Ghazal, Warrap, Unity and Western Equatoria states are the worst affected and 80% of those affected were from Jonglei, Unity and Upper Nile states. People were forcibly displaced repeatedly due to multiple compounding shocks, both in areas of displacement and return [10]. The same source estimates that 9.4 million people will be in need of humanitarian assistance in 2023, a staggering 76% of South Sudan's population, increased by 500,000 people from 2022. At least 148,000 returnees from abroad remained displaced within the country, unable to reach their homes.

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Anthropogenic climate change exacerbates and compounds this already complex picture. A changing climate will alter the frequency, intensity, duration, timing, and location of slow and sudden onset of climate-related hazards. According to the Climate Change Vulnerability Index, South Sudan is among the five most vulnerable countries in the world, with temperatures increasing 2.5 times faster than the global average [11]. Floods have worsened over the past years as South Sudan is suffering increasingly from the consequences of climate change. Floods are affecting every year between 750,000 and more than one million people, forcing half of them to leave their homeland to higher ground. Floods affect mostly areas along the Nile and Lol rivers and Sudd marshlands. In recent years up to half of all counties in South Sudan were affected by the floods. Jonglei, Unity and Upper Nile States are the hardest hit, representing three quarters of the affected people [12].

Several research works have immensely focused on community resilience, disaster risk reduction and climate change, post-conflict economic recovery, peace and conflict assessments; community-based approaches to peacebuilding in fragile contexts; learning from local opportunities; building peace in South Sudan; triple nexus in South Sudan; among other key studies conducted from the South Sudan perspectives. Nevertheless, they seemed to have ignored the relevance of monitoring and early warning of disasters in hard to reach areas such as Ulang County in the greater Upper-Nile region.

Ulang is one of the thirteen counties of the Upper-Nile State— located in the Southern part of the Upper Nile State. It borders with Baliet County to the North and Nasir County to the North East. It also shares borders with Jonglei State (Nyirol and Akobo Counties) to the South-West and Gambella region/Ethiopia to the East. The County is located along the River Sobat and habitually suffers strongly by flooding [13]. Since 2019, Ulang has faced unprecedent episodes of flooding and this posed a big threat to communities in Ulang given the fact that many people were internally displaced and lost their livelihood assets, several homes were smashed and crops were washed away. Ulang being a flood prone area suffers flooding every year. Due to limited adaptive capacities and resources, the resilience level of communities in Ulang is extremely low, and this increases the impact of climate shocks and chronic stresses. Although communities have constructed dykes, the latter do not however resist the high scale of floods. In 2022, there was an inter-agency initial rapid needs assessment (IRNA) for flooding conducted in Ulang County to ascertain the needs and inform the humanitarian response. The assessment findings revealed that 1,805 households with 13,329 individuals were severely affected by floods across all the eight payams of Ulang [14]. It is evident that vulnerable communities in Ulang County shall continue to experience acute shocks and persistent pressures as a result of both man-made and natural calamities in the event there are still inadequate

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monitoring systems and approaches and coherent early warning identifiers in the area. According to the same IRNA report, Ulang being a flood prone area suffers climate shocks every year. Due to lack of resources, communities are not resilient enough to the potential devastation. In 2022, due to heavy rains in the region, the scale of the flood was quite high and inhabitants along the river faced an emergency situation as river and swamps overflowed, destroying the houses and livelihood inputs of the communities [15].

The research conducted sought to ascertain the existing mechanisms and indicators that the community in Ulang Payam, Ulang County uses for monitoring and early warning of recurrent natural and man-made disasters. The findings obtained enabled the research to formulate evidence-based remedies that would help affected communities to mitigate the impact of natural and manmade disasters on the lives and livelihoods. Hence, three main objectives of this research were formulated as follows:

- Identify the existing monitoring mechanisms and early warning identifiers of disasters in Ulang County.
- Assess how disasters distress livelihoods of the affected communities.
- Propose sound interventions strategies that will enhance monitoring and early warning of disasters to reduce disaster shocks.

MATERIALS AND METHODS

This study employed both quantitative and qualitative methods, focusing on households in Ulang Payam, Ulang County. Randomly selected households completed structured questionnaires, while interviews were conducted with sampled households. Qualitative methods included Focus Group Discussions (FGDs) and Key Informant Interviews (KIIs) with community members and government staff. Both quantitative and qualitative data collection happened in September 2023. Quantitative data was collected using Kobo Collect, and the analysis was done through the Statistical Package for the Social Sciences (SPSS). Qualitative data were collected through semi-structured interviews and focus group discussions, ensuring a rich exploration of participants' perspectives. The interviews were conducted with a purposive sample of individuals, allowing for in-depth insights into their experiences and opinions related to the research topic. All interviews were audio-recorded, transcribed verbatim, and analyzed using thematic analysis. This process involved coding the data to identify key themes and patterns, followed by an iterative review to ensure accuracy and depth of understanding. By triangulating findings from different sources, the analysis provided a comprehensive view of the participants' narratives, ultimately enhancing the credibility and validity of the results.

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The sample size of 120 households was determined as described below. The study employed participatory and non-participatory methods, including literature review.

Sampling frame: Households, community members, community leaders and stakeholders (government and non-government).
Sample size: Cochran sample size formula was used to determine standard sample, which is:

$$n_0 = \frac{Z^2 pq}{e^2}$$

Where;

- Z=1.96 at 95% confidence level
- e=the desired level of precision (i.e. the margin of error)
- p=the (estimated) proportion of the population which has the attribute in question
- q=1 – p

To determine the sample size for this study, the above sample formula was applied, where Z represented 1.96 at 95% confidence level, eE is 0.5% margin of error, simple calculation was therefore shown as; ((1.96)2 (0.5) (0.5)) / $(0.05)^2$ = 385. However, given the level of uniformity among the study population, the researcher considered 31% of the sample size determined above for this study. Hence, 120 households participated in the survey. Therefore, the study covered household interviewees selected randomly from a uniform sample of 120 - which are households who had been affected by floods and episodes of inter-communal violence in Ulang Payam, Ulang County. The selection of the households was done without replacement so as to remove bias and ensure validity of the data reported in the survey. However, when applying the sample size formula for a Finite Population:

$$n = \frac{N \cdot Z^2 \cdot p \cdot (1-p)}{(N-1) \cdot E^2 + Z^2 \cdot p \cdot (1-p)}$$

Where:
n = required sample size
N = population size (2,578 households in Ulang Payam)
Z = Z-score for the desired confidence level (for 95% confidence, Z≈1.96)
p = estimated proportion of the population with the attribute of interest (commonly p=0.5 for maximum variability)
E = margin of error

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Let's calculate the margin of error associated with using a sample of 120 households. Rearranging the formula, we can solve for E and determine whether the 120 households provide a reasonable estimate within the 95% confidence level for this population size. The margin of error for a sample size of 120 households from a population of 2,578 households, with a 95% confidence level, is approximately 8.95%. This means that the sample will estimate population parameters with a ±8.95% margin of error, which is acceptable depending on the level of precision we need in this study. Thus, a sample of 120 households is justified.

RESULTS AND DISCUSSION

Household Occupation

The data obtained from household survey shows employment dynamics in Ulang town: 33.3% are unemployed, 18.3% are self-employed in off-farm activities, and another 18.3% are in agriculture-related self-employment. Formal private sector employment stands at 14.2%, with only 0.8% in the public sector. Additionally, 9.2% work as temporary workers. This complex arrangement reflects the community's diverse economic options. The interaction between official employment, self-employment, and unemployment, along with the influence of humanitarian groups, shapes Ulang town's job landscape.

Household who encountered disasters

The findings obtained from the household survey revealed that 92.5% of respondents confirmed to have experienced a shock in the past 12 months as a result of a disaster. This exacerbates the level of hunger and increases vulnerabilities of these communities that reside in hard to reach areas in already protracted humanitarian situation.

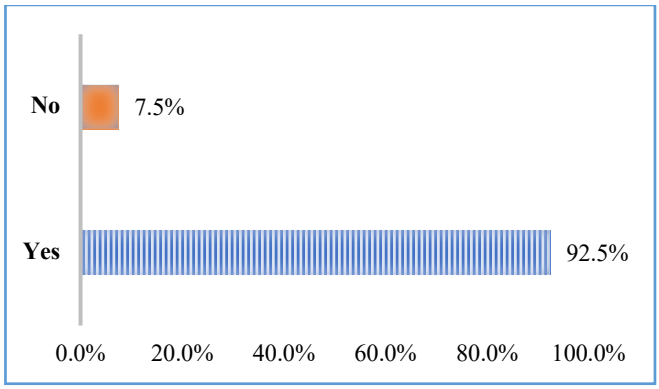

Figure 1: Proportion of households who faced a shock in the past 12 months

"Farming here is hampered by frequent flooding, which washes away our crops, leaving us with nothing to harvest. Without World Vision's food aid, our livelihoods would have been at risk". Said a woman participating in the FGD in Ulang Payam, Ulang County on August 31, 2023.

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Ulang County, situated in the heavily impacted Sobat corridor, faces ongoing inter-clan and communal violence, disrupting daily activities and endangering community stability and livelihoods. Community members that participated in the FGDs in Ulang county mentioned various reasons that trigger intercommunal violence and revenge killings. However, poverty was cited to be the main source of conflict. *"In our community people are denied access to some natural resources and this becomes a source of conflict in our community. Additionally, another contributing factor is the abuse of power by local chiefs"* said a female participant to the FGD in Ulang Payam, Ulang County.

Limited education access fuels conflict among youths. Without opportunities, idle adolescents may turn to violence like cow raids, escalating tensions. Closing this gap is vital for personal growth and conflict prevention. Empowering youth with education redirects energies to positive pursuits, reducing violent involvement. In early 2023, 4,500 internally displaced persons fled Jonglei to Ulang County due to fear of retaliation following raids. Addressing education gaps is critical for individual and community stability, as per the United Nations Office for Coordination of Humanitarian Affairs (OCHA) reports.

Food Assistance

Families continue to rely considerably on food assistance from humanitarian agencies and still grapple with various socioeconomic limitations that constrict their ability to attain self-reliance. The findings revealed that 95.8% of respondents depend on food assistance in during the lean season (April through September). Engagement in income generating activities remain low and this continues to limit their purchasing power and capacity to access other needed non-food items.

Across all locations, the impacts of the floods have been catastrophic and contributed heavily to crops destruction and yield reduction. *"Crop production was already hampered at the start of the planting season by unavailability of seeds/planting materials and low level of skills amongst farmers"* said a participant to the focus group discussion (FGD) in Ulang Payam, Ulang Center.

Ulang County grapples with severe food insecurity, often reaching Integrated Food Security Phase Classification (IPC) phase 4 or 3, signifying emergencies. The World Food Program and World Vision International South Sudan offer crucial unconditional food aid from April to September, targeting the lean season. This aid helps families survive until harvest, promoting self-sufficiency afterward. The aim is long-term food security and community resilience through sustainable solutions, bridging nutritional gaps and empowering households.

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Types of shocks

The effects of flooding are complex and have far-reaching consequences that go beyond their initial appearance. As a natural calamity, floods not only directly endanger human life but also submerge residences and commercial buildings, resulting in extensive property damage.

Critical infrastructure is put in jeopardy in the aftermath, making it more difficult for impacted communities to get essential public services and making them more vulnerable.

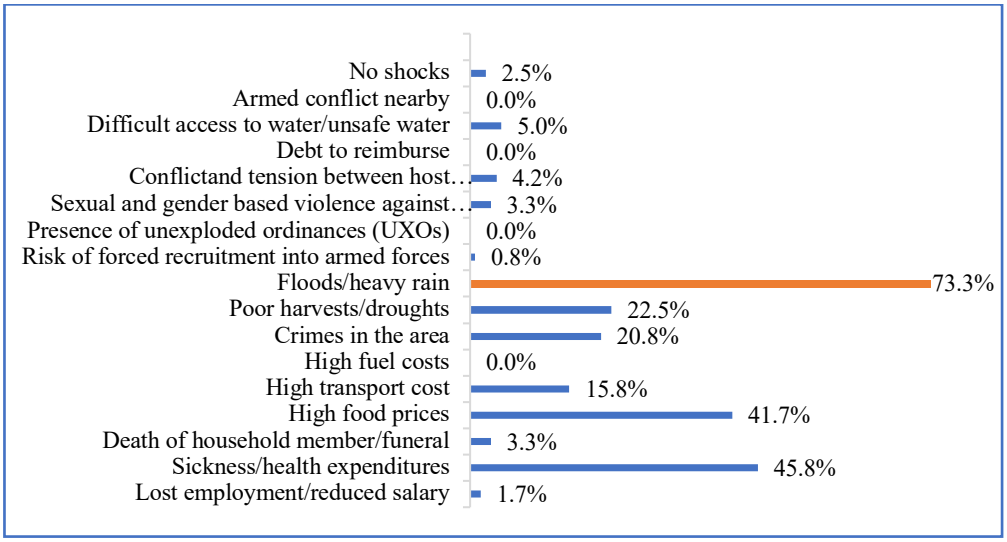

Figure 2: Major shocks experienced in the past 12 months

Key informants reveal the severe consequences of floods between September 2022 and January 2023. Disrupting communities' routines, the floods led to internal displacements, damaged livestock and crops, and jeopardized food security. They also exacerbated challenges in medical care, water, sanitation, and nutrition, while increasing gender-based violence. The floods magnified existing vulnerabilities, especially among disadvantaged groups, demanding a comprehensive response. This must entail both emergency relief and long-term resilience-building initiatives to mitigate lasting harm to community well-being.

In 2022, heavy rain, particularly in Ulang County and Ethiopia's Gambella region, caused widespread flooding. The Sobat River overflowed, submerging homes and disrupting livelihoods, making it challenging for affected people to seek refuge on higher ground. Evacuations were hindered as the river became hazardous, impacting homes, infrastructure, and services. This event highlights the importance of robust disaster plans in the face of climate uncertainty, emphasizing preventive measures beyond immediate threats. Communities urgently require thorough disaster planning, including infrastructure improvement and early warning systems, to address increasing vulnerability exacerbated by climate change. The influx of

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displaced people underscores the need for organized humanitarian efforts to provide essential supplies and services. A comprehensive, long-term plan is essential for promoting resilience and sustainable recovery, considering the flooding's lasting effects on livelihoods and community well-being.

Methods utilized by households in controlling floods

The data shows that 61.7% of the Ulang Payam community relies on dykes to combat flooding, a common practice in Upper Nile and Bahr-El Ghazal. However, observations reveal a significant issue: while dykes are widespread, many lack the necessary strength to withstand flooding. This raises doubts about their effectiveness due to factors like, inadequate materials or technical expertise. To enhance community resilience, infrastructure development and capacity-building initiatives are crucial, potentially necessitating alternative flood prevention methods.

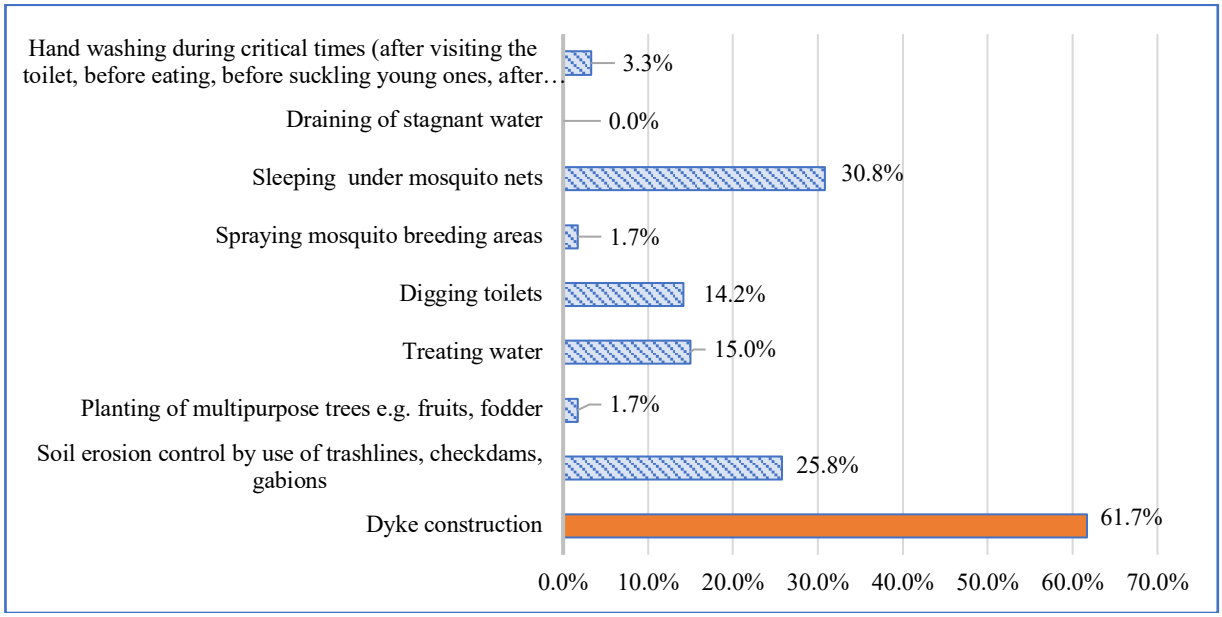

Figure 3: Methods utilized by households in controlling floods

A Key Informant within Ulang Payam stated *that "Some households build dykes, but others neglect them. Shallow dykes easily break during heavy rains, significantly impacting the community. However, the 2023 rainy season has been less intense than the previous four years. If this trend continues, flooding in the Sobat corridor, including Ulang and Nasir counties, may be reduced. However, external factors such as heavy rains in Ethiopia can still cause the Sobat River to overflow, leading to flooding in the area".*

Household capacity to reduce disaster risks

Community capacity encompasses resources, tools, and access to early warning systems, vital for managing disaster risks and enhancing resilience. In Ulang County, findings reveal capacity gaps, with 71.9% lacking sufficient resources to

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mitigate shocks post-disaster. Collective efforts from government, humanitarian, and development sectors are needed to bolster community knowledge on disaster preparedness. Only 28.1% of household heads reported adequate capacity to mitigate disaster risks, underscoring the need for strengthened community-based disaster risk management systems.

It is important to note that preventing disaster shocks requires adequate planning in terms of hazard identification - identifying the actual threats facing a community as well as vulnerability assessment - evaluating the risk and capacity of a community to handle the consequences of a disaster.

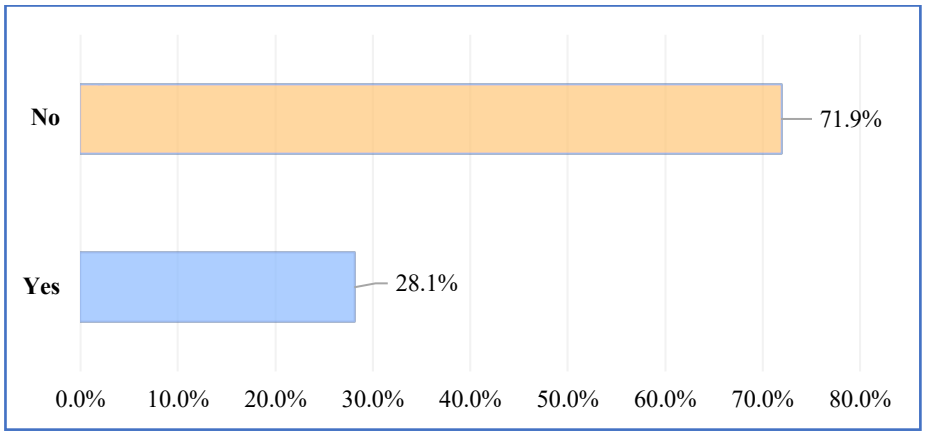

Figure 4: Do households have enough capacity to reduce disaster risks?

South Sudan's local leaders lack the critical knowledge and ability to mitigate significant disaster outcomes due to an ill-managed governmental system, corruption, tribalism, and resource mismanagement [16]. This government system relies on assistance from international organizations, e.g, United Nations, USAID, and others, to mitigate disaster risk and subsidize basic needs [17, 18].

During the key informant interview with a local leader in Ulang center, he said that *"there is a need to conduct a participatory community hazard, risk, vulnerability analysis in the whole county to ascertain the gaps and formulate evidence-based intervention strategies. Our communities need to construct strong dykes that will prevent water from entering their compound. They also have to learn to do dry season farming using small-scale irrigation systems. Unfortunately they are not in position to afford a such technology".*

Ulang local authorities highlighted World Vision International South Sudan's significant role in disaster risk reduction (DRR). Their integrated program strengthens social cohesion and resilience, focusing on community-based disaster risk reduction (CMDRR) committees at the Payam level. These committees ensure community action plans for early warning and intervention. World Vision constructed over 10,000 meters of dykes in Ulang to combat flooding. However, a lack of early

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warning signals, attributed to constraints in the South Sudan meteorological department and the absence of a radio station in Ulang County, hampers disaster preparedness. Establishing infrastructure like a radio station is crucial for timely information dissemination and strengthening Ulang against floods. Collaboration between humanitarian organizations and government bodies is vital for effective DRR.

Government capacity to respond to future disaster shocks

Ulang county has been one of the counties hit most by civil disturbances in 2013 and 2016. Although there is a transition government that is composed of various political parties - Ulang remains a county led by the opposition. This has hindered the local authorities to have access to resources that would enable them to deliver adequate services to the population residing Ulang Center and its vicinity.

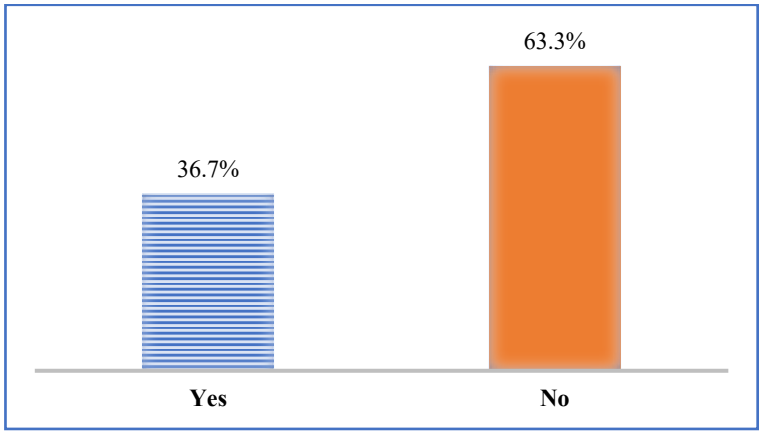

Figure 5: Percentage of households believing the government will respond effectively to future shocks and stresses

Given frequent inter-communal violence and floods, 63.3% of survey respondents doubt the local Government's ability to respond effectively to disasters. This highlights the community's vulnerability to shocks and stresses due to anticipated limited support from duty bearers.

The Disaster Risk Management and Social Cohesion Coordinator for the Accelerating Recovery and Resilience in South Sudan (ACCESS) project for World Vision South Sudan, indicated during the key informant interview that *"during natural disasters, county authorities inform humanitarian partners about impact magnitude and affected households. The Nonviolence Peace Force coordinates relief efforts, convening agencies to plan support for affected communities in Ulang. An Initial Rapid Needs Assessment (IRNA), endorsed by the Inter-agency Cluster Coordination Group (ICCG), guides response. Clusters engage member organizations based on resource capacity. Local Government's role is coordination, monitoring, and evaluation due to limited resources. Consequently, affected communities rely on humanitarian aid, perceiving limited Government involvement".*

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Households' capacity to respond to shocks

Disasters are inevitable, but communities can mitigate their impact through preparedness. The United States Federal Emergency Management Agency (FEMA) defines disaster preparedness as readiness to respond to emergencies, providing leadership, training, and assistance to strengthen citizens, communities, and professional emergency workers.

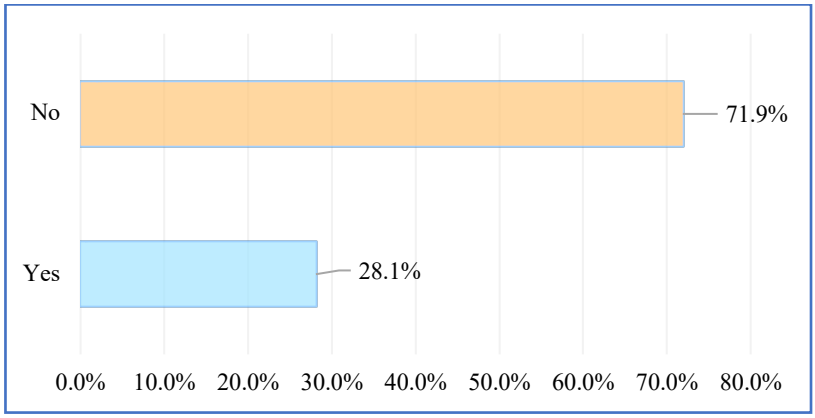

Figure 6: Percentage of respondents believing that households have enough capacity to respond to shocks

Ulang requires resources, skills, and strategies to mitigate future disasters, as 71.9% feel unprepared, especially for flooding. Formalized procedures are vital for swift response. A comprehensive disaster risk reduction plan should include early warning systems, evacuation protocols, and first-aid training. Collaboration among stakeholders, including local government and humanitarian groups, is crucial for community-specific preparedness. Long-term resilience measures must accompany immediate responses. Empowering Ulang with tools and resources enhances adaptability and self-sufficiency in facing unforeseen challenges. A participant to the FGD in Ulang County stated that *"during flooding or conflicts, we depend on humanitarian aid for survival. Organizations offer non-food items like jerrycans, shelter materials, and water purification supplies. Food assistance and unconditional cash aid are provided, helping purchase nutritious food, especially for under-five children. Some use cash to start small shops for income generation".*

Households awareness of any early warning systems for disasters

Adequate early warning systems for disasters enable communities prone to recurring natural and manmade disasters to reduce risks that they may have on lives, livelihoods and properties. The researcher wished to get an idea about the proportion of household respondents who are aware of any traditional or modern early warning systems for disasters that may be in place within the Ulang Payam, Ulang County.

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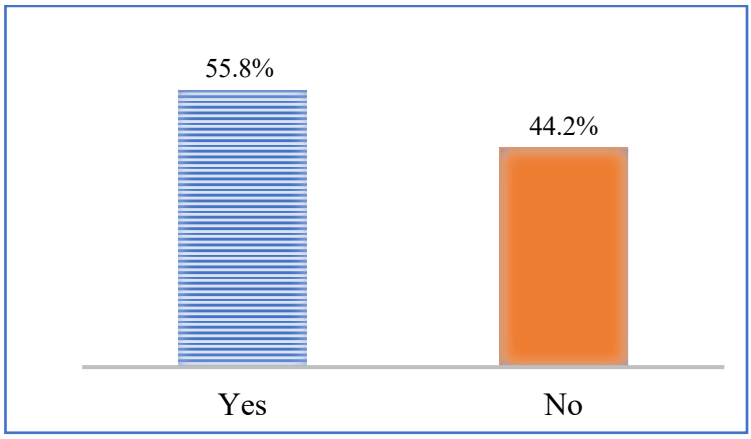

Figure 7: Percentage of households aware of any early warning systems for disasters (floods or conflict) in community

As reflected in Figure 8, the percentage of households aware of any early warning systems for disasters was 55.8%. The key informant from Ulang county during an interview with the researcher on September 1, 2023 stated that *"early warning systems for manmade disasters, like inter-communal violence, differ from natural disasters. Natural disaster alerts include messages through megaphones and gunshots, especially when dykes break. A gunshot signals the community to repair the dyke. Conflict warnings involve mass mobilization of youth in different areas. Youth moving to raid cattle triggers retaliation, affecting population movement to safe places".* Information gaps persist regarding early warning systems for disasters, hindering vulnerable communities' preparedness. Duty bearers must ensure remote communities receive timely warnings. Unfortunately, Ulang lacks access to radio or television, complicating message dissemination.

Most commonly utilized early warning systems in Community

In Ulang Payam, various early warning systems are in place for disasters, with the most common being emergency alerts through megaphones or other sound systems, utilized by 83.3% of respondents.

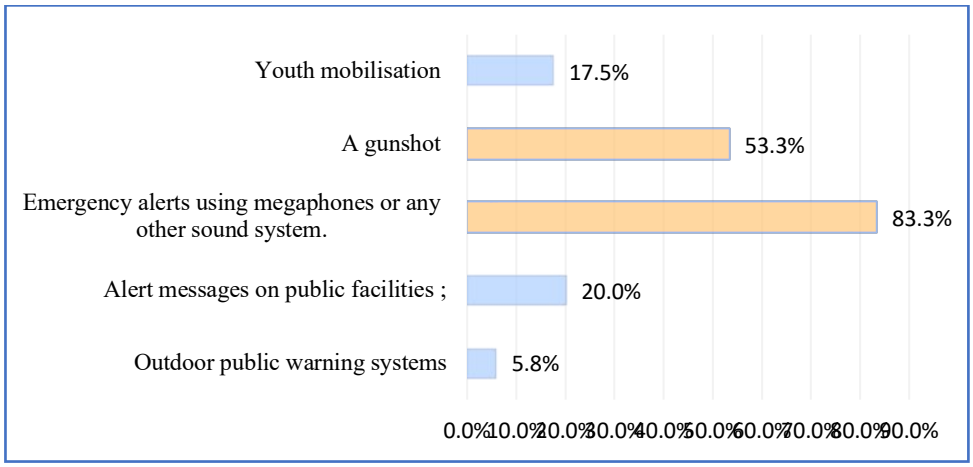

Figure 8: Most commonly utilized early warning systems in community

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This method informs about flood forecasts and potential impacts, while 53.3% mention gunshot alerts for dyke repair or evacuation during disasters. About 20% receive alerts in public facilities, aiding preparedness. However, 55% lacking formal education struggle with written messages. Local leaders use traditional methods for alerts, with 5.8% mentioning door-to-door campaigns and church announcements. Humanitarian workers aid in disseminating warnings in remote areas for comprehensive preparedness.

CONCLUSION AND RECOMMENDATIONS FOR DEVELOPMENT

Since 2019, Ulang county has endured persistent flooding, worsening hunger among vulnerable communities. Inter-communal violence, driven by factors like cattle rustling, exacerbates the situation. Despite this, leadership shows commitment to resolving community differences and restoring peace. Climate change continues to disrupt agriculture and prompt population displacements, further deteriorating the humanitarian situation.

The household survey in Ulang revealed widespread vulnerability, with 92.5% experiencing disaster-related shocks, primarily flooding. While many construct dykes and use erosion control measures, most lack capacity to mitigate shocks. Doubts regarding effective government response exacerbate concerns. Awareness of early warning systems is low at 55.8%. Research highlights a mix of traditional and innovative methods, including gunfire alerts and youth mobilization. The findings underscore the urgent need for bolstered disaster preparedness, emphasizing accessible resources, and modern early warning systems to mitigate recurring disasters.

The absence of modern early warning systems in Ulang, due to infrastructure challenges, hinders access to radio, TV, and the internet. Without broadcasting stations and limited communication channels, reliance on traditional methods persists, compounded by low literacy rates. Addressing this requires a multifaceted approach: establishing essential infrastructure, like a radio station, complemented by educational programs. Integrating technology, such as messaging apps, expands reach. Collaboration among stakeholders ensures culturally relevant solutions and empowers individuals for effective disaster preparedness.

The research findings unveiled a lot of gaps in relation to monitoring and early warning systems of disasters in Ulang Payam, Ulang County - the following recommendations have been formulated to strengthen community capacity for disaster preparedness and response:

- To strengthen disaster preparedness, the government to consider investing in modern early warning systems, including meteorological infrastructure and radio

stations. Such funding would enable timely alerts, as well as the acquisition and maintenance of advanced equipment for accurate forecasting. Upgrading radio stations near Ulang would ensure reliable communication during emergencies. Modernizing early warning systems is essential for effective disaster response, bridging critical information gaps and protecting public safety. This proactive approach will boost Ulang's resilience and sustainability in the face of climate challenges.

- Establish and empower Community-Managed Disaster Risk Reduction (CMDRR) committees at both Payam and Boma level to disseminate preparedness knowledge and skills to households. Strengthening these committees enhances early response efforts, minimizing disaster impact on lives and livelihoods. The initiative aims to empower communities to identify, report, and respond to early warning signs effectively, thereby improving their ability to mitigate disaster risks.
- Develop disaster contingency plans and do regular context monitoring to ensure that Ulang communities have access to early warning information so that they can be to take early actions to mitigate disaster shocks and stresses.
- Effective early warning systems are crucial for Ulang's disaster management. Monitoring allows documentation of successful practices and learning from community experiences. Sharing these lessons with neighboring communities fosters inter-county cooperation in disaster preparedness, strengthening resilience to climate challenges. Collaborative learning promotes a coordinated response to potential disasters, benefiting Ulang and its surroundings.
- Raising community awareness about disaster risk reduction is essential for building resilient communities. Effective collaboration among local leaders, community structures, and NGOs plays a vital role in organizing mass campaigns that enhance public understanding of early warning signs and preparedness measures. In regions without access to radio stations, alternative methods like megaphones, community meetings, and public gatherings become crucial channels for reaching people with vital information. By leveraging these accessible means, we can ensure that communities are well-informed, empowered to take preventive actions, and better equipped to respond in times of crisis. Efficient disaster management requires collaboration between local administration, humanitarian partners, and community representatives. Regular participation in forums by key stakeholders like Payam administration, CMDRR committees, and County Development Committee (CDC) is crucial. The aim is to develop a comprehensive early warning system addressing potential disasters. Through open communication, stakeholders identify gaps and assess

community contingency plans' effectiveness. Regular evaluations enable solutions, fostering a unified commitment to enhancing community resilience.

- County authorities should raise awareness among community members to build robust dykes. Additionally, social safety net programs could be redesigned to support communal efforts in disaster risk reduction, such as constructing dykes, rehabilitating roads, and improving sanitation facilities, aligning with public interests. Ulang residents should adopt dry season farming using small-scale irrigation, particularly for vegetables and drought-resistant crops. With all payams near the Sobat river, access to irrigation water is feasible, and partners are committed to supporting crop production for sustainable community livelihoods.

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CONFLICT OF INTEREST

I hereby declare that I have no conflicts of interest, whether financial or personal, that could have influenced the research findings, analyses, or conclusions presented in this paper. This research was conducted without any external sponsorship, commercial involvement, or affiliations that might lead to a potential conflict. Additionally, there are no competing interests related to data ownership, intellectual property rights, or inventions associated with this study.

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