ISSN: 2312-0134

African Research Journal of Education and Social Sciences, 11 (3), 2024 | Website: *www.arjess.org*

EXAMINING THE EFFECTIVENESS OF RESILIENCE STRATEGIES TO FLOODING EMPLOYED BY THE LOCAL POPULATION OF NYANDO SUB-COUNTY, KENYA

Authors: Charles Ogambo Owino, Edward Masibayi and Evans Odhiambo Wabwire

[1&2]National Defence University-Kenya
P.O Box, 370, Nakuru Kenya
owinohcharles@gmail.com

[3]Kabianga University,
P.O Box 2030 - 20200 Kericho, KENYA.

Abstract: *This paper sought to examine the effectiveness of resilience strategies to flooding employed by the local population of NyandoSub-County, Kenya. A Descriptive Research Design was used in the study. The sampling technique for members of Focus Group Discussions (FGDs) was Simple Random sampling, while that for the Key Informants (KIs) was Purposive sampling. Sample size determination was done through Andrew Fisher's formula, giving a study sample of 100 persons that comprised 75 members of FGDs and 25 KIs. Data collection was done once in each Ward through questionnaires and Interviews. The Quantitative data collected was analysed quantitatively through SPSS while content analysis was used for qualitative data. The key findings were as follows: It was found out that 91% of the households had been adversely affected by experiencing unfavorable impacts of floods such as threatening lives, destroying of properties and damage to crops. Further, 47.3% of the respondents indicated farming as their main source of income, but only 0.1% of the respondents indicated applying agricultural adaptation measures. In conclusion, it was noted that indeed flooding has negative socio-economic effects on the local population, which is reflected in destruction of food stocks, loss of lives of people, and destruction of infrastructure. Ultimately, accessibility to goods and services also became difficult. The study makes recommendations as follows: first, policy makers to strengthen a whole of government approach in flood mitigation; secondly, stakeholders to implement sustainable environmental practices for maintaining the well-being and resilience of affected households.*

Keywords: *Resilience strategies, Flooding, Flood adaptation measures, Drainage control and desilting, Destruction of infrastructure, Socio-economic effects.*

ISSN: 2312-0134

African Research Journal of Education and Social Sciences, 11 (3), 2024 | Website: *www.arjess.org*

INTRODUCTION

Flooding is among the most prevalent natural hazards, with particularly disastrous impacts in low-income countries (Rentschler, J., et al., 2022). According to UNDRR (2020), the data on flooding from the year 1980 to 1999 shows that the total number of Global Flood disasters was 1,389. Further to the foregoing, UNDRR (2020) indicates that from the year 2000 to 2019, the number of Flood disasters was 3,254, affected 1.6 billion people worldwide, and caused the deaths of 104,614 people. According to Nkwunonwo, U.C. et al., (2020), the prevalence of flooding events and the associated risk in the urban areas is an increasingly important issue of global significance, although it is more critical for the developing countries, such as Nigeria, where the hazard is often poorly understood and under-studied.

In North America, flooding has negatively impacted the United States of America. According to the National Academies of Sciences, Engineering, and Medicine (2019), flooding is the natural hazard with the greatest economic and social impact in the United States, and these impacts are becoming more severe over time. Further to this, the National Academies of Sciences, Engineering, and Medicine (2019) states that catastrophic flooding from recent hurricanes, including Superstorm Sandy in New York in 2012 and Hurricane Harvey in Houston in 2017, caused billions of dollars in property damage, adversely affected millions of people, and damaged the economic well-being of major metropolitan areas.

The European continent has equally been affected by flooding. Bednar-Friedl, B., et al., (2022) state that impacts of compound hazards of warming and precipitation have become more frequent.According to Kreienkamp, F., et al., (2021), extreme rainfall occurred in Germany, Belgium, Luxembourg and neighbouring countries during the period 12 to 15 July 2021, leading to severe flooding particularly in North Rhine-Westphalia and Rhineland-Palatinate in Germany and along the river Meuse and some of its tributaries in Belgium and the Netherlands. Kreienkamp, F., et al., (2021) aver that the 6th Intergovernmental Panel on Climate Change assessment report (IPCC, 2021) states that extreme precipitation, pluvial and fluvial floods have been observed to increase in Western and Central Europe and will increase with high confidence in case global warming reaches 2 °C, expected to occur by mid-century in case greenhouse gas emissions reduction do not take place quickly.

During the period 2000 – 2019, floods had the highest impacts in Asia as the continent experienced 41% of all flooding events and, with a total of 1.5 billion people affected, accounted for 93% of people affected by floods worldwide (UNDRR, 2020). China was the most affected country by flooding during the period 2000 – 2019, in which it experienced an average of 20 flood events per year andhad a total of 900 million people who were affected, accounting for approximately 55% of people affected by flooding worldwide (UNDRR, 2020). India was the 2nd most affected country by floods since it experienced an average of 17 flood events per year and had a total of approximately 345 million people affected (UNDRR, 2020). In terms of loss of life due to flooding events during the period 2000 to 2019, the UNDRR (2020) states that two of

ISSN: 2312-0134

African Research Journal of Education and Social Sciences, 11 (3), 2024 | Website: *www.arjess.org*

the three deadliest flooding events were the June 2013 floods in India (6,054 deaths), and the July 2010 floods in Pakistan (1,985 deaths).

Flooding has had a devastating impact on Africa. According to UNDRR (2020), data collected from 2000 to 2019, indicates that 763 floods occurred in Africa. According to CRED Crunch (2020),of the 46,078 deaths caused by disasters from 2000 to 2019, approximately 15,000 deaths were caused by floods. According to Rain et al., (2011), in West Africa (i.e., Benin, Burkina Faso, Ivory Coast, Ghana, Mali, Nigeria, Senegal and Togo), alongside flash and riverine floods induced by heavy rainfall, coastal communities and major cities like Dakar, Lagos, Abidjan, Lome and Accra are all exposed to regular inundation due to sea-level rise and improper urban development in the face of increasing urbanization (GIZ, 2020). The Southern Africa sub-region, according to Pusch et al., (2016), is home to large transnational river systems like Zambezi, Limpopo, Okavango and Orange River with several tributaries. Seasonal flooding occurs regularly due to these river systems and puts populations driving their livelihoods along the river basins at risk (GIZ, 2020). In Eastern Africa (i.e., Djibouti, Eritrea, Ethiopia, Kenya, Somalia, Uganda), according to Owusu and Nursey-Bray (2018), the climate dynamics reflect alternating wet and dry conditions and, in what may be seen as a discerning contradiction to the frequent episodes of devastating droughts, the region is also plagued by devastating floods (GIZ, 2020).

In Kenya, flooding is a recurrent phenomenon (Appendix XI) due to seasonal rains (National DRM Policy, 2018). In northwest Kenya, the most affected locations are where theTurkwell River passes through as it flows towards Turkwell Dam and where the Omo River passes through as it flows from Southwestern Ethiopia into Lake Turkana. In northeast Kenya, the Daua River flows southeast from the Southern Ethiopian Highlands towards Kenya. The course of the Daua River forms the administrative boundary between Mandera and Wajir Counties which it routinely floods. The other flood risk areas are the floodplains of the lower Tana River, the Galana and Sabaki Rivers, the EwasoNgiro River, the lower Nzoia River at Budalang'i plains, and the lower Nyando River at Kano Plains (National DRM Policy, 2018). In the Nyanza Region of Kenya, Nyando sub-County is characterized by its proximity to Lake Victoria and its tributaries, and it experiences seasonal flooding mainly due to the 148 Km-long Nyando River breaking its banks.

The upper catchment of the Nyando riveris in Kericho and Nandi Counties, both of which border Kisumu County. The National Water Harvesting and Storage Authority (NWHSA) states through its website that the Nyando River is severely affected by environmental degradation. The NWHSA further states that, in the lower Kano plains, about 60% of the households are temporarily denied access to cultivable lands when it is flooded, and that the poor drainage of the flood plains make large portions of the farmlands inaccessible when under prolonged inundation. Lastly, the NWHSA states that households that live along the riverbanks are displaced by the highwater levels, have to seek refuge on raised grounds or in neigbouring trading centres, and have to live in temporary shelters for extended durations until the floods recede.According to Nyong'o et al. (2019), the historical flooding events in the subcounty have resulted in substantial

ISSN: 2312-0134

African Research Journal of Education and Social Sciences, 11 (3), 2024 | Website: *www.arjess.org*

damage to infrastructure such as roads, bridges, schools, health facilities, and housing structures. As such, the current study intends to examine the effectiveness of resilience strategies to flooding employed by the local population of Nyando Sub-county, Kenya.

METHODOLOGY

A descriptive research design was used for this research study since it enabled gathering of detailed information about socio-economic aspects, including the characteristics of the local population, the magnitude of the effects they face, and the strategies they employ to cope with the challenges that result from flooding. The descriptive research design provided a detailed account of components, factors, or occurrences within the research field. The descriptive design enabled the researcher to quantify variables and elucidate the associations between them, such as features and means.

The target population was the local population of Nyando sub-County which, according to the Kenya population and housing census vol.1, 2019, was 161,508 people.The initial step was to ascertain the sample size. After determining the sample size, the researcher developed a method for selecting the subjects or cases that were to be included in the sample. The representative sample in the research study comprised of members of Focus Group Discussions (FGDs) who were also selected through simple random sampling, and Key Informants (KIs) who were selected through Purposive sampling.

Andrew Fisher's formulawas used to arrive at the sample size as follows:

$$\text{Sample size} = \frac{(\text{Z-score})\ ^2 \times \text{Std Dev} \times (1 - \text{Std Dev})}{(\text{confidence interval})\ ^2}$$

The calculation gave a study population (i.e., a sampling frame) of 2,263 persons. Hence, a study sample of 100 persons was selected from a study population of 2,263 persons.

Research instruments used to collect data were Questionnaires, FGD Guide, KII Guide. The questionnaire, aimed at gathering demographic data of the respondents and specific information based on the thematic areas, for each FGD member to individually fill. Consequently, 75 persons were selected as members of FGDs through simple random sampling. Since there are 5 Wards in Nyando sub-County, 4 Wards each had 1 FGD team comprising 12 persons and 1 Ward had 2 FGD teams with 8 persons and 7 persons respectively. Hence, 6 Focus Group Discussion sessions were held. Moreover, 25 persons were selected as Key Informants (KIs) through Purposive sampling.

Data analysis for this study involved both quantitative and qualitative methods. Quantitative data collected through questionnaires were entered into the Statistical Package for the Social Sciences (SPSS), where descriptive statistics such as frequencies and percentages were used to summarize

ISSN: 2312-0134

African Research Journal of Education and Social Sciences, 11 (3), 2024 | Website: *www.arjess.org*

the data. The findings were then presented using tables, charts, and graphs to provide a clear visualization of the results. For the qualitative data gathered from interviews, content analysis was employed, beginning with transcription and followed by thematic analysis to identify recurring patterns and themes. This process involved coding and organizing the data to highlight key insights, using direct quotes to support the findings. The integration of both quantitative and qualitative results provided a comprehensive understanding of the study's outcomes, ensuring that the data types complemented each other and enriched the overall interpretation.

RESULTS

Effectiveness of Resilience Strategies to Flooding Employed by the Local Population

This section presents the findings related to the effectiveness of resilience strategies employed by the local population in response to flooding. The strategies explored in this section include the type and extent of humanitarian support received during flood events, plans for evacuation in case of severe flooding, and the coordination methods utilized during flooding emergencies. The data collected on these aspects provides insight into the local population's ability to mitigate the impacts of floods and highlights areas where improvements are necessary to enhance community resilience and response.

Humanitarian Support Received during Flood Events

The study aimed to assess the effectiveness of humanitarian support as a resilience strategy for flood mitigation. Figure 1 illustrates the respondents' perspectives on the impact of this support in addressing the challenges posed by flooding.

ISSN: 2312-0134

African Research Journal of Education and Social Sciences, 11 (3), 2024 | Website: *www.arjess.org*

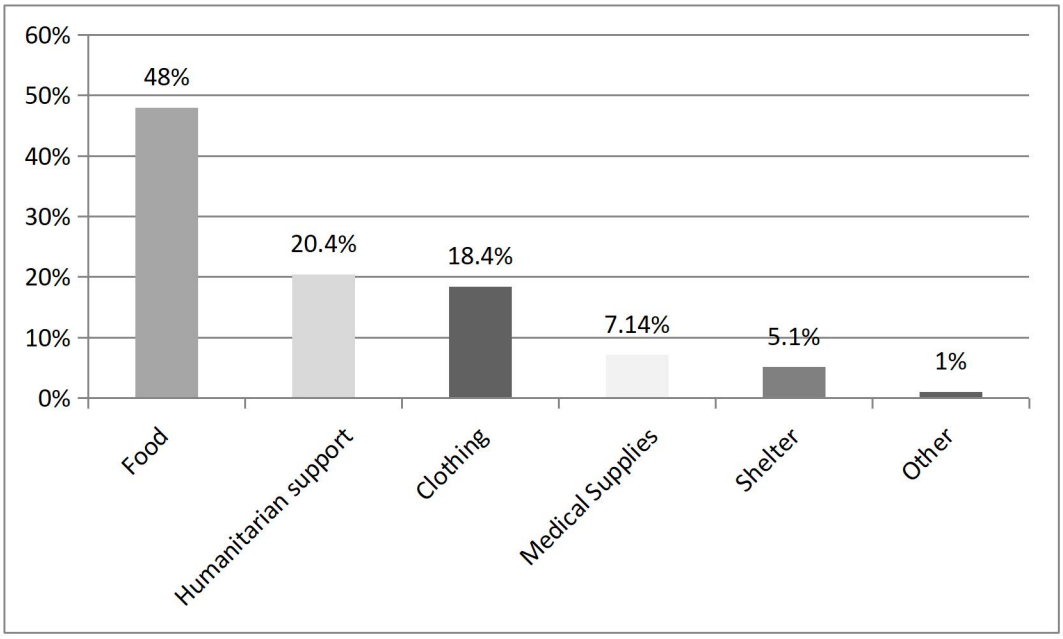

Figure 1: Humanitarian support received during flood events

According to the data shown by the graph, 48% of respondents acknowledged that they receive food during flood events. A significant proportion of respondents (20.4%) indicated that they receive no humanitarian support during flood events.

Additionally, 5.10% of respondents reported receiving shelter or accommodation support, including temporary shelters, camps, and other forms of accommodation. The data also indicates that 18.4% of respondents received items such as clothing, blankets, bedding, and mosquito nets. Furthermore, 7.14% of respondents mentioned receiving medical supplies, including medicine and water treatment supplies.

Approximately 1% of the respondents indicated that they receive other forms of support not specified in the main categories.

ISSN: 2312-0134

African Research Journal of Education and Social Sciences, 11 (3), 2024 | Website: *www.arjess.org*

Plan for Evacuation in Case of Severe Flooding

The study also explored the preparedness of respondents in planning for evacuation in case of severe flooding. Figure 2 presents the percentages of respondents who have an evacuation plan in place for such scenarios.

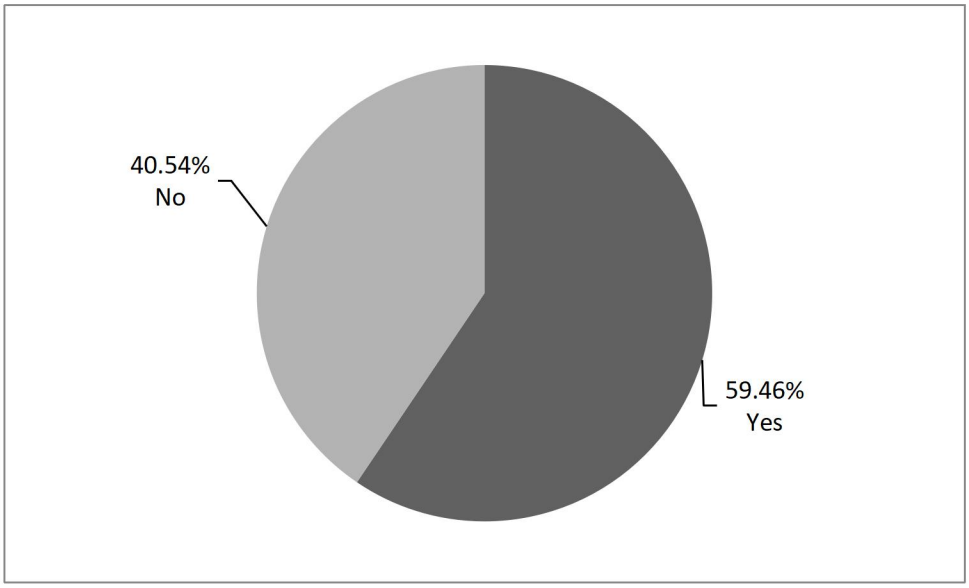

Figure 2: Plan for evacuation in case of severe flooding

The respondents were asked whether they have a plan for evacuation in case of severe flooding and 59.5% of the respondents agreed that they have a plan whereas 41% indicated that they don't have a plan. This implies that in case of severe flooding there will still be a good number of residents who will be affected because they are not ready to be evacuated. Unpreparedness is seen as an attributing factor that threatens resilience of the local population of NyandoSub-County and, in addition to this, a Key Informant respondent commented as follows, *"*There are limited pieces of land for the affected people to move to from the low-lying areas.*"*

Co-ordination Methods during Flooding Emergencies

The study further examined the coordination methods employed during flood emergencies. Figure 3 highlights the percentages of the various coordination strategies used by the respondents during these critical situations.

ISSN: 2312-0134

African Research Journal of Education and Social Sciences, 11 (3), 2024 | Website: *www.arjess.org*

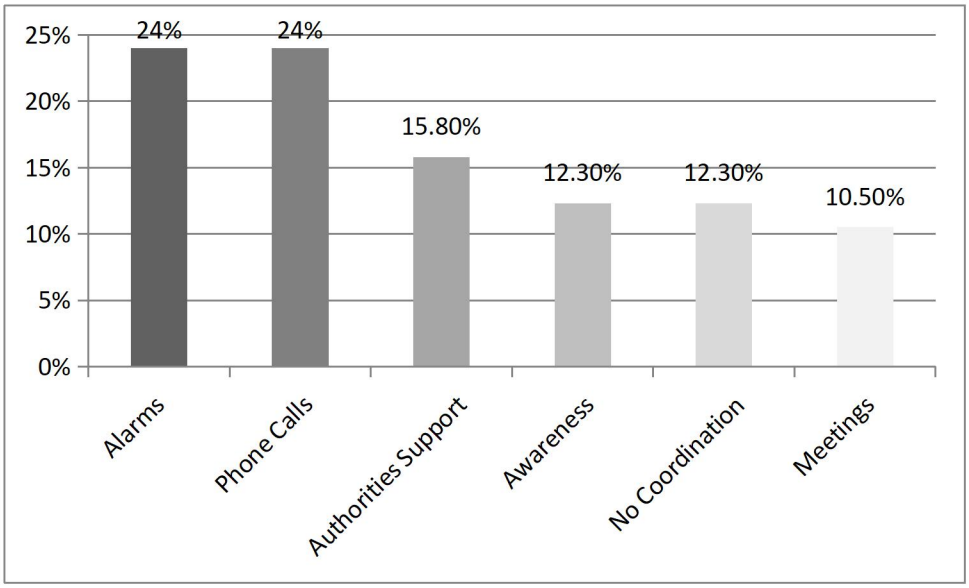

Figure 3: Co-ordination methods during flooding emergencies

The analysis categorized the coordination methods during flood emergencies into six primary areas: phone calls, alarms, meetings, awareness, no coordination, and authorities' support. Each category was quantified based on the responses and visualized using a percentage-based bar plot. Phone calls and alarms were reported by 24% of the respondents in each category, indicating that they are the most commonly used methods for coordination during flood emergencies.

The graph also shows that 15.8% of respondents indicated receiving support from authorities, including local leaders, government agencies, and organizations.

Additionally, 12.3% of respondents reported creating awareness as a coordination method, while 10.5% mentioned using meetings, forums, and public gatherings to coordinate efforts.

Meanwhile, 12.3% of respondents reported having no specific coordination mechanism.

Key Factors Influencing Recovery from Flood-related Economic losses

After examining the effectiveness of resilience strategies employed by the local population in response to flooding, the study also explored the key factors that influence recovery from flood-related economic losses. The figure 4 illustrates the percentages of these critical factors, providing insight into the elements that significantly impact the recovery process for affected households.

ISSN: 2312-0134

African Research Journal of Education and Social Sciences, 11 (3), 2024 | Website: *www.arjess.org*

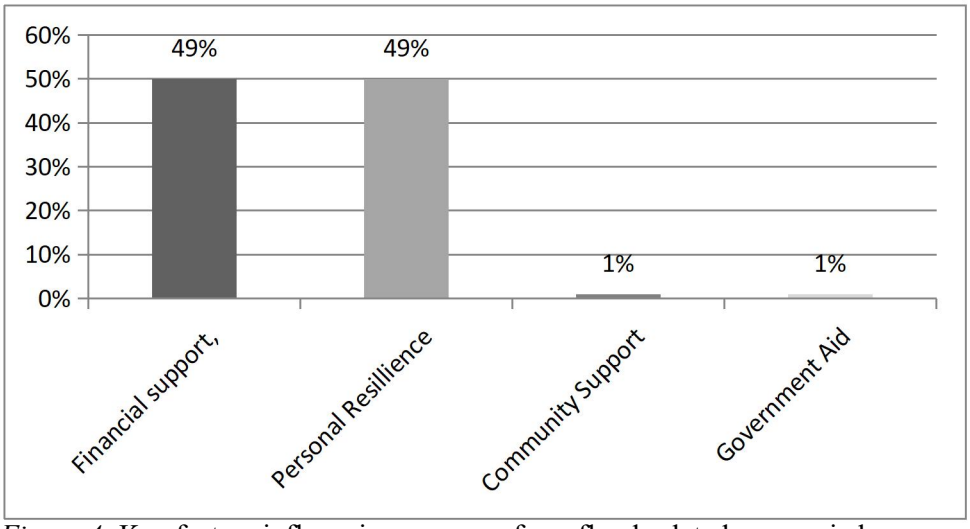

Figure 4: Key factors influencing recovery from flood-related economic losses

The analysis categorized the key factors influencing the ability of households to recover from flood-related economic losses into four primary areas: financial support, community support, government aid, and personal resilience. Each category was quantified based on the responses, and the results were visualized using a percentage-based bar plot. Notably, 49% of respondents indicated that financial support, including insurance, loans, and savings, significantly influenced their ability to recover from economic losses.

Similarly, 49% of respondents highlighted personal resilience factors, such as skills, education, and health, as important for their recovery.

In contrast, a small percentage of respondents (1%) identified community support, including local aid, community groups, and cooperatives, as a significant factor in their recovery.

ISSN: 2312-0134

African Research Journal of Education and Social Sciences, 11 (3), 2024 | Website: *www.arjess.org*

Shelter or Refuge during Flooding Incidents

The study also examined the availability of shelter or refuge during flooding incidents. The Figure 5 illustrates the percentages of respondents who sought shelter or took refuge during such events, highlighting the various options and levels of preparedness within the community.

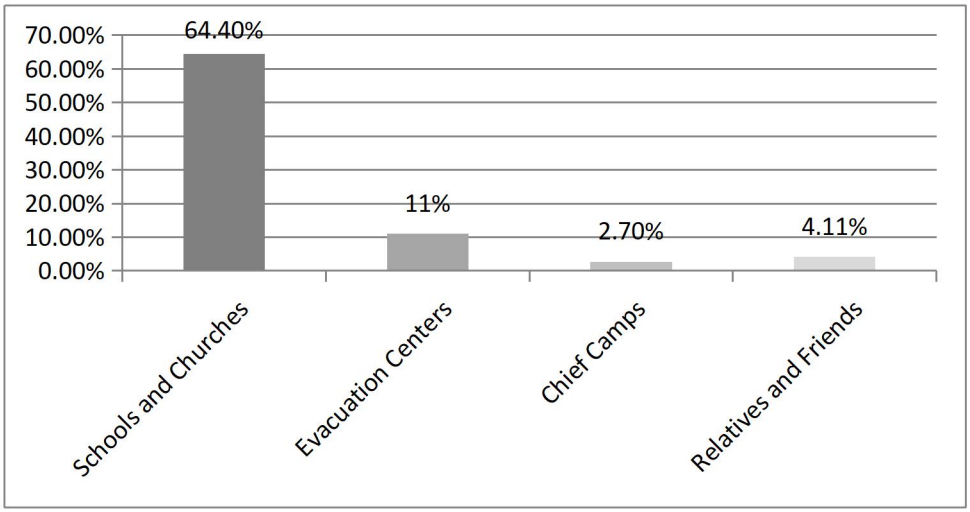

Figure 5: Shelter or refuge during flooding incidents

The analysis categorized the places where households seek shelter or refuge during flooding incidents into five primary areas: schools and churches, evacuation centers, Chiefs' camps, relatives and friends, and no action. Each category was quantified based on the responses and visualized using a bar plot. The bar graph indicates that 64.4% of respondents reported seeking shelter in schools and churches during flooding incidents, highlighting the critical role these institutions play in providing refuge for residents.

Additionally, 11.0% of respondents reported seeking refuge in Chiefs' camps, which are community-designated areas supervised by local leaders.

Approximately 2.74% of respondents mentioned staying with relatives and friends, suggesting that while some residents rely on social networks for refuge, it is not the primary source of shelter for most.

Only 4.11% of respondents indicated taking no specific action or not seeking shelter during flooding incidents.

ISSN: 2312-0134

African Research Journal of Education and Social Sciences, 11 (3), 2024 | Website: *www.arjess.org*

Actions Taken to Manage Access to Clean Water and Sanitation

The study also investigated the actions taken by households to manage access to clean water and sanitation during flood events. The figure below illustrates the percentage of respondents who implemented various measures to ensure the availability and safety of water and sanitation resources, highlighting the community's efforts in addressing these critical needs during emergencies

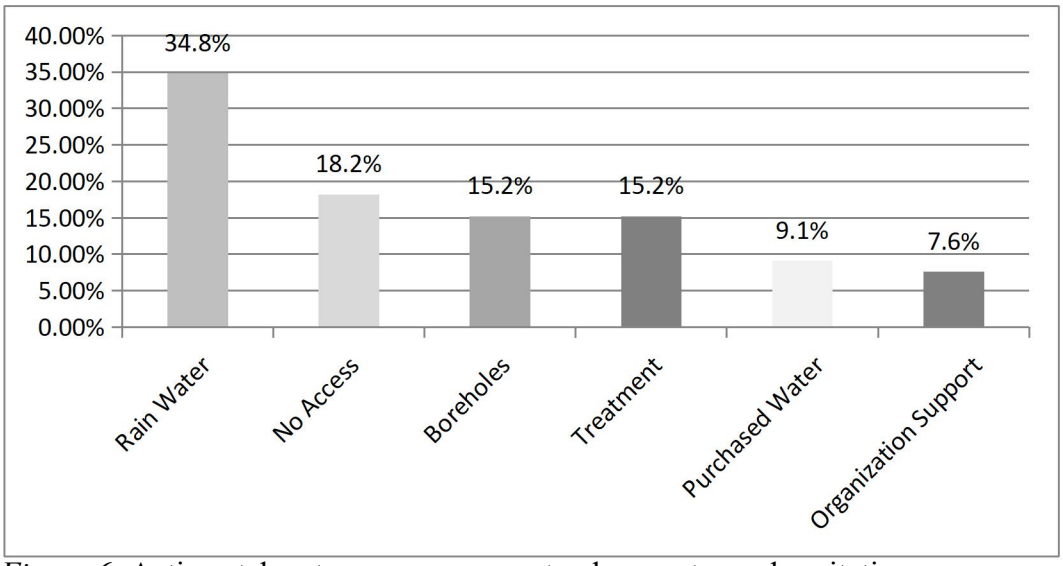

Figure 6: Actions taken to manage access to clean water and sanitation

The analysis categorized the methods used to manage access to clean water and sanitation facilities into six primary areas: rainwater, boreholes, water treatment, purchased water, organizational support, and no access. Each category was quantified based on the responses and visualized using a bar plot. The graph indicates that 34.8% of respondents relied on rainwater as their primary source of clean water during and after flooding.

Additionally, 15.2% of respondents reported using boreholes to access clean water, which provides a reliable source of groundwater less likely to be contaminated during flooding.

Approximately 15.2% of respondents mentioned treating available water through methods such as boiling, chlorinating, and using water guards to ensure its safety.

The data also shows that 9.09% of respondents purchased clean water from shops or vendors, typically when other sources are unavailable or contaminated. However, this method may not be sustainable for all households due to cost and accessibility concerns.

ISSN: 2312-0134

African Research Journal of Education and Social Sciences, 11 (3), 2024 | Website: *www.arjess.org*

Furthermore, 7.58% of respondents received support from organizations, such as the Red Cross and local government, which provided clean water and water treatment supplies. Interestingly, 18.2% of respondents reported having no access to clean water or found it very difficult to obtain.

DISCUSSION

The findings of this study reveal that 64.4% of respondents sought shelter in schools and churches during flooding incidents, highlighting the essential role these institutions play in providing refuge for affected residents. This reliance on educational and religious facilities underscores their significance in community disaster preparedness and response strategies. Research has shown that such institutions are often viewed as central, accessible, and trusted locations where residents can gather for safety during crises (Mastrorillo et al., 2016; Hutton et al., 2017). Their established presence in communities makes them ideal venues for sheltering individuals who have been displaced by flooding. Moreover, the findings align with literature that emphasizes the importance of community infrastructure in disaster management. For example, a study by Ritchie and Gill (2017) found that local schools and churches are often utilized as emergency shelters due to their spatial characteristics, such as large open areas and proximity to populations in need. These structures not only provide physical shelter but also foster a sense of community resilience and solidarity, which is crucial during emergencies (Paton, 2006).

In addition to schools and churches, 11.0% of respondents reported seeking refuge in chief camps. These community-designated areas offer a more localized and culturally relevant option for shelter, supervised by local leaders. This finding aligns with research that emphasizes the significance of traditional leadership and community networks in disaster response, as they often mobilize resources and facilitate coordination during crises (Haque & Zuberi, 2017). However, while the high percentage of individuals seeking shelter in schools and churches demonstrates effective community resource utilization, it also raises questions about the adequacy of these facilities to meet the needs of all displaced individuals during severe flooding events. The reliance on a limited number of shelters may lead to overcrowding and resource strain, which can diminish the quality of support offered (Parker et al., 2019). Therefore, it is essential to consider strategies that enhance the capacity of these institutions to accommodate larger populations while ensuring equitable access to shelter for all community members.

Humanitarian support during flood events also plays a vital role in ensuring the safety and well-being of affected households. This analysis focuses on the types of humanitarian assistance received by households in Nyando sub-County, Kisumu County, Kenya, during flooding incidents. By categorizing responses, the study identifies the most common types of support and highlights areas where additional assistance is needed. The analysis reveals that food emerges as the most commonly received form of humanitarian support, underscoring its critical importance during crises. Access to food is essential for survival, particularly in the aftermath of flooding, when local agricultural production may be severely disrupted (Schwerdtle et al., 2018). This

ISSN: 2312-0134

African Research Journal of Education and Social Sciences, 11 (3), 2024 | Website: *www.arjess.org*

finding aligns with existing literature that emphasizes the need for timely food aid to prevent malnutrition and food insecurity in disaster-affected populations (Barrett, 2010).

In addition to food, clothing and medical supplies were also identified as key forms of assistance, indicating a broader understanding of the diverse needs of affected individuals. However, a concerning 20.4% of respondents reported receiving no humanitarian support at all during flooding events. This significant percentage highlights a critical gap in aid provision and suggests that many households may be left vulnerable and unsupported when they need assistance the most. Such gaps in humanitarian response can exacerbate the impacts of flooding, leaving households without the necessary resources to cope with the immediate and long-term consequences (Houghton et al., 2016). The lack of support for a substantial portion of the population underscores the necessity for improved and more widespread aid distribution. Effective humanitarian assistance must be tailored to address the specific needs of communities, taking into account factors such as the scale of the disaster, the socio-economic status of households, and the existing infrastructure for aid delivery (Schwerdtle et al., 2018). This calls for enhanced coordination among humanitarian organizations, local authorities, and community leaders to ensure that support reaches those most in need.

The findings reveal that 59.5% of respondents have a plan for evacuation in the event of severe flooding, while 41% do not. This significant portion of the population lacking an evacuation plan indicates a potential vulnerability that could exacerbate the impacts of flooding in Nyando sub-County. The lack of preparedness among a notable number of residents suggests that, in severe flooding situations, many individuals may face increased risks, including loss of property, displacement, and even loss of life. Unpreparedness is a critical factor that threatens the resilience of the local population. The ability to respond effectively to flooding emergencies hinges not only on having an evacuation plan but also on the accessibility and availability of safe refuge areas. As highlighted by one of the key informants, “There are limited pieces of land for the affected people to move to from the low-lying areas.” This comment underscores the challenges faced by communities in identifying suitable relocation sites during disasters, which can further complicate the effectiveness of evacuation plans.

Literature emphasizes the importance of community preparedness and planning in enhancing resilience to flooding (Mastrorillo et al., 2016). Effective evacuation plans must account for geographical constraints, such as limited safe land available for relocation, as well as socio-economic factors that may impede individuals' ability to evacuate. For instance, households with fewer resources may find it more challenging to relocate, especially when evacuation routes are inadequate or when they lack access to transportation (Gonzalez et al., 2018).To address the identified gaps, it is essential for local authorities and humanitarian organizations to promote awareness of evacuation planning and provide resources for residents to develop comprehensive plans. Additionally, enhancing community engagement in the planning process can ensure that evacuation strategies are tailored to the specific needs and circumstances of the local population, thereby fostering greater resilience against future flooding events.

ISSN: 2312-0134

African Research Journal of Education and Social Sciences, 11 (3), 2024 | Website: *www.arjess.org*

Effective coordination among community members during flooding emergencies is vital for minimizing risks, ensuring safety, and enhancing overall community resilience. The analysis reveals that phone calls and alarms are the predominant methods of coordination, with 24% of respondents indicating their use. This demonstrates the effectiveness of these methods in rapidly disseminating information and alerting community members to necessary actions during crises. The ability to communicate quickly can significantly influence the response time and preparedness of individuals facing imminent flood threats. In addition, 10.5% of respondents mentioned using meetings, forums, and public gatherings as coordination methods. These gatherings are essential for discussing strategies, sharing critical information, and planning collective actions. Engaging in dialogue not only enhances the community's situational awareness but also fosters a sense of solidarity and collective responsibility among residents. This aligns with findings from existing literature, which emphasizes the importance of social networks and community engagement in disaster preparedness (Bennett et al., 2020).

While the study indicates that phone calls and alarms are effective, the notable lack of specific coordination mechanisms among a significant portion of the population highlights a critical gap in organized efforts. This absence of established coordination strategies can lead to confusion and delays in response during emergencies, potentially exacerbating the impact of flooding on vulnerable households. As noted by several scholars, effective disaster response relies heavily on clear communication and pre-established coordination protocols among community members and local authorities (Cottam et al., 2020; Mastro et al., 2021). To enhance community resilience in Nyando sub-County, it is crucial for local authorities and humanitarian organizations to promote the development of comprehensive coordination frameworks. This could include training programs focused on communication strategies and emergency response planning, as well as fostering partnerships between community groups and local authorities. By building robust coordination mechanisms, communities can improve their preparedness for flooding emergencies, ultimately reducing vulnerabilities and enhancing recovery efforts.

The findings under factors influencing recovery were that 50% of respondents indicated that financial support, including insurance, loans, and savings, significantly influenced their ability to recover from economic losses. This indicates that access to financial resources plays a crucial role in the recovery process. On the other hand, 50% of respondents highlighted personal resilience factors, such as skills, education, and health, as important for their recovery. This underscores the role of individual capabilities and attributes in overcoming the economic challenges posed by flooding. Very small percentage of respondents (below 1 %) indicated community support, such as local aid, community groups, and cooperatives, as a significant factor in their recovery. This suggests a potential gap in community-based recovery mechanisms that could be leveraged to enhance household resilience.This reflects the gap identified by Deroliya et al. (2022), who emphasized the need for integrating agricultural adaptation and community-based strategies into flood mitigation measures. Similarly, very few respondents indicated government aid, including subsidies and relief programs, as a key factor influencing their recovery. This points to a lack of effective government intervention and support in the

ISSN: 2312-0134

African Research Journal of Education and Social Sciences, 11 (3), 2024 | Website: *www.arjess.org*

recovery process for flood-affected households. The findings reveal that financial support and personal resilience are the most critical factors influencing the recovery of households from flood-related economic losses.

The analysis categorized the methods used to manage access to clean water and sanitation facilities into six primary areas: rainwater, boreholes, water treatment, purchased water, organizational support, and no access.34.8% of respondents reported relying on rainwater as their primary source of clean water during and after flooding. This indicates a significant dependence on natural precipitation for water needs. This dependence on rainwater underscores the need for effective rainwater harvesting systems and storage facilities to ensure a reliable supply.The analysis indicates that rainwater, boreholes, and water treatment practices are the primary methods for managing access to clean water during and after flooding in Nyando sub-County. However, a significant portion of the population still faces challenges in securing clean water, highlighting the need for improved infrastructure and support.

CONCLUSION

The study highlights that floods significantly undermine the economic prospects and production capabilities of households in Nyando sub-County. These disasters disrupt employment opportunities and severely impact agriculture, leading to crop losses, livestock fatalities, and overall economic instability. Furthermore, the limited and uneven implementation of flood mitigation measures reveals a gap in community involvement, indicating a need for the government; both national and county levels, to actively engage local populations in the planning and execution of these strategies.

Flooding has resulted in the displacement of many residents, forcing them to seek shelter in public institutions and places of worship, which play vital roles in disaster response and community preparedness. In light of these challenges, several key recommendations are proposed. The National Government, in collaboration with the Kisumu County government and non-governmental organizations, should adopt a comprehensive approach to flood mitigation, securing adequate funding for structural improvements and enhancing agricultural resilience. Initiatives should include the development of adaptive infrastructure, the establishment of evacuation centers for displaced individuals, and the promotion of awareness through community meetings and forums. Implementing sustainable environmental practices will also be crucial for the well-being and resilience of affected households.

ISSN: 2312-0134

African Research Journal of Education and Social Sciences, 11 (3), 2024 | Website: *www.arjess.org*

REFERENCES

Barrett, C. B. (2010). Measuring food insecurity. *Science*, 327(5967), 825-828.

Deroliya, P., Ghosh, M., Mohanty, M.P., Ghosh, S., Rao, K.D., & Karmakar, S. (2022). A novel flood risk mapping approach with machine learning considering geomorphic and socio-economic vulnerability dimensions. *Science of the Total Environment*, 851, 158002.

Gonzalez, E., et al. (2018). Assessing evacuation planning and its implications for resilience: A case study. *Natural Hazards Review*, 19(1), 04017020.

Haque, C. E., & Zuberi, D. (2017). The role of community in disaster resilience: A case study from Bangladesh. *International Journal of Disaster Risk Reduction*, 23, 39-49.

Houghton, R. A., et al. (2016). Humanitarian response in disasters: A review of the literature. *Disasters*, 40(4), 600-619.

Hudson, P., Botzen, W. J. W., Poussin, J., & Aerts, J. C. J. H (2019). Impacts of Flooding and Flood Preparedness on Subjective Well-Being: A Monetisation of the Tangible and Intangible Impacts. *Journal of Happiness Studies*, Springer, vol. 20(2), pages 665-682, February.

Hutton, G., Haller, L., & Bartram, J. (2017). Global cost-benefit analysis of water supply and sanitation interventions. *Journal of Water and Health*, 15(1), 43-55.

Kreienkamp, F., Philip, S.Y, Tradowsky, J.S., Kew, S.F., Lorenz, P., Arrighi, J., Belleflamme, A., Bettmann, T., Caluwaerts, S., & Chan, S.C. (2021). *Rapid attribution of heavy rainfall events leading to the severe flooding in western Europe during July 2021*. World Weather Attribution.

Mabuku, M. P.,Senzanje, A., Mudhara, M., Jewitt, G.P.W. &Mulwafu, W.O. (2019). Strategies for coping and adapting to flooding and their determinants: A comparative study of cases from Namibia and Zambia. *Physics and Chemistry of the Earth, Parts A/B/C*.doi:10.1016/j.pce. 2018.12.009

Mastrorillo, M., et al. (2016). Community resilience: a literature review. *International Journal of Disaster Risk Reduction*, 19, 1-10.

Mastrorillo, M., et al. (2016). The role of community preparedness in disaster resilience: A systematic review. *International Journal of Disaster Risk Reduction*, 18, 211-223

ISSN: 2312-0134

African Research Journal of Education and Social Sciences, 11 (3), 2024 | Website: *www.arjess.org*

Mugenda, O. M., & Mugenda, A. G. (2019). *Research Methods: Quantitative, Qualitative and Mixed Method Approaches*. Centre for Innovative leadership & Governance. Nairobi, Kenya.

National Academies of Sciences, Engineering, and Medicine (2019). *Framing the Challenge of Urban Flooding in the United States*. Washington, DC: The National Academies Press. https://doi.org/10.17226/25381.

National Disaster Operations Centre (2018). *National Disaster Risk Management Policy*. Ministry of Interior and Co-ordination of National Government, Kenya.

Nkwunonwo, U.C., Whitworth, M., and Bailey, B. (2020). A review of current status of flood modelling for urban flood risk management in the developing countries. *Scientific African*. Elsevier B.V.

Nyong'o, P. (2019). The socio-economic impacts of flooding on vulnerable populations in Nyando Sub-County, Kisumu County, Kenya: A comprehensive assessment. *Journal of Disaster Studies and Risk Management*, 7(3), 45-68.

Odero, N. A., & Mahiri, I. (2022). The Complacency of Flood Victims, Socio Economic Factors, and Effects and Vulnerabilities of Floods in Lower Kano Plains, Kisumu County, Kenya. *International Journal of Disaster Risk Management*, 4(2), 59-77.

Odero, N.A. (2022). *Socio-economic determinants of Integrated floods management for vulnerability reduction in Kano plains, Kisumu County, Kenya*. Kenyatta University.

Okaka, F. O., & Odhiambo, B. D. (2019). Health vulnerability to flood-induced risks of households in flood-prone informal settlements in the Coastal City of Mombasa, Kenya. *Natural Hazards*, 99(2), 1007-1029.

Parker, S., et al. (2019). The impact of overcrowding on community shelters during natural disasters: A systematic review. *Disaster Medicine and Public Health Preparedness*, 13(3), 530-537.

Paton, D. (2006). Disaster preparedness: A psychological perspective. *Australian Journal of Emergency Management*, 21(3), 45-50.

Ritchie, L. A., & Gill, D. A. (2017). Building resilient communities: The role of local schools in disaster preparedness. *Natural Hazards*, 88(2), 535-556.

Schwerdtle, P. N., et al. (2018). The health impacts of flooding in the context of climate change. *Environmental Research Letters*, 13(12), 123006.

UNDRR (2020). *The Human cost of Disasters: an overview of the last 20 years (2000-2019)*. UNDRR.