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Influence of Floods on Community Livelihood Sustainability and Development in Nyando River Basin, Nyando Sub-County, Kenya

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ABSTRACT

The Nyando River Basin experiences floods nearly every year, which is a key factor contributing to high poverty levels in Nyando District. Prior to this study, none had ever assessed the effect of floods on community livelihood sustainability in the Basin. This study investigated the influence of Floods on Community Livelihood Sustainability and Development in Nyando River Basin, Nyando Sub-county, Kenya on: Household food security and shelter status. A cross-sectional design was applied to source data from 561 household heads and 22 officials of humanitarian agencies operating in the Nyando River Basin. Probability and non-probability sampling procedures were applied to select participants, while the analysis yielded descriptive statistics, cross-tabulation with Chi-square statistic and one-way analysis of variance. The study area was divided into two zones - high-risk (within 2 kilometres) and low-risk (more than 2 kilometres).The results show that the floods increased the fishing potential but reduced the potential of crop farming and livestock production. The damage was most severe for maize crop (63.2%), beans (61.9%), poultry (62.6%) and goats (36.5%). The two zones were significantly different in terms of access to food (χ^2 = 23.151, df = 3 and a p-value = 0.022); the duration for which pupils stayed out of school due to floods (χ^2 = 22.861; df = 3 and p-value = 0.000. However, there was no significant difference regarding shelter type. In this regard, the analysis obtained a computed χ^2 value of 2.166, with 3 degrees of freedom and a p-value of 0.155, which was not significant. This suggests that the high-risk and low-risk zones were not significantly different in terms of the type of shelter prior to the floods. However, after the floods the proportion dwelling in temporary structures increased from 10.6% to 38.5% in the high-risk zone and from 3.0% to 11.6% in the low-risk zone. Besides, the proportion accessing drinking water from open sources increased significantly during the floods. The study concludes that: appropriate risk reduction interventions are likely to safeguard community livelihoods, while increased investments in education is likely to reduce community vulnerability to floods, in the long-term. The study recommends the need to: develop crop calendars to guide farming activities; construct food stores in higher grounds to support grain banking; establish a housing kitty for vulnerable groups. The study further recommends the need to strengthen the constituency bursary kitty for children affected by floods; sustain health education to improve knowledge about the safety of drinking water and the need to equip households with knowledge and skills of modern fishing technology for household food security.

1.0 Introduction

Precipitation is vital for living things to survive and thrive. On the flip side too much of rainfall becomes potential threat to human life and property as well destruction on the environment. Flooding is a primary manifestation of climate change, affecting all parts of the world. Floods are frequent and widespread natural disasters (Schanze, Evzen and Jiri, 2006; IPCC, 2007). Increase of temperatures and rainfall, the frequency and occurrence of flooding may also increase significantly across the globe (Afeku, 2005; IPCC, 2007). In the past ten years, severe flooding has been reported in countries such as Ghana, Niger, Zambia, Zimbabwe, Uganda, Mozambique, Kenya and Tanzania, just to mention a few (Gwimbi, 2004; Nott, 2006; Armah *et al*, 2010; ILGS & IWMI, 2012).

In Kenya, most of recent floods have been associated with the *El Niño*. A study commissioned by the African Wildlife (2004) points out that the cumulative impact of human activities with little or no regard for nature has turned the recent floods from a natural phenomenon into a man-made disaster of epic proportions. High rate of urban growth and expansion in flood-prone areas, as well as inadequate flood control measures are factors that increase the risk of floods and related impacts.

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Schanze, Evzen and Jiri (2006) note that human impacts on river catchments, particularly land use changes have a direct impact on the magnitude and behaviour of floods. Nott (2006), notes that floods are either be caused through climatological factors or human induced.

Shelter is a basic need. All human kind as well as animals require shelter. High poverty levels have subjected many people to move to vulnerable and hazardous areas such as flood plains and steep hills, in search of farming land (Nott, 2006). Smith and Ward (1998) noted that floods constitute a hazard only where human encroachment into flood prone areas has occurred. Floods become a major natural hazard because of the high human population densities that inhabit flood plains (Nott, 2006). Vulnerability is perpetuated by factors such as poor living conditions, lack of power, exposure to risk as well as lack of capacity to cope with shocks and adverse situations (Ariyabandu and Wickramasinghe, 2005; IPCC, 2007). Karki and Pradhan (2011) note that the majority of flood victims are poor people living in flood plains.

Flooding exerts adverse socio-economic impact on the wellbeing of vulnerable communities inhabiting flood-prone settlements. Schanze, Evzen and Jiri, (2006) notes flooding displaces people, destroys buildings and leads to loss of human life and thus leading to unplanned migration, starvation, disease and a host of other social challenges. Smith and Ward (1998) indicate that heavy precipitation results into recurrent flash floods and water logging in low lying areas, causing varying impacts on various sectors, including shelter, infrastructure and agriculture; where impacts are dependent on the level of vulnerabilities among the local communities.

1.1 Statement of the Problem

The frequency of floods has increased significantly over the past five decades, particularly due to anthropogenic activities, increasing carbon emissions and resulting increase in global temperature (Afeku, 2005; IPCC, 2007; World Bank, 2011). Afeku (2005) and Nott (2006) suggest that flooding events are set to increase towards end of the Twenty-first Century.

Vulnerabilities to flooding events in Nyando River Basin are attributed to poverty which made people to move into floodplains in search of farming lands and shelter. Flooding events in Kenya recently were associated with *El Niño* rains, which have had significant effects on community livelihood sustainability. The Nyando River Basin in Kenya is prone to flooding, which suffered serious consequences due to the *El Niño* rains of December 2011 to April 2012. This study intended to generate information that would complement existing literature from where government planners and development agencies can draw to support their programming activities aimed at improving community livelihood sustainability.

1.2 Research objectives

The general objective of the study was to assess the influence of floods on household food security in Nyando River Basin. The research sought to specifically determine the influence of floods on shelter status of communities in Nyando River Basin.

1.3 Research Questions

The study addressed the following questions: What is the influence of floods on households' food security and shelter status of the communities in Nyando River basin?

1.4 Significance of the Study

The findings of this study are likely to draw the attention of government and humanitarian agencies operating in Nyando Sub-county regarding the effects of floods on various aspects of community livelihood sustainability. The new findings are likely to support project design, with a view to making activities more responsive to community needs, as well as support fund raising initiatives through proposals.

1.5 Scope of the Study

The study was confined to the lower Nyando River Basin covering, six administrative locations, including Wawidhi, Kakola and Onjiko in the high-risk zone of 2 kilometres from the river channel, as well as Awasi, Kochogo and East Kano in the low risk zone of more than 2 kilometres from the river channel. The study focused on food security and shelter status

1.6 Assumptions of the Study

The study was founded on the assumption that communities in the low-risk and high-risk zones were similar in terms of socio-economic pointers.

2.0 Literature Review

2.1 Influence of Floods on Household Food Security

Armah *et al*. (2010) notes that floods are periodic occurrences but have large impacts on the process of food production and security. Karki and Pradhan (2011) assessed the impact of flooding on people's livelihood in the Kankai watershed in Nepal and found that the occurrence of floods affected access to food by damaging rice and paddy fields, particularly in Terai and mid-hills of the country – whose economy is largely anchored on agriculture, with a single season of rice crop dependent on the easterly monsoon. Buitelaar *et al*, (2007) revealed that the flooding not only deprived people of their stocks of food supplies which they had already reaped and processed, but also destroyed crops in the ground and made the agricultural plots unusable for immediate replanting, for subsistence farmers, thus increasing their overall vulnerability.

Gwimbi (2004) indicates that communities residing within a distance of less than one mile from the river channel experienced a greater loss of crops in the farms than those residing beyond the one-mile distance from the river channel. Communities residing within a distance of less than one mile were about 2.5 times as likely to report inadequate access to food as those residing beyond the one-mile distance. Given that the economies of vulnerable communities heavily relies on agriculture, the destruction of crops in the farms also mean a reduction in household income and ability to purchase food. Nyakundi *et al*, (2010) established that food and water shortage were common problems during floods in Nyando District. Many households coped by reducing the quantity of food eaten or skipping some meals.

Gichere *et al*, (2013), established that occurrence of floods in the Lake Victoria Basin was often accompanied by huge losses of livestock and crop damage. Also pests and disease outbreaks, were found to have influenced a lot of damage in the basin. Lower Nyando Basin is generally food insecure, producing less than 50 percent of its grain requirements annually (Government of Kenya, 2001). Perennial flooding is one of the key factors perpetuating food insecurity, besides poor agricultural technology, erratic rainfall, agricultural inputs, poor road network, lack of credit facilities and post-harvest wastage due to inadequate storage facilities (GoK, 2001, 2003).

2.2 Influence of Floods on Shelter Status in the Community

UN-HABITAT (2003), noted that flooding is one of the most critical natural hazards posing threatening human shelter in developing countries, particularly because people are

increasingly pushed by economic circumstances top settle in flood-prone areas such as flood plains and steep slopes. The Commonwealth Australia (1998) reported that the destruction of shelter brought heavy emotional costs that took too long to heal, particularly among vulnerable groups such as the elderly and low-income earners. Prolonged recovery was associated with factors such as severity of floods, financial hardship and age, with the most affected being elderly people on low income, whose houses were destroyed. Gwimbi (2004) further showed a significant correlation between the extents to which shelter was destroyed and proximity to the river channel.

Nyakundi *et al*. (2010), indicated that a considerably high percentage of respondents reported damage to their shelter in both high 85.7% and low risk areas 46.7%.

2.3 Conceptual Framework

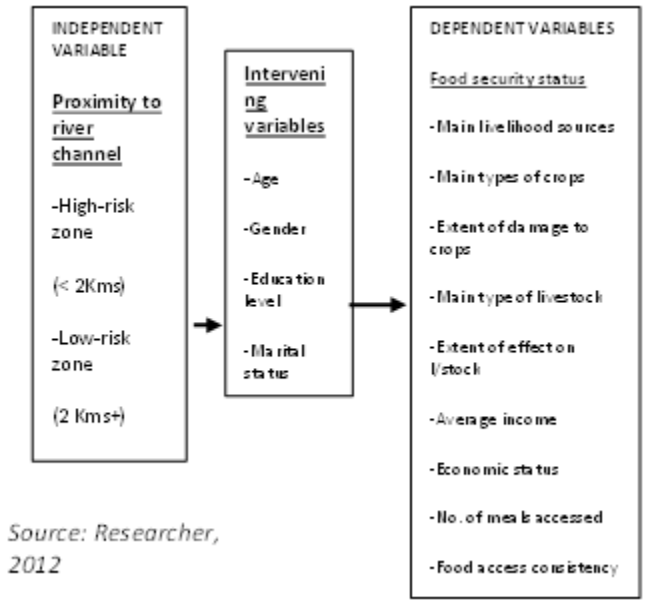

Figure 2.1. Influence of floods on livelihood sustainability.

3.0 Research Methodology

This study applied the cross-sectional survey design, which allows the collection of requisite information from target population at a single point in time (Babbie, 1973; Fowler, 1993). It involved the application of two approaches, quantitative and qualitative. The study was conducted in the Nyando River Basin in Nyando Sub-county. The study area covers the lower parts of the basin, measuring approximately 248.3 square kilometres, with a total population of 79,711 people (GoK, 2009). The population density ranges between 158 persons per square kilometre in Katolo Sub-location to 982 per square kilometre in Tura Sub-location. The study population included community members in six administrative locations, including Awasi, East Kano, Kakola, Kochogo, Onjiko and Wawidhi. The study also targeted Community-Based Organizations (CBOs) and Non-Governmental Organizations (NGOs) operating in the district, government officials, as well as community leaders. The community was divided into two zones; high-risk and low-risk zones.

Three data collection instruments were applied in this study, including a household survey questionnaire, a key informant interview schedule and an observation checklist. The sample size was determined using the two pre-designated zones of high-risk and low-risk locations, using Fisher's formula for sample size determination from finite populations (Mugenda and Mugenda, 1999) as stated below: -

$$n = Z^2pqD/d^2$$

Where: -

n = desired sample size (the target population is greater than 10,000 – **[n=384]**).

Z = standard deviationat 95% confidence level.

p =proportion of population having the characteristics being measured

$q = 1 - p$ = probability of non-success

D = the level of statistical significance set

d = the degree of accuracy (acceptable margin of error) =0.05

The sample size was distributed proportionately across the administrative locations, in the high-risk and low-risk zones, based on the population distribution.

4.0 Results and Discussions

4.1 Introduction

The study area was divided into *high-risk zone* - households within two kilometres from the channel and *low-risk zone* - those lying beyond two kilometres from the Nyando River channel. 70.8% of household heads were sampled within the high-risk zone, while 29.2% were natives of the low-risk zone. The information obtained from respondents in the two zones was compared to determine the effect of floods on community livelihoods.

22 key informants were purposively sampled, including key officials or staff of CBOs, NGOs and the government.

4.2 Influence of Floods on Household Food Security

Floods can have significant negative effects on agricultural production and food security. Directly, floods can destroy crops in the field and foodstuff in stores; and indirectly, floods can constrain food supply, escalating food prices (Banerjee, 2005). For some livelihood sources, such as fishing, floods may have positive effect by encouraging the breeding and multiplication of various fish species.

Table 4.1 outlines the main livelihood sources before floods as reported by participants. In the high-risk zone, the most important activities included crop farming (92.9%), livestock husbandry (86.4%), casual labour (63.5%), transport services (57.7%) and bee keeping (31.5%).

Table 4.1.Main livelihood sources before floods.

Valid responses	High-risk zone		Low-risk zone	
	Frequency	Percent of cases	Frequency	Percent of cases
Fishing	124	31.2	6	3.7
Crop farming	369	92.9	119	72.6
Livestock production	343	86.4	164	100.0
Bee keeping	125	31.5	9	5.5
Brick making	40	10.1	22	13.4
Casual labour	252	63.5	101	61.6
Transport services	229	57.7	78	47.6
Total	**1482**	**373.3**	**499**	**304.3**

In the low-risk zone, the top five livelihood sources included livestock production (100.0%), crop farming (72.6%), casual labour (61.6%), transport services (47.6%) and brick making (13.4%). Based on the distribution, the cross tabulation analysis obtained a computed χ^2 value of 8.723, with 6 degrees of freedom and a p-value of 0.033, suggesting up to 95% chance that the high-risk and low-risk zones were significantly different in terms of main livelihood sources before the floods.

Table 4.2 shows that in the high-risk zone, the proportion of households engaging in crop production decreased significantly from 92.9% before the floods (Table 4.1) to 40.8%, the proportion involved in livestock production reduced marginally from 86.4% to 80.1%, while the proportion of households earning a living through casual labour reduced from 63.5% to 40.1%.

Similarly, in the low-risk zone, the proportion of households involved in livestock husbandry decreased from 100.0% before the floods to 95.7%, those engaging in crop production decreased from 72.6% to 45.7%, while the proportion of casual labourers declined from 61.6% to 42.7% after the floods. The findings suggest that floods reduced the potential of most livelihood activities, with the exception of fishing, which became more attractive to a higher proportion of community members. The proportion of households sourcing their livelihoods through fishing increased significantly from 31.2% before floods to 40.6% in the high-risk zone and from 3.7% to 45.1% in the low-risk zone.

Table 4.2. Main livelihood sources after the floods.

Valid responses	High-risk zone		Low-risk zone	
	Frequency	Percent of cases	Frequency	Percent of cases
Fishing	161	40.6	74	45.1
Crop farming	162	40.8	75	45.7
Livestock production	318	80.1	157	95.7
Bee keeping	14	3.5	3	1.8
Brick making	18	4.5	26	15.9
Casual labour	159	40.1	70	42.7
Transporter	124	31.2	6	3.7
Total	956	240.8	411	250.6

4.2.1 Disruption of crop production

The study found that crop farming was one of the most important livelihood sources for a majority of households in both zones. The study sourced information on the extent to which crops in the field were destroyed by the floods. The results show that before the floods, up to 87% participants were active crop farmers. Of these, 92.9% were natives of the high-risk zone, while 72.6% dwelt in the low-risk zone. Crop farmers were requested to state three main types of crops in the farms at the time of the floods, the results of which are presented in Table 4.3.

Table 4.3. Main types of crops in the field at the time of the floods.

Main crops	High-risk zone		Low-risk zone	
	Frequency	Percent of cases	Frequency	Percent of cases
Maize	325	88.1	112	94.1
Cassava	184	49.9	56	47.1
Sweet potatoes	76	20.6	43	36.1
Beans	324	87.8	107	89.9
Sorghum	342	92.7	119	100.0
Total	1251	339.0	437	367.2

In the high-risk zone, the most important crops included sorghum (92.7%), maize (88.1%) and beans (87.8%). In the low-risk zone, sorghum, maize and beans were cited as the most important crops in the field at the time of floods by 100.0%, 94.1% and 89.9% of the participants, respectively. The analysis showed that the two zones were not significantly different in terms of crop types (computed χ^2 value = 2.549, df = 4 and p-value = 0.248).

Key informants affirmed that crop destruction by floods remains a key challenge to food security in the community. Participants indicated that the challenge may be addressed by developing and disseminating crop calendars, which are tools that provide timely information about planting, sowing and harvesting periods of locally adapted crops in specific agro-ecological zones. Crop calendars inform farmers about the crops on which to concentrate before the onset of floods. Participants further indicated that the damage to crops in the field necessitates the adoption of technology in farming by initiating irrigation schemes and greenhouse farming to ensure that crop farming does not coincide with floods. Also important, according to participants, is the construction of check dams upstream to harness and retain water for irrigation as well as reduce the intensity of damage downstream. However, participants noted that establishing irrigation schemes, greenhouse farming and flood control infrastructure are capital-intensive ventures that will inevitably require the involvement of bilateral and multilateral development partners.

Participants indicated that supporting community members with innovative interventions such as grain banking is likely to prevent post-harvest losses; thus, assure consistent access to food during displacement and after floods, as well as improve access to seeds as community members rebuild their livelihoods. Lastly, participants indicated that appropriate interventions should focus on strengthening early warning systems, by involving the Meteorological Department; mass media and community leaders.

Livestock farming is one of the key livelihood sources for communities in the Nyando River Basin. A total of 507 participants engaged in livestock production, with 343 sampled in the high-risk zone and 164 being natives of the low-risk zone. Table 4.4 shows that in the high-risk zone, poultry was the most common type of livestock kept by up to 95.0% followed by goats (71.1%), cattle (67.6%) and sheep (26.5%).

Table 4.4. Main types of livestock kept prior to floods.

Livestock type	High-risk zone		Low-risk zone	
	Frequency	Percent of cases	Frequency	Percent of cases
Cattle	232	67.6	91	55.5
Sheep	91	26.5	86	52.4
Goats	244	71.1	137	83.5
Poultry	326	95.0	160	97.6
Donkey	43	12.5	62	37.8
Total	936	272.9	536	326.8

The study found that livestock farming was disrupted through drowning and death of animals, resulting to economic loss in terms of income and source of food. The results presented in table 4.4 show that in the high-risk zone, poultry birds were the most affected by floods as reported by 62.6% respondents, followed by goats 36.5% and cattle 10.3%. In the same zone, donkeys and sheep were the least affected, as reported by 83.7% and 79.1% of the participants, respectively. In the low-risk zone, Table 4.5 indicates that the most affected livestock types included poultry (28.8%) and goats (8.8%), while those not affected included donkeys (100.0%), sheep (96.5%) and cattle (95.6%).

Livestock off-take schemes in Kenya have been initiated by humanitarian agencies such as KRCS, Concern International and World Vision, among others, in Turkana,

Isiolo, Marsabit and Moyale Counties. Livestock off-take schemes are likely to minimize economic losses, sustain access to quality food as well as ensure the sustainability of livelihood activities. The damage to crops in the field, foodstuff in stores and livestock had significant economic consequences, in terms of change in average income, individual perception of change in the economic status, the number of meals accessed in a day, as well food security.

The floods increased access to fish as a protein source and enhanced fishing as an economic activity. Research showed that a higher proportion of households sourcing their livelihoods through fishing increased significantly from 31.2% before floods to 50.6% in the high risk zone and from 3.7% to 54.1% in the low risk zone.

Photo 4.1. Photograph of children fishing in a flooded section in their village of Kamuga, Kakola Location.

Table 4.5. The extent to which different livestock were affected by floods.

Livestock type	Affected severely		Affected slightly		Not affected	
	Frequency	*Pct of cases*	*Frequency*	*Pct of cases*	*Frequency*	*Pct of cases*
High-risk zone						
Cattle	24	10.3	67	28.9	141	60.8
Sheep	7	7.7	12	13.2	72	79.1
Goats	89	36.5	104	42.6	51	20.9
Poultry	204	62.6	63	19.3	59	18.1
Donkey	2	4.7	5	11.6	36	83.7
Low-risk zone						
Cattle	0	0.0	4	4.4	87	95.6
Sheep	1	1.2	2	2.3	83	96.5
Goats	12	8.8	37	27.0	88	64.2
Poultry	46	28.8	65	40.6	49	30.6
Donkey	0	0.0	0	0.0	62	100.0
Study area						
Cattle	24	7.4	71	22.0	228	70.6
Sheep	8	4.5	14	7.9	155	87.6
Goats	101	26.5	141	37.0	139	36.5
Poultry	250	51.4	128	26.3	108	22.2
Donkey	2	1.9	5	4.8	98	93.3

4.3 Influence of Floods on Shelter Status

Destruction of shelter is one of the direct negative effects of floods to the human population. Access to shelter is a fundamental element of basic needs that defines the decency of human life. When shelter is destroyed by floods, the economic implication may be overwhelming for most poor families. Shelters were categories into “permanent house”, referring to those constructed using stone/brick walls and iron sheet/tile roofs; and “semi-permanent”, which included iron sheet roofs and earth walls. The next category was the “traditional hut,” referring to grass-thatched roof and earth wall; as well as “temporary shelter,” which referred to tents and other temporary dwelling units.

Figure 4.1 shows that at the time of the study 38% of respondents were dwelling/owning semi-permanent houses, 31% were living in temporary structures, 24% lived in traditional huts, while 7% owned/lived in permanent houses. The findings suggest that about one-third of the community members whose houses were destroyed by floods were yet to construct new houses.

Figure 4.1 show that prior to floods, 49.1% of participants in the high-risk zone and 82 52.4% in the low-risk zone reported owning/living in semi-permanent houses; 34.5% respondents in the high-risk zone against 30.5% in the low-risk zone owned/lived in traditional huts. Those owning/living in permanent houses included 5.8% respondents in high-risk zone and 14.0% in the low-risk zone; while temporary shelter was reported by 10.6% and 3.0% respondents in the high-risk and low-risk zones, respectively.

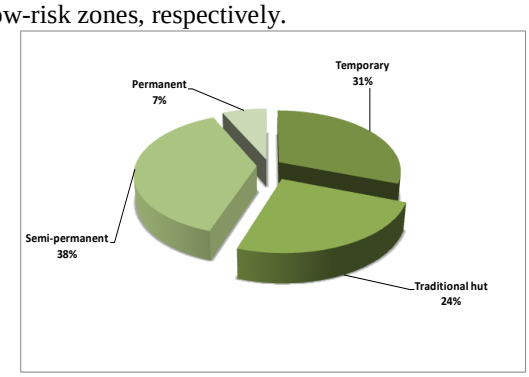

Figure 4.1. Type of houses owned at the time of the study.

Based on this, the analysis obtained a computed χ^2 value of 2.166, with 3 degrees of freedom and a p-value of 0.155, which was not significant. This suggests that the high-risk and low-risk zones were not significantly different in terms of the type of shelter prior to the floods. Although the proportion of participants owning/living in temporary shelter and traditional huts was higher in the high-risk than low-risk zones, this variation was not statistically significant, implying that the living standards in the two zones was nearly homogenous.

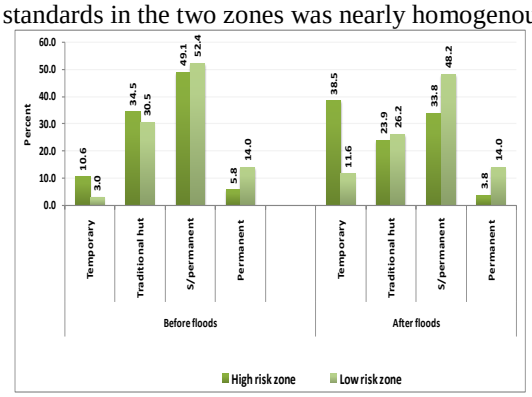

Figure 4.2. Type of houses owned before and after floods.

After the floods, Figure 4.2 shows that the proportion of participants owning/living in semi-permanent houses dropped to 33.8% and 48.2% in the high-risk and low-risk zones, respectively. A drop was also noted among owners of traditional huts. Those owning/living in tradition huts in the high-risk zone decreased from 34.5% to 23.9% after the floods, while in the low-risk zone, the proportion dropped from 30.5% to 26.2% after the floods. Respondents owning/living in temporary structures increased significantly in both the high-risk and low-risk zones after floods.

In the high-risk zones, the proportion owning/dwelling in temporary structures increased from 10.6% to 38.5% after the floods, while in the low-risk zones, the proportion increased from 3.0% to 11.6% after floods. The cross-tabulation analysis

revealed a significant difference between residents of the high-risk and low-risk zones regarding the type of housing (computed χ^2 value = 12.096, df = 3; p-value = 0.035). These findings are attributable to the floods; in this regard, the high-risk zone, which was hit harder by the floods, reported a significantly higher proportion of community members dwelling in temporary structures at the time of the study.

4.3.1 Extent of damage to shelter

47.9% participants in the high-risk zone, compared to 25.3% in the low-risk zone described the damage to their shelter as "very large". Those who estimated the damage to be "large" include 33.3% and 54.7% participants in the high-risk and low-risk zones respectively; while, another 18.8% participants in the high-risk zone and 20.0% in the low-risk zone said the damage was "slight."

Based on this, the analysis obtained a computed χ^2 value of 11.639, with 2 degrees of freedom and a p-value of 0.037, which was significant at 0.05 error margin.

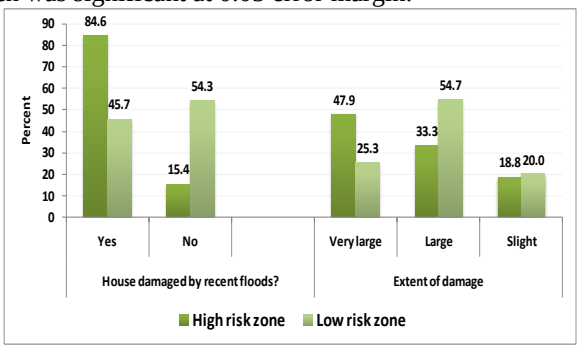

Figure 4.3. Extent of damage to shelter.

This suggests up to 95% chance that the two zones were significantly different in terms of damage to shelter by floods, with the high-risk zone bearing a heavier burden than low-risk zone.

Photo 4.2. Photograph of a house marooned by floods in Kakola Location.

The damage to shelter was serious and many residents displaced when their houses were submerged in water at the time of the research. The researcher waded through the water under guidance from a local resident conversant with the deeper sections of the floods and pitfalls. The goat shed is abandoned and damaged by floods. Even though the government and relief agencies provided support during the displacement period, the study found that flood survivors lived with a number of challenges, including shortage of clean drinking water and inadequacy of sanitation facilities, which heightened the risk of disease outbreak. Other challenges included non-adherence to hygiene standards, overcrowded rooms, as well as lack of medical services because some health facilities were destroyed and others cut-off by floods (Chang, 2003).

Key informant interviews also revealed that relocation of the most vulnerable households to safer places was constrained by factors such as cultural ties to ancestral land, high potential nature of the alluvial soil deposits in flood plains, which is attractive to farmers as well as lack of alternative land for resettlement. Frequent destruction of shelter by floods does not mean well for the community's livelihood security and development, particularly because putting up a decent shelter is not only expensive but also time consuming. Consequently, the level of absolute poverty in Nyando Sub-County remains high at 60.5% and recurrent flooding is identified as a key factor ensnaring the community in the vicious cycle of poverty (GoK, 2009).

Ensuring sustainable access to shelter requires long-term interventions such as construction of check dams upstream, extension of the eastern dyke by a further 3 kilometres downstream, construction of the three-kilometre Wagai-Ombeyi dyke and afforestation of the flood plains and around the compound. Long-term projects are particularly important because most donors are apprehensive about financing recurrent relief operations.

5.0 Conclusion and Recommendation

5.1 Conclusion

Floodplains are always at risks of floods hence the name. Land is shrinking as population grows every day. Livelihood and shelter are basic requirement for human kinds. Nyando River Basin has a lot of challenges attributed to floods. Crop and livestock farming form the main economic activities in the study area; which implies that any factor weakening the potential of these activities significantly threatens food security, economic status and the community's survival. Floods in the area over years has had serious damages to crop and environmental destruction. The destruction of livelihood activities was greater in the high-risk than in the low-risk zones and so was the intensity of economic losses and food shortage. Skewing interventions in favour of the high-risk zone is not only logical but also and more importantly, likely to ensure that resources are allocated based on need. There was frequent destruction of shelter by floods. Most houses were made of mud and grass thatched houses which are vulnerable to floods. Many residents of Nyando River Basin has many cultural attachment. Therefore, moving out of the area seemed impossible. It remains for the government and development agencies to provide solutions to the flood menace in the area.

5.2 Recommendations

In order to provide a workable solution on safeguarding community's livelihood sustainability, the government and humanitarian agencies should develop crop calendars to guide farming activities in the agro-ecological zone. New technologies need to be introduced to boost crop farming in the Nyando River Basin. Food store have to be constructed on higher grounds to support grain banking.

The government should initiate a livestock off-take scheme prior to floods. The concept of Village Savings and Loan Schemes should be introduced to enable community members mobilize their own resources and access affordable capitation funding. Settlement in floodplain should be discouraged. Equip households with knowledge and skills of modern fishing technology in order enhance fishing as a livelihood for food security.

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