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Management of Flash Floods in Marigat Sub County, Baringo County, Kenya

Julius K. Kiptim[1]; Eliud Michura[2]; Ednah Koskei[3]

[1,2,3] Kabarak University, Kenya
Main author Email: jkiptim@kabarak.ac.ke

Abstract

Flash flood is a natural disaster caused by the sudden onset of rainfall resulting in runoff waters from high to low altitude areas. This runoff waters leads to loss of lives, destruction of property, and environment; a problem experienced by residents of Marigat Sub-County. The purpose of the study was to investigate the management strategies of flash floods in Marigat Sub-County. The study used descriptive research management practices of flash floods on qualitative and quantitative methods. The target population was 120,263 people with 24,893 households. Purposive sampling method for three locations which were Ilng'arua, Ng'ambo and Salabani experiencing flash floods with a population of 13,885 translating to 3168 households, from which a sample size of 355 respondents was obtained. Stratified proportionate random sampling method was used to select household heads for the survey. Purposive sampling method was adopted for identifying key informants and one disaster management officer. Primary and secondary data were used. Questionnaires, key informants interview schedules, and observations were used to collect data. The validity of the study was achieved through the construction of relevant instruments to the objective of the study. To ensure reliability, piloting of the questionnaire was done and results obtained were 0.76 Cronbach's alpha level. Collected data were coded and analysed using the SPSS software, where descriptive and inferential statistics were generated to test the study hypothesis. The findings of this study will be beneficial to Baringo County and the Kenyan government in the management of flash floods and the achievement of sustainable development goals.

Keywords: Marigat, Flash floods, Management

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Introduction

Flash flood occurs when water inundates in a dry land, but it occurs in many ways. This can include in a hurricane scenario where the affected land is covered with water. Flash floods occur when the leeward side receives runoff from the side that had experienced convectional rainfall. Climate variability in warmer climates is reported by the Intergovernmental Panel on Climate Change (IPCC) to have an increased likelihood of flood occurrence. Weather-related disasters currently account for approximately 90% of natural disasters (Llasat et al., 2010). In flash flood-prone areas, there is an evident increase in disaster-related losses aggravated by the increased population growth and economic assets (Kundzewicz et al., 2014). Approximately flood causes an annual $40 billion damage in the world (Webster, 2013). The United States records an annual loss of $ 8 billion per year in flood-related occurrences (Michel-Kerjan, Lemoyne de Forges, and Kunreuther, 2012). Millions of people have been killed in China due to flash floods (Ziegler, She, Tantasarin, Jachowski, and Wasson, 2012). In Europe, early warning systems have been developed and improved through remote sensing and nowcasting that utilise mesoscales of up to 0-6 hours to predict the weather patterns and occurrences of flash floods; this is according to World Meteorological Organisation (Borga, Stoffel, Marchi, Marra, and Jakob, 2014).

In Africa, flash flooding has been experienced in different parts. News Africa, (20190 for instance, cites Mozambique with 5,756 homes and 141,325 people affected and Malawi, where 739,000 people were affected and from which 230,000 people were left without shelter in March 2019. According to a study done by Lukamba (2010), Eastern Africa is leading in hydro-meteorological disasters (41%), followed by West Africa (24%) and North Africa (14%). The effect is depended on the intensity of the flash flood and the vulnerability of the areas as measured by its topographic and demographic features, the quantity and quality of the materials exposed. The anthropogenic interventions and the effectiveness of the prevention measures taken by the local authorities, the social effects of the flood differ. Extreme flash floods are often experienced in the Mediterranean countries and tend to be greater in magnitude compared to the inner continental countries while they occasionally produce catastrophic damages (Llasat et al., 2013). In Nigeria, flash floods hazard risk analysis involving computing of flash flood hazard, vulnerability and dangers posed to the people have been used to mitigate the disaster (Komolafe, Adegboyega, and Akinluyi, 2015).

Kenya is among the countries in East Africa that have experienced significant losses from flash flood occurrences. The most common being Budalangi flash floods, where they have become an annual event, claiming several lives and properties in Western Kenya. Dykes have been used to prevent flash flooding, and due to poor maintenance have led to failure (Okaka and Odhiambo, 2018). Nyando experienced flash floods in 2018 which greatly affected human life and environment (Okaka and Odhiambo, 2019). Moreover, in Tana River, flash floods have regularly occurred due to bursting of the banks of River Tana. In 2018, most families living along the Tana Delta were affected. The majority were evacuated by Red Cross humanitarian aid as a result of submerges of the houses in flash flood water (Shukla, Husak, Way-Henthorne, & Macharia).

Marigat Sub- County, especially Lake Baringo, has since been identified as the most flash flood-prone area in the Rift Valley since 2013 (Omondi et al., 2017). Approximately 2000 households were affected by the heavy rains that lead to an increase of the water level in Lake Baringo and homesteads and schools were equally affected (Deichsel, 2019). Almost five schools were submerged in Marigat, making learning difficult for the better part of the first term of 2014. The livelihoods were exposed to the dangers of water-related diseases and the challenges of wild aquatic animals such as hippopotamuses and crocodiles invading villages (Deichsel, 2019). Marigat Sub-County has been

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affected by flash floods leading to emergency response by government and NGO's; this happens during the occurrence of disasters which is a knee jerk reaction kind of response and not sustainable, therefore this study aims at finding and proposing long term solutions to this problem.

The effects of weather changes due to climate change have brought along adverse effects of flash floods in low-lying lands. Marigat in Baringo County is lowland that slopes towards Lake Baringo, and during flash floods, people and animals die; property and food crops are destroyed. This affects economic generating units, premises, water sources, learning institutions and agricultural lands in Ilng'arua, Ng'ambo and Salabani locations. Despite frequent flash floods experienced annually in Marigat Sub-County since 2013 (Daily Nation, 2013), little has been done by both the county and the national government in addressing the flash flood disaster affecting and claiming lives in Marigat Sub-County. This study, therefore, was appraising the management of flash flood in Marigat Sub-County, Kenya.

LITERATURE REVIEW

Strategies of mitigation measures of flash floods

Various strategies are being employed to mitigate flash floods.

Traditional knowledge

Traditional knowledge refers to skills, knowledge and practices that were developed, sustained, and passed on from generation to generation within a community, often forming part of its cultural or spiritual identity (Nyakundi, Mogere, Mwanzo and Yitambe, 2010). Conversely, "local knowledge" is the knowledge which people in every community have developed and continue to develop over time. It is based on experience, usually tested over centuries and adapted to the local environment and culture embedded in community practices, institutions, relationships, and rituals (Ngwese, Saito, Sato, Boafo, & Jasaw, 2018). Local and traditional knowledge is a way through which "culture" is understood, thereby understanding the world. Transmitting a body of knowledge believes and practices of the use of locally available resources to improve human health and wellbeing, is an important function of culture in traditional societies. Research in recent decades has shown that traditional knowledge contributes substantially to topics like community resilience, sustainable use of resources, and biodiversity conservation (Nyakundi et al., 2010). The relevance of local traditional and local knowledge in sustaining natural resources and improving disaster preparedness has been identified in different socio-ecological regions of the world.

Ngwese et al. (2018), in their study in Northern Ghana, found that the local communities were utilising the hippopotamus behaviour to determine an impending flood. The locals believed that when the hippopotamus ventures inland, there is a flood coming. Usually, these animals spent most of their time in water except when there is heavy rainfall that could cause floods. In western Kenya, the local communities were found to have a number of traditional weather forecasting knowledge, for example, when the bones of the old people began itching, frogs croaking, heavy lightning and thunder at the river, heavy and persistent rains together with rising water levels in the river (Nyakundi et al., 2010).

Forecasts

Climate change events are currently addressed based on meteorological weather forecasts; various departments in question are dependent on the department's projections for their early preparation on how to avoid disasters. 'Early Warning Early Action' has been a common phrase used by the humanitarian aid organisations in their bid to address an incoming disaster. The scientific community addresses the effective way of approaching a disaster is through early warning. This allows room for the affected communities to prepare and or to avoid the disaster altogether, for example, an early warning of an upcoming heavy rainfall in a flood-prone area, will allow the residents to evacuate the area early enough before the onset of the rains. On the

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other hand, people living in flood plains should also vacate the area early enough before the onset of the rains. Floods experienced in Marigat Sub-County have been due to lack of early warning system for use by the communities. Adoption of the early warning system should allow the communities living in Salabani, Ngambo and Ilng'arua to vacate the Lake Baringo region early enough before the onset of the rains.

Cash transfers program

Studies indicated that the victims of climate change disasters were often people of poor communities, especially marginalised communities in Kenya. Therefore, implementing a cash program can help in reducing the effect of a flash flood event. This is explained as follows; if poor families are financially empowered, they will be in a capacity to evade a flash flood event and move to safer areas before the rains. Comparing the cash transfer program to the Nyando plains residents, if the victims had received cash transfer before the rains, most of them could have saved their commodities and families from the effects of flash floods. Lack of financial ability, allowed them to be caught up by floods, and the majority were moving away after the flash floods had swept their residential areas. This scenario was found to be replicated in many parts of Kenya, where flash flood occurs then the aid comes in later after the effects have been felt. Kenya Government recognises the benefits of social protection through cash transfers. It is described as policies and actions (Suroso, Sagala, Alberdi, and Wulandari, 2018), including legislative measures, that enhance the capacity of and opportunities for the vulnerable and poor to enhance and sustain their lives, welfare and livelihoods and welfare, enable income-earners and their dependents to maintain a reasonable level of income through decent work, and ensure access to affordable healthcare, social security, and social assistance.

Humanitarian aid

Humanitarian aids known for addressing emergency situations in Kenya include Kenya Red Cross Society, St John Ambulance Kenya and the Kenya Police (Owuor, 2015). Among these are other Non-Governmental Organisations such as AMREF, CARE international, and Concern worl4d, that have also been on the lead in addressing the emergencies that occur due to floods in the arid and semi-arid lands. However, these responses are short-lived since they always come in after the flood event has occurred.

Building of bridges

Innovations were essential in the management of flash floods in Kenya. Areas that are prone to this natural disaster were flat such that construction of bridges required skills to raise the facility to accommodate the large unpredicted quantities of water. Engineers have been advising and managing constructions of raised bridges to enable passage by vehicle, people and animal during the rainy season to the other side (Akivaga, 2010).

METHODOLOGY

A descriptive research design was used to determine the appropriate management practices in a flash flood and provide both qualitative and quantitative methods (Desai and Hoyer, 2000). This design was appropriate since it provided quantitative and qualitative data and also gave characteristics of the population which was studied.

The study population was 120,263, which comprised the whole population of Marigat Sub-County. The study was done in three locations that were purposively sampled, namely; Ng'ambo, Salabani and Ilng'arua locations that were affected by flash floods. The population of the three mentioned locations was 13,885 with total households being 3,168. The key informants were the 3 chiefs from the respective locations and 1 county disaster management officer working in Marigat Sub-County. Focus group discussion was held and facilitated by village elders comprising of 6-12 people in every location.

RESULTS AND FINDINGS

Demographic characteristic

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The majority of the respondents in terms of gender were 232 male (74 per cent), and female was 82 (26 per cent). The age of majority study respondents range between 34-41years (31.65 per cent), 42-49 years (20.54 percent), 26-33 years (17.17 per cent), 18-25 years (12.46 per cent), 58-65 years (11.45 percent), 50-57 years (4.04 percent) and the least were those over 65 years (2.69 percent). The researcher sought to understand the education level of the respondents which indicated in the results that illiterate were 112 (36.72 per cent), certificate 119 (39.02 per cent), undergraduate 60 (19.67 per cent) and Postgraduate (PhD) 1 (0.33 per cent). This showed that the majority have tertiary education with 119 (39.02 per cent)

Strategies of mitigating flash floods

The results revealed that majority of the respondents were not aware of any mitigation measures 163 (53 per cent) meaning people and environmental resources were in danger whereas 147 (47 per cent) were aware of some form of mitigation strategies of flash floods in the study area. The respondent who was aware gave their encounter to this phenomena and majority 169 (65 per cent) often, 79 (30 per cent), 9 (3 per cent) have not experienced, 3 (1 per cent) did not know anything and 2 (1 per cent) about the experience of flash floods.

Regarding the signs of upcoming flash floods in the area, the respondent was aware of traditional signs which they used and majority said that; clouds and rainfall 187 (76 per cent), use of stars 38 (15 per cent), sheep intestines and shape of the moon respectively had 7 (3 per cent), wind direction and temperature 5 (2 per cent) and animal behaviour 3 (4 per cent). According to Nyakundi, Mogere, Mwanzo and Yitambe (2010) traditional mitigation measures assisted in the management of flash floods in the world and it has been practised by this community to gap problems associated with this problem. Adaptation of local culture and environment and embedded in community practices, institutions, relationships, and rituals (Ngwese et al., 2018).

On the time it takes from when the signs are observed to when the flash flood is experienced, the results were the majority of the respondents said after a few hours 119 (67 per cent). This proved that flash floods occurrence is immediately after rainfall. This does not give time for the preparation of calamities to occur. Other respondents were; after some days 45 (25 per cent), after some weeks 7 (4 per cent), after one year 5 (3 per cent) and after one month and above 3 (2 per cent). All these were insignificant to the disaster that occurred.

Regarding where the appearance of the signs was seen, rivers and lakes, 80 (44 per cent) hinted that when the rivers and lakes begin swelling, then flash floods were expected immediately. The results for the sky and ground 60 (33 per cent), highlands around Marigat was an indication that rainfall occurs in the area.

Regarding how long it usually takes from the time the signs are observed to when the flash floods are experienced were as follows; immediately 118 (38 per cent), a month 100 (32 per cent), few days 76 (24 per cent), more than one week 12 (4 per cent) and do not know 3 (1 per cent).

The mitigation measures provided to flash floods affected households are detailed in the table below. The majority of the respondents agreed that often, the supply of humanitarian aids was done 153 (49 per cent). According to Owuor (2015), humanitarian aid was provided by non-governmental organisations like Red Cross and AMREF through the provision of clothing and food. This strategy was unsustainable due to increased population and regular occurrence of the disaster. The second significant management strategy was traditional warning 41 (13 per cent), cash transfer 4 (1 per cent) and finally the building of bridges 3 (1 per cent).

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The table below gives a summary of the results.

Mitigation measure	Very often		Often		Rarely		Not at all		I don't know	
	Freq	Per cent	Freq	Per cent	Freq	per cent	Freq	per cent	Freq	per cent
Cash transfers	4	1.3	44	14.33	127	41.37	117	38.11	15	3.81
Humanitarian aid	153	49.35	76	24.52	59	19.43	22	7.1	-	-
Traditional warning	41	13.36	64	20.85	74	24.1	105	34.2	23	7.41
Building of bridges	3	0.94	60	19.67	145	47.54	84	27.71	13	4.26

CONCLUSIONS

The findings proved that the respondents were aware of the problem affecting them and the government had no concrete plan to assist them since this area could be used for other productive projects rather than living and resettling the community. The results proved that the amount of water during the rainy season is high and this calls for a de-siltation process of rivers to accommodate a large volume of water. Findings proved that the speed of water from the highlands around the area had caused damage to land through erosion. There is a need to grow more trees to facilitate absorption and percolation of more water into the ground and reduce runoffs. There is need to have medical facilities in the area to facilitate emergency services in case of this natural disaster. There is also need to have an alternative productive project in the area to avoid settlement of people.

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