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UNDERSTANDING THE STATUS AND NEED FOR ANTICIPATORY EARLY ACTION IN LOWER TANA AND LOWER ATHI RIVER BASINS

Occasional Paper Series 2

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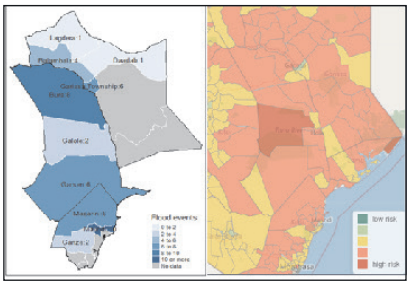

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ABSTRACT

The Tana River and Athi River basins are the first and second largest[2] basins in Kenya respectively. The two basins are known to experience flooding during the long (March-April-May) and short (October-November-December) rains and this causes great impact on vulnerable communities living in Garissa, Tana River and Kilifi counties.

Some of the impact of the flooding includes; displacement, death, destruction of property, disruption of access to essential health care and related services, irrigation systems and farm equipment, road infrastructure, livelihoods and key installations such as water, sanitation and hygiene facilities. As if that is not enough, these impacts take back the development gains made.

To support an anticipatory approach in managing flood impacts, a review of current status of flood management in Garissa, Kilifi and Tana River counties was conducted through literature review conducted over a period of six years (2013 to 2019). The study focused on flooding events, impacts and actions taken. The review revealed that all the actions including, situation assessment, evacuation of people and distribution of non-food items taken to respond to flood events always occur during and after flooding. This implies that within the lower Tana and lower Athi river basins, the management of flood is in response to the hazard rather than in anticipation of the floods.

This is partly due to the lack of a basin-wide flood early warning system, lack of defined anticipatory actions that can be taken following early warning and limited institutional coordination and capacity to support preparedness.

The Tana River and Athi River basins

are the first and second largest basins in Kenya respectively...are known to experience flooding during the long...and short rains.

1.0 INTRODUCTION

The Tana River Basin is the longest and largest basin in Kenya, originating from the headwaters of Mt. Kenya and the Aberdares and covers 22% of the country's total land mass[1]. The basin is divided into three regions namely the upper, middle and lower sub-basins (Figure 1).

The river basin faces a number of challenges, one of which includes land degradation from land use practices (e.g. farming close to the river banks) along the river, which is leading to higher and faster flows in the upper sub-basin and floods and droughts in the middle and lower sub-basin[1].

The Athi River Basin is the second largest[2] basin in Kenya, originating from headwaters located in Central and Southeast Kenya. The river changes names along the basin; it is known as Athi River upstream and Sabaki or Galana River further downstream (Figure 2). Land use activities,

[1] *'The Economics of Ecosystem Services of the Tana River Basin' https://www.wetlands.org/publications/the-economics-of-ecosystem-services-of-the-tana-river-basin/*

[2] *'A comprehensive biogeochemical record and annual flux estimates for the Sabaki River (Kenya)' https://www.researchgate.net/publication/323907534*

such as farming close to the river banks and in the basin contribute significantly to soil erosion and sediment transport into the river. The high amounts of sediments flowing into the river during the rainy season results into floods that inundate vast areas in the lower parts of the basin[3].

[3] *'Sediment dynamics and improvised control technologies in the Athi River drainage basin, Kenya' https://iahs.info/uploads/dms/14551.70-485-490-62-325-Kithiial.pdf*

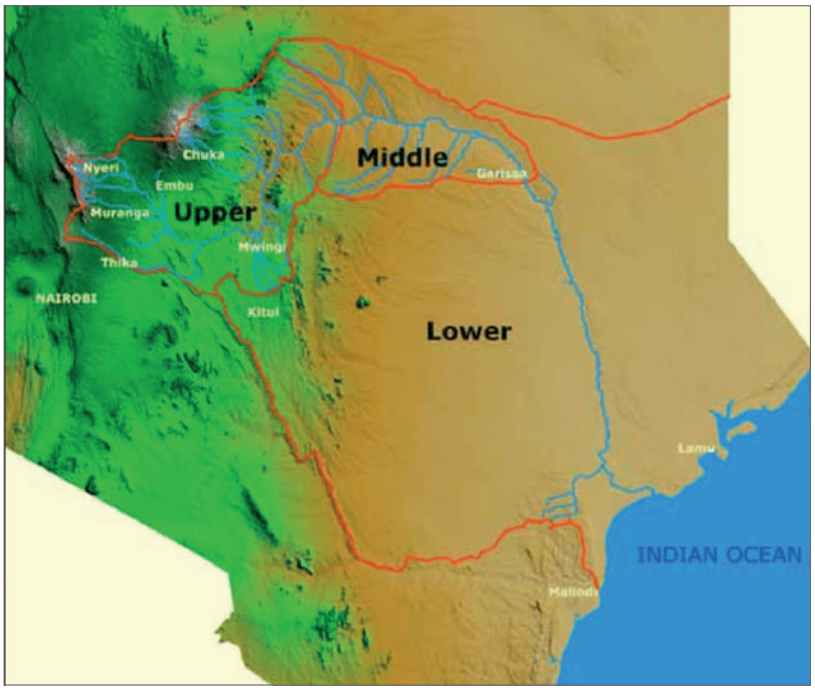

Figure 1: Map of the Tana River Basin with division in sub-basins

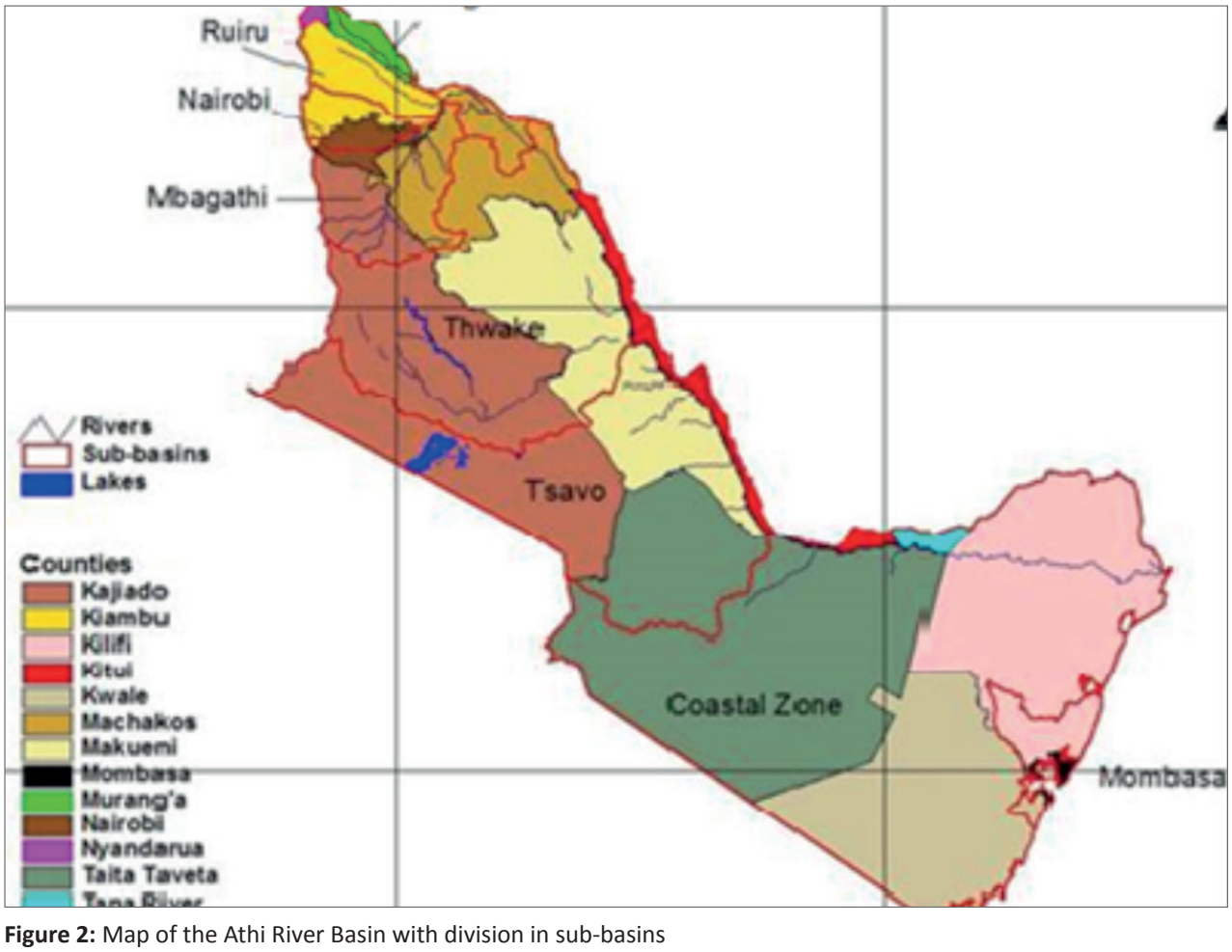

Figure 2: Map of the Athi River Basin with division in sub-basins

1.1 FLOODING IN TANA AND ATHI RIVER BASINS

During the two rainy seasons in Kenya; the March-April-May (MAM) 'long rains' and October-November-December (OND) 'short rains' the lower Athi and lower Tana basins experience flooding due to heavy rains in the upper catchments and siltation which raises the river level.

The Seven Forks dams located in the upper catchment of the Tana Basin store water for hydro-power generation, and during heavy rains, the storage capacity of the dams is sometimes exceeded with the overflow resulting in flooding downstream.

The Tana Basin also has a dense network (Figure 3) of both permanent rivers and seasonal rivers (commonly known as laghas in downstream areas), all of which contribute to the flooding downstream when it rains. The Tana and Athi river basins experience two types of flooding: flash and river floods.

Flash floods occur when runoff from heavy rainfall results in a sudden rise in water levels and overflow in streams and seasonal rivers. River flooding is common in larger rivers when runoff from sustained heavy rainstorms causes a slower rise in river levels.

For example, Garissa County in the lower Tana Basin is majorly affected by flash floods which usually occur abruptly in areas traversed by seasonal rivers that are locally called *'laghas'*; overflow of the Seven Forks dams also contributes to the flash floods. In Tana River County, sustained heavy rainfall upstream increases the river level resulting in the river breaking its banks and therefore flooding.

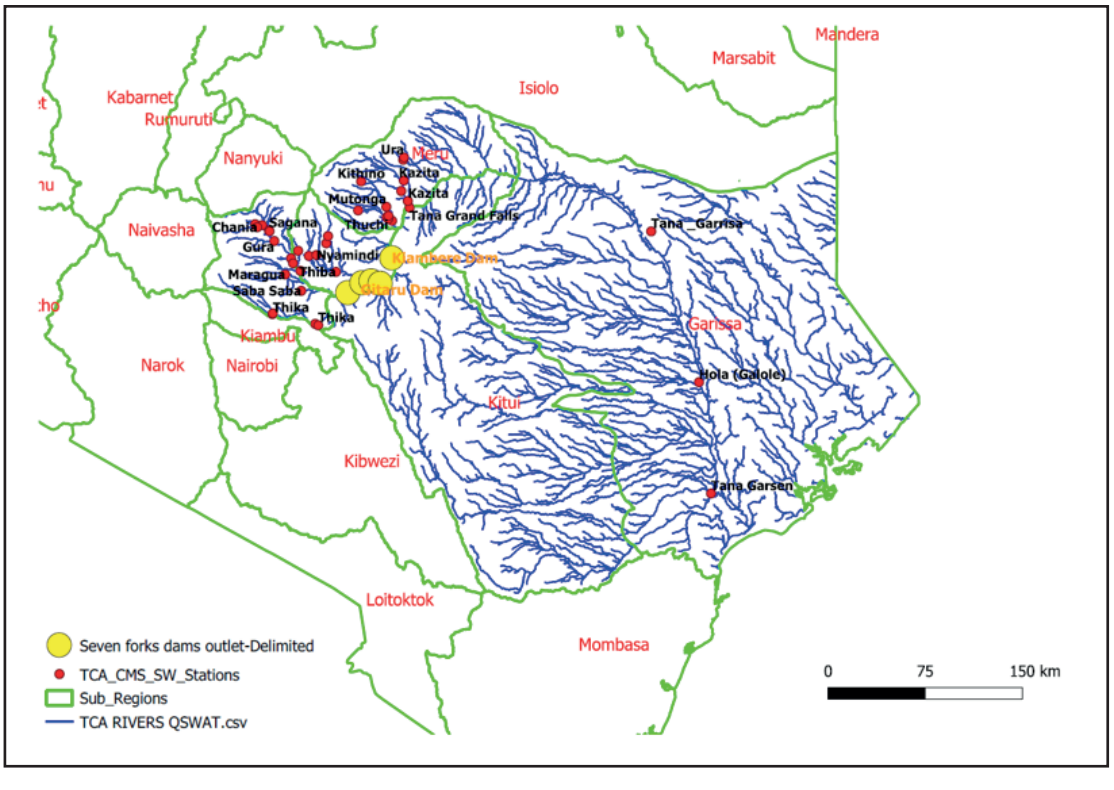

Figure 3: Location of the Seven Forks dams and river network in the Tana Basin

1.2 THE STRENGTHENING EARLY RESPONSE CAPACITY PROJECT

As a way of mitigating flood risks and impacts in Garissa, Kilifi and Tana River counties, the Strengthening Early Response Capacity (StERC) Project is focusing on improving systems for preparedness through early warning early action. This is a move towards anticipatory disaster risk reduction to address the recurrent adverse impacts due to flooding in lower Tana and Athi basins.

The StERC Project will help:

(i) In building the capacity of stakeholders to co-develop and interpret early warning information that will be integrated in decision making;

(ii) Define forecast thresholds that will trigger different flood early actions at different lead times; and

(iii) Develop county-owned early warning communication strategies that will strengthen the reach of early warning information to communities at risk of flood impacts. This will help in reducing flood risks and impacts in the two basins by strengthening the capacity of county institutions and key partners, and over the long term, to build the resilience of vulnerable communities.

This Project is implemented by the International Centre for Humanitarian Affairs (ICHA) and Kenya Red Cross Society (KRCS) Disaster Management Department, with support from the British Red Cross and funding from European Civil Protection and Humanitarian Aid Operations (ECHO).

1.3 OBJECTIVE AND METHODOLOGY

Since the StERC Project aims to support the implementation of early actions before a flood or at the very least early response after a flood in the lower Tana and Athi river basins, it is important to note that this will be based on an improved early warning information system.

To inform the identification of early actions, literature review was conducted to primarily investigate impacts and actions that were taken either in advance of or in response to flooding in Garissa, Kilifi and Tana River counties.

The reports reviewed (from 2013 to 2019) included news articles, online reports from various stakeholders involved with flood disaster management in the counties and data recorded by the Emergency Operations Centre at KRCS. The information drawn from the review (Table 1) was used to give context to the actions that were found in each of the three counties.

To analyse the collated information, feature engineering was done to have binary variables indicating flood impacts experienced, magnitude of impacts, timing of the actions taken, various actions taken and the number of flood events experienced in each season. Data analysis was conducted using R statistical software. Descriptive statistics such as, mean and percentages were calculated for the respective characteristics and graphical presentation of data was adopted where appropriate.

It is important to note that the analysis presented here is only indicative, as the data mined from online sources was sparse. Data on flooding is also held by various institutions who may have it in paper form rather than on an online database. The limited data on flood events, impacts and actions is linked to the lack of a centralised management system that coordinates recording of this information.

Table 1: Example of information collated from literature review

Date	Season When Flooding Occurred	Type of Flood (If Available)	Location (In the three counties)	Impacts	Actions Taken	When The Actions Were Taken	Institutions/ Organisations Involved
20/11/2019	OND	Flash Floods	Chakama location in Malindi	Matolani Primary school and residential houses were destroyed	KRCS Kilifi Branch out to the field to conduct assessment Distribution of NFIs	During flooding event	KRCS
2019 (November)	OND	Flash Floods	Sala and Iftin wards - Bakuyu 1, Bakuyu 2, Mathengeni, Ziwani and Mlimani, Bula Vumbi, Bula Kamor and ADC villages	634 HH in Bakuyu Ziwani, Milimani and Mathengeni village Disruption of sources of income Destruction of infrastructure Marooned health facilities making them inaccessible Destruction of latrines and toilets hence resulting in poor waste management	Distribution of NFIs kits Supply of clean water Distribution of relief food and blankets Carrying out situation assessment	Actions taken as a way of flood response	KRCS
2018 (May)	MAM	Flash floods Riverine Floods	Tana River	Houses and health facilities marooned Roads cut off Displacement of people	Evacuation of people to higher/ safer grounds Carried out an assessment	Actions taken during the flood event	County Government KRCS

2.0 RESULTS

2.1 FLOODING EVENTS AND IMPACTS

Analysis on frequency of flooding events in Garissa, Kilifi and Tana River counties shows that flood events are more frequent in the MAM Season (Figure 4). The occurrence of flood events in Tana River County is almost equal during the MAM and OND seasons. In Kilifi and Garissa counties, 83% and 64% of the flood events were recorded in the MAM season respectively. The higher frequency in the MAM Season is because heavier rainfall is received during this season upstream in the headwaters of the two basins.

Several areas in the three counties are affected by floods, but the frequency of occurrence of flood events varies within the counties, as shown in Figure 5a. Additionally, analysis shows the three counties are at high risk of flooding based on hazard frequency, community vulnerability and coping capacity (Figure 5b). Garsen and Bura sub-counties in Tana River County have the highest frequency of flood occurrence.

In Garissa County, Balambala and Township are the sub counties that are frequently affected by floods. The high frequency of flood events in these sub-counties could be related to changes in the river ecosystem caused by the alteration of the river biodiversity to pave way for agriculture and urbanisation[4]. In Kilifi County, Magarini and Ganze sub-counties have high frequencies for flood occurrence. This could be due to their location at the mouth of River Athi where the flow is slower thus flood plains exist[5].

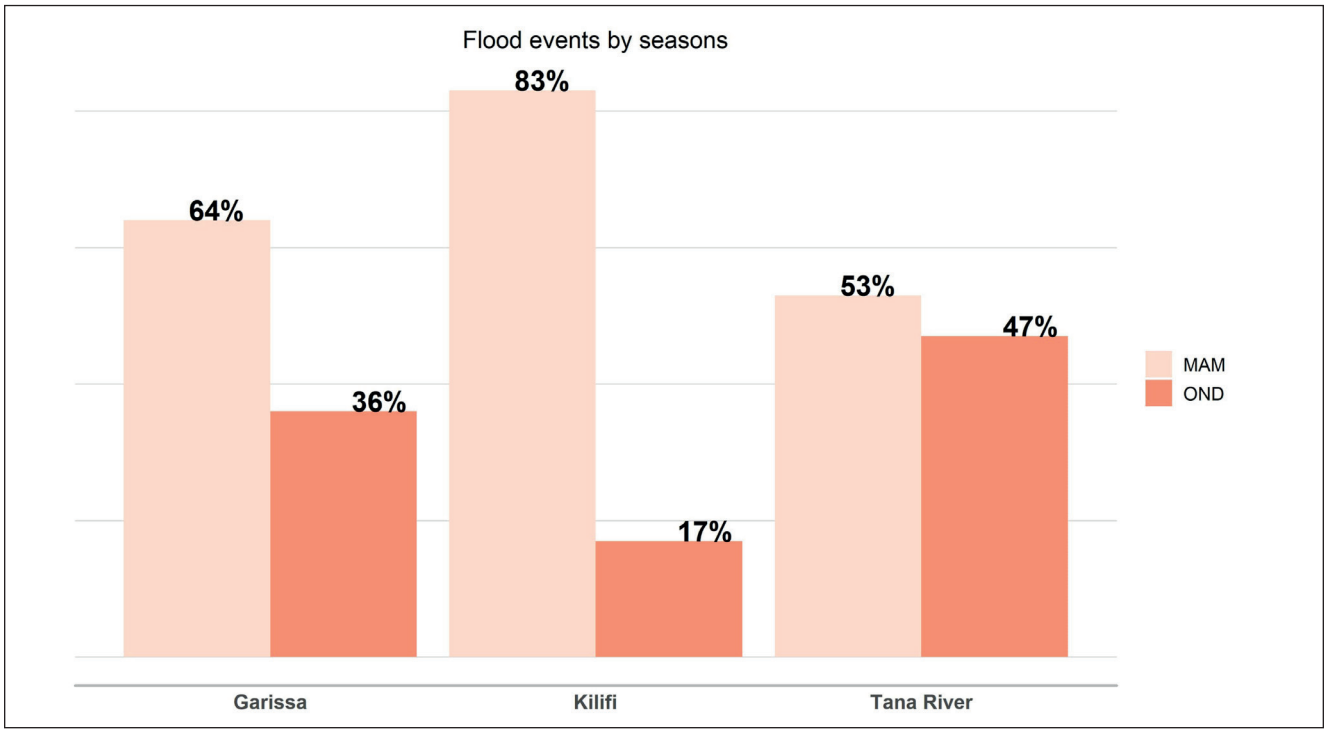

Figure 4: Flood occurrence per rainfall season in Garissa, Kilifi and Tana River counties

[4] *'Baseline Review and Ecosystem Services Assessment of the Tana River Basin, Kenya'* *http://www.iwmi.cgiar.org/Publications/Working_Papers/working/wor165.pdf*

[5] *'Freshwater Ecology of Kenyan Highlands and Lowlands'* *http://erepository.uonbi.ac.ke/bitstream/handle/11295/66316/Full%20text.pdf?sequence=1&isAllowed=y*

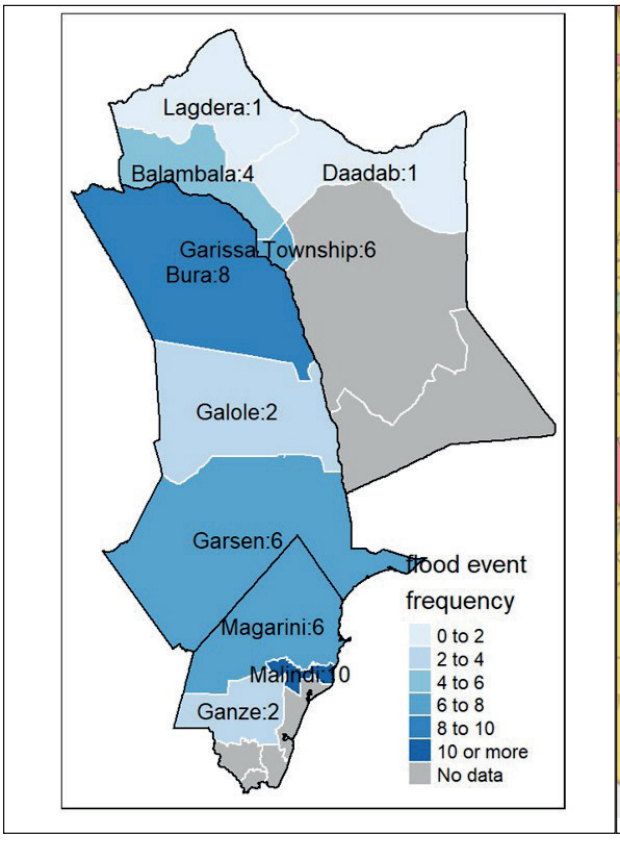

Figure 5a: Flood frequency per sub-county

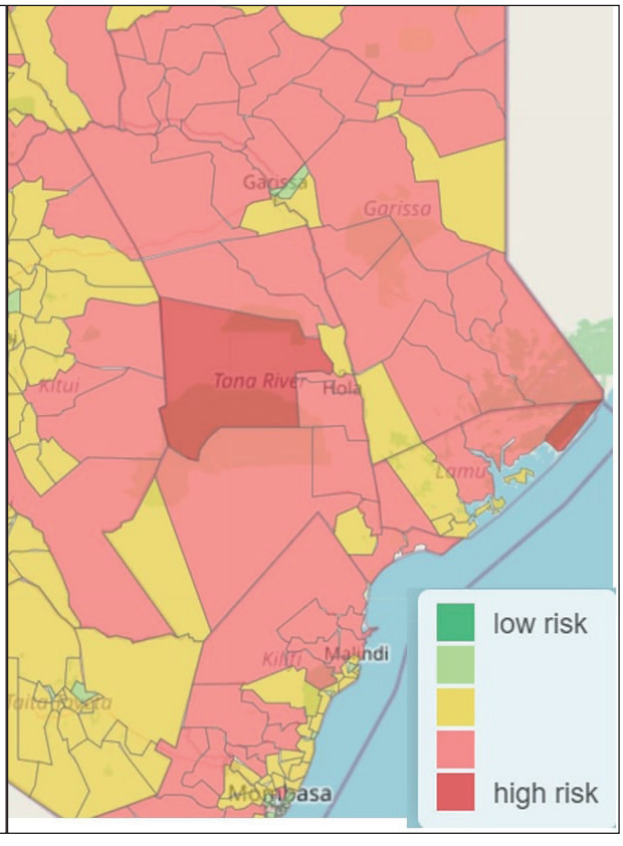

Figure 5b: Flooding risk in Kilifi, Garissa and Tana River counties

Floods in the counties within lower Tana and lower Athi river basin have caused significant impacts. For example, during the MAM 2018 rainfall season, when most parts of Kenya experienced the heaviest rains on record that resulted in extensive flooding, some of the impacts recorded in the Athi and Tana basins included: deaths, displacement, destruction of property, inaccessibility to essential health care and related services, destruction of irrigation and farm equipment, destruction of livelihoods and destruction of key installations such as water, sanitation and hygiene facilities[6].

[6] *'Emergency appeal revision Kenya: Floods' https://reliefweb.int/sites/reliefweb.int/files/resources/MDRKE043ear1.pdf*

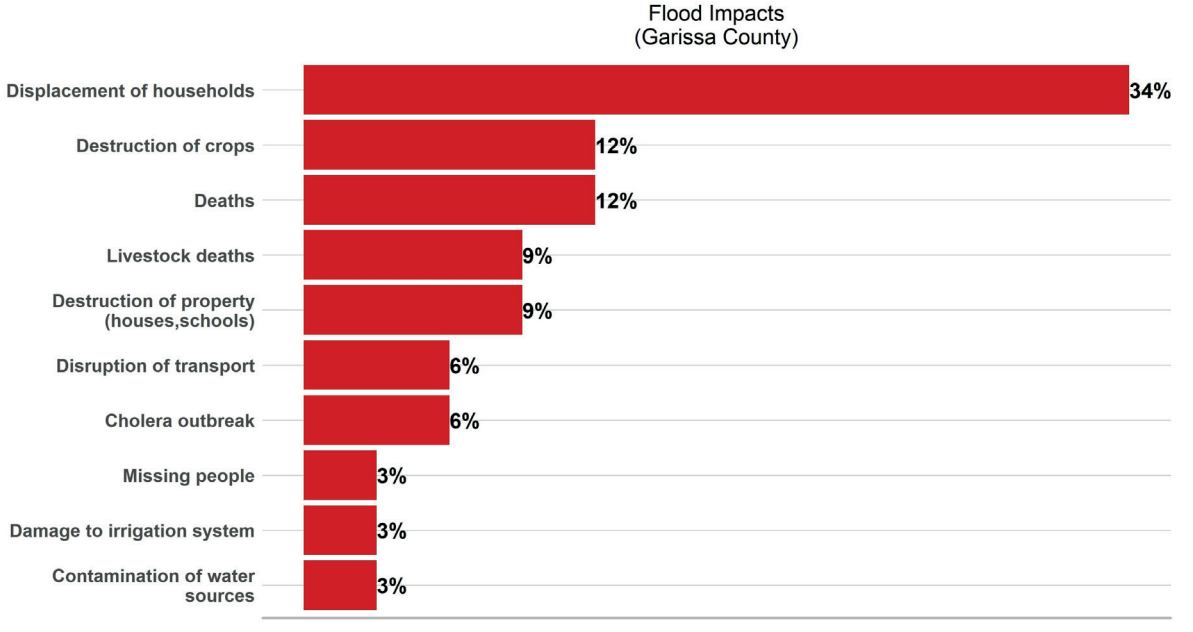

Figure 6a: Impact of flooding in Garissa County

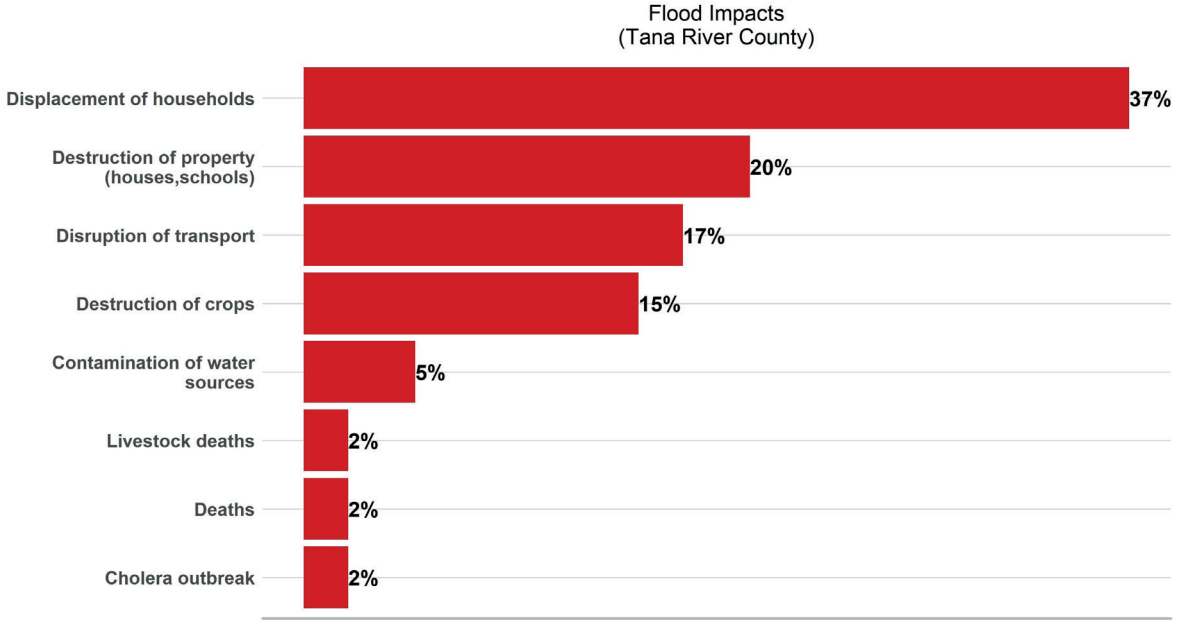

Figure 6b: Impact of flooding in Tana River County

Displacement of people/households is the most commonly reported impact of flooding in Garissa, Tana River and Kilifi counties (Figure 6). In Garissa and Kilifi counties, destruction of crops and death are ranked second and third respectively (Figure 6a & c), while for Tana River County destruction of property (houses, schools etc.) and disruption of transport are ranked second and third respectively (Figure 6b).

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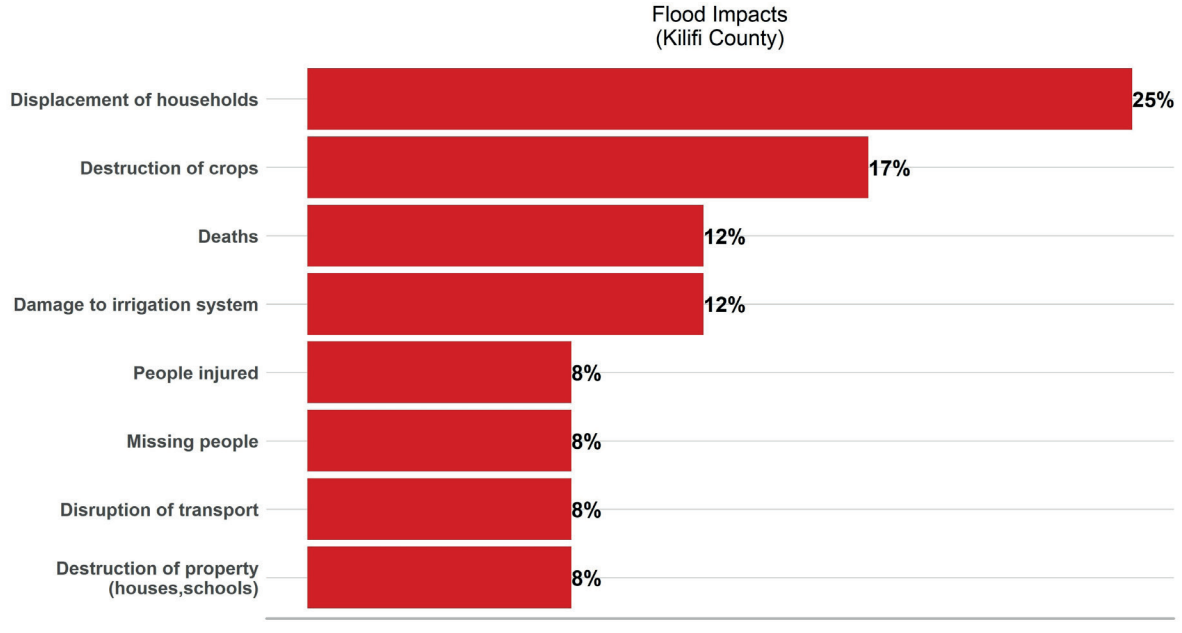

Figure 6c: Impact of flooding in Kilifi County

The flood impacts result in huge economic losses, requiring heavy investments for recovery in livelihoods and development. For instance, destruction of crops and loss of livestock disrupts food production and market activities, with implications on food security and livelihood systems.

This often results in the need for humanitarian support and recovery assistance. Destroyed infrastructure such as, roads and bridges reduces economic growth since it disrupts the movement of people, goods and services, and is expensive to reconstruct. To illustrate, a large amount of money was donated towards the humanitarian action and nationwide recovery from flooding in MAM 2018.

Through the International Federation of the Red Cross and Red Crescent Societies (IFRC), KRCS put out an international appeal for USD 4.8 million for humanitarian support needed. The Government of Kenya provided KES 1 billion for shelter reconstruction for flood victims, an intervention that was implemented by KRCS.

Various development partners (including the EU, the UK and Dutch governments) contributed an additional €3.3 million[7]. The losses and damages caused by floods and the money invested in humanitarian assistance and recovery points to the need to implement early action that can mitigate and/reduce the impacts of floods.

[7] *'Reducing flood impacts through forecast-based action' https://www.odi.org/sites/odi.org.uk/files/resource-documents/12645.pdf*

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2.2 STATUS OF FLOOD EARLY ACTIONS AND RESPONSE

A review of the timing of actions before, during and after the flood events in Garissa, Tana river and Kilifi counties indicated that no action took place before the floods events (Figure 7). Most actions take place after a flood event has occurred.

This means that flood management in the lower basin is in reaction to floods and not anticipation of floods. This can be linked to the lack of a flood early warning system (FEWS) in the basin and a systematic plan to define and take action based on early warning.

Although there is no formal FEWS, sections of the Tana River have an informal FEWS that depends on the monitored water level at Garissa Bridge. Whenever the water level reaches 4m, it has been observed that parts of Garissa County are expected to flood and if the level gets to 5.3m, flooding is expected further downstream in Tana River County after 48 hours.

This information is communicated to the communities and relevant authorities via WRUAs and WhatsApp respectively, however, the communication structure is not formalised.

For the communities, the reactive nature to flood management can be associated with attitude and the economic vulnerability. Despite the communities receiving information from upstream that the water levels are expected to rise, they do not act. Reasons for communities not acting will be explored in later discussions as part of the StERC project.

In all the three counties, the top four response actions are carrying out needs assessments, evacuation, tracing of displaced and missing persons and distribution of non food items (NFIs) (Figure 8). These actions are tied to the number one impact in the counties that is displacement of households. People often get marooned by the floods and need to be evacuated to higher safer grounds using boats and in some instances using helicopters.

The people in evacuation shelters, mostly in schools or camps, are provided with NFIs such as, blankets, tarpaulins and dignity kits.

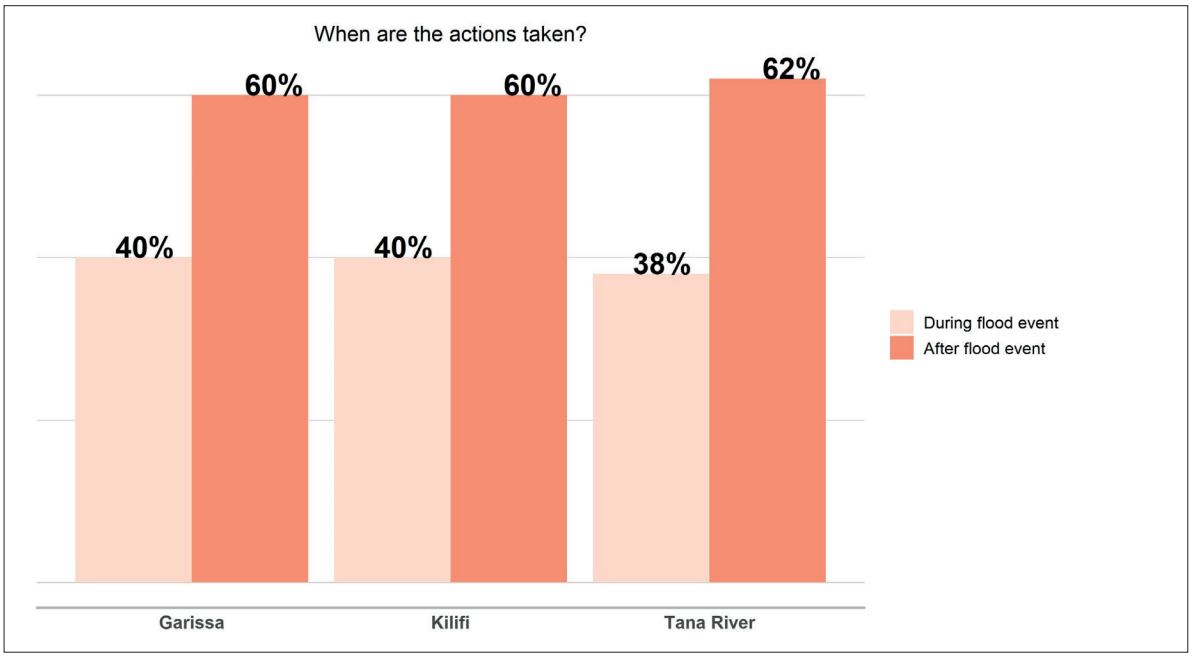

Figure 7: Frequency of timing of actions in Garissa, Kilifi and Tana River counties

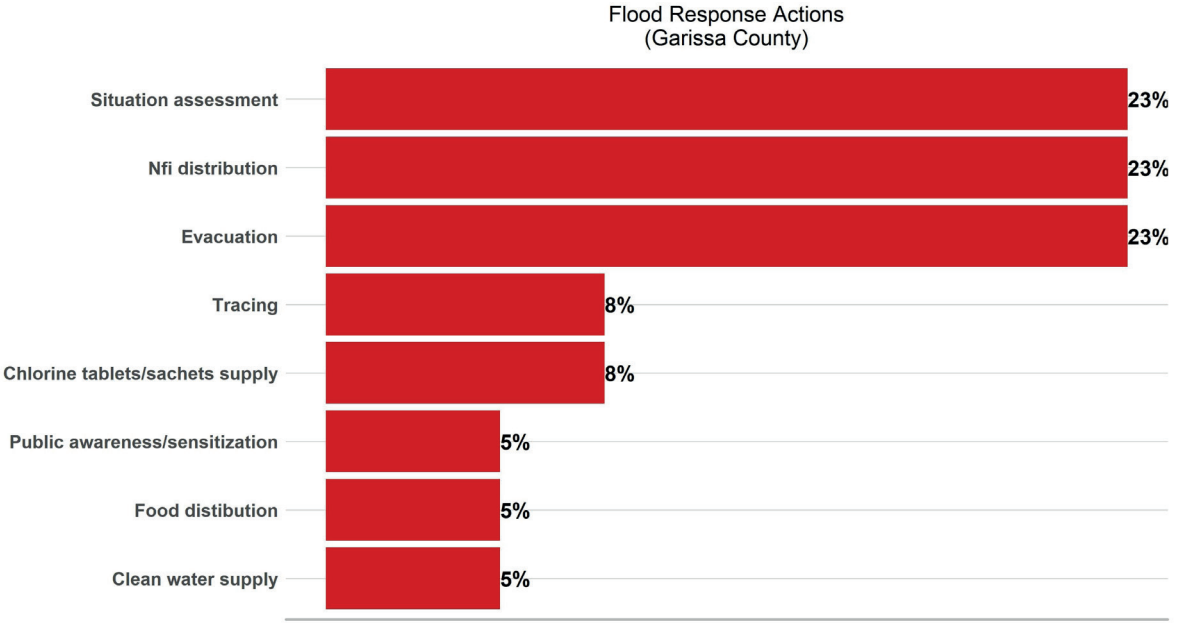

Figure 8a: Flood response actions in Garissa County

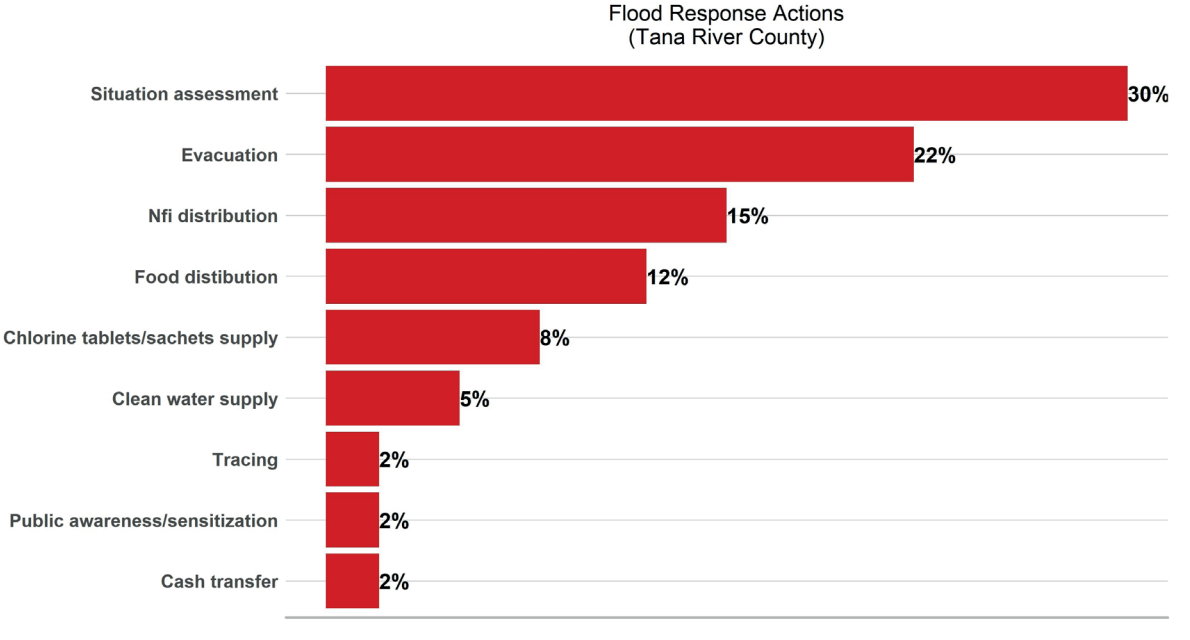

Figure 8b: Flood response actions in Tana River County

The first four actions (Figure 7) respond to direct impacts of floods, while the ones that follow from five to seven are linked to secondary impacts such as, the outbreak of acute watery disease as a result of poor sanitation and access to clean water for displaced people.

Due to limited access to clean safe water and hygiene facilities during and after floods, the actions focus on creating awareness, providing clean water and distributing chlorine tablets for water purification. These actions can also act as early actions for cascading impacts such as, disease outbreaks that are linked to poor hygiene and contaminated water.

The implementation of response actions during and after floods calls for a multi stakeholder approach since different expertise and resources are needed to manage the impacts of the disaster. For example, when displaced people move to camps where space is limited

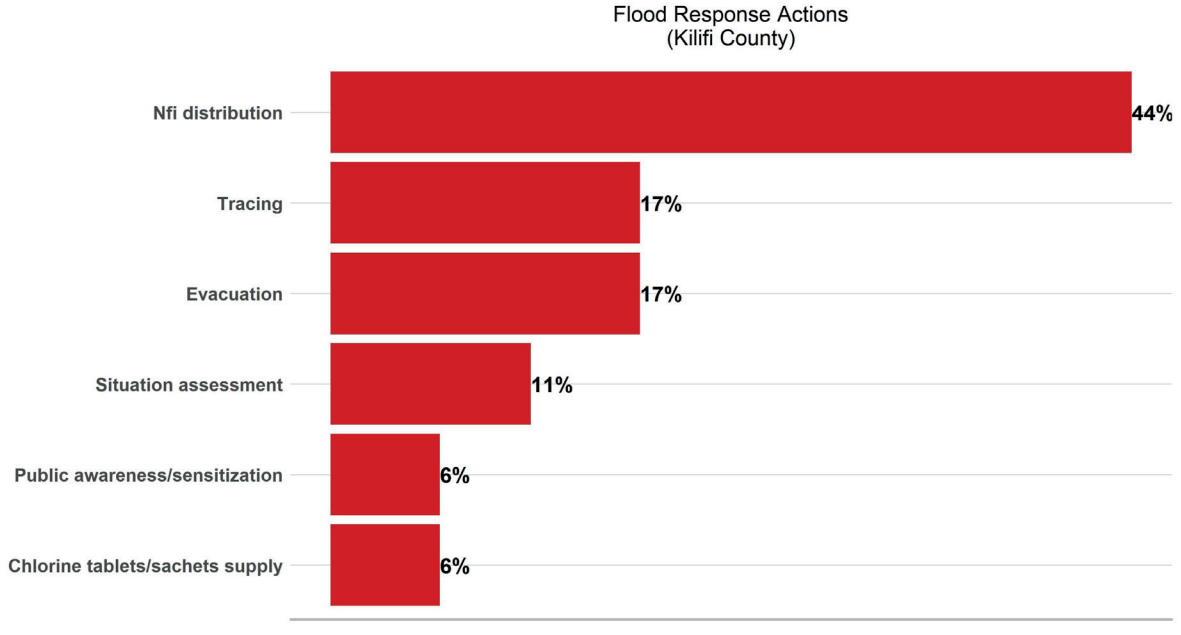

Figure 8c: Flood response actions in Kilifi County

and structures are semi-permanent, security becomes a big concern.

A review of the stakeholders involved in flood response in the three counties shows that the stakeholders involved include those from the National and County Government, since disaster management is a shared function between the two levels of government.

Some of the key stakeholders involved in flood response include: Ministry of Interior and Coordination, Ministry of Devolution and Arid and Semi-Arid Lands, World Vision Kenya, Kenya Red Cross Society, UNICEF, County Government Departments (agriculture, disaster, water, health) and National Drought Management Authority (NDMA).

The County Steering Group (CSG), which brings together all stakeholders involved with drought management at the county level, acts as a platform for flood management in the absence of a similar structure for managing floods. This further stresses the need for dedicated harmonized structures for flood management from the national to the count level. The creation of harmonized structures will also partially address the problem of duplication of roles, responsibilities and efforts in flood management since each institution will have a clear mandate that exploits its strength.

Some of the key stakeholders involved in flood response include: Ministry of Interior and Coordination, Ministry of Devolution and Arid and Semi-Arid Lands, World Vision Kenya, Kenya Red Cross Society, UNICEF, Country Goverment Deparments (agricuture, disaster, water, health) and National Drought Management Authority (NDMA).

3.0 DISCUSSION

Global disaster frameworks such as, the Sendai Framework for Disaster Risk Reduction 2015-2030 are now focusing on anticipatory disaster risk reduction at all levels to reduce the impact of existing and new risks.

One of the Global targets of the Sendai Framework is to substantially increase the availability of and access to multi-hazard early warning systems and disaster risk information and assessments to the people by 2030. In an effort to align to this framework as supporting the move to disaster risk reduction instead of disaster response, humanitarian organisations in collaboration with government institutions are piloting anticipatory approaches such as, early warning early action (EWEA), forecast-based action (FbA) and forecast based financing (FbF).

All these approaches aim to maximize the window of opportunity presented by climate and weather forecasts to take mitigative actions prior to a hazard event occurring. These approaches have so far been piloted in small geographical areas but the desire is to scale this up and institutionalize them in government systems and institutions as well as, development institutions and private sectors for sustainability.

In the case of Garissa, Tana River and Kilifi counties, the review presented shows that the frequency of flood events in the two rainy seasons is high and no early actions are taken in advance of a flood event to mitigate impacts on the vulnerable communities. The analysis of flood frequency and impacts helps in understanding the:

i. Floods landscape within the two basins

ii. Most frequent impacts to inform impact prioritisation of impacts and design of early actions.

Additionally, there is no formal and larger scale FEWS in the two river basins. In the absence of a well-structured FEWS, early warning information might not reach the most vulnerable and in good time to implement early actions. As the early actions are not defined and captured in a plan, resources and responsibilities are not allocated to implement such actions at government and community level.

In recognition of the move towards anticipatory disaster risk reduction and the recurrent flooding problem in lower Tana and Athi basins,

in 2019 ECHO through British Red Cross funded KRCS to implement the ***'Enhancing disaster preparedness for effective early action and response in Lower Athi and Lower Tana River Basins as well as responding to rapid onset emergencies in Kenya'*** project.

The Project aims to improve the capacity of county government institutions, partners and communities along the Tana and Athi river basins to adequately prepare for and respond efficiently and effectively to rapid onset disasters in Garissa, Kilifi and Tana River counties by 2020.

In improving systems for early warning early action; a FEWS to be operated by mandated institutions will be set up, there will be capacity building for stakeholders to be able to interpret early warning information and integrate it in decision making, county owned early warning communication strategies will be developed and early actions for mitigating flood impacts will be defined for different lead times and forecast thresholds.

Based on the current status of preparedness and response actions, with good knowledge of areas at risk, good lead time and skillful early warning information, adequate resources, institutional structures and good will from communities and government, some of the response actions can be turned into early actions that are implemented before a flood occurs.

For example, in areas that are known to flood frequently, when early warning information indicates a flood is imminent, residents of these areas can be assisted to move to higher ground as well as recover when the flood subsides. Irrigation equipment can also be moved away from the river banks when there are indications of a flood.

However, the identification and prioritization of early action needs multi stakeholder co-development and agreements to define which institution will do what when, over which area and with what resources.

The Project aims to improve, the capacity of county government institutions, partners and communities along the Tana and Athi river basins...

4.0 CONCLUSION

The literature review has clearly shown that flooding in the lower Tana and lower Athi basin causes great impacts to communities living in Garissa, Kilifi and Tana River counties during the long and short rains.

The major flooding impacts in the three counties were found to be displacement, loss of lives, destruction of property, disruption of access to essential health care and related services, destruction of irrigation systems and farm equipment and destruction of livelihoods and key installations such as water, sanitation and hygiene facilities.

The continuous flood impacts and the timing of actions confirms that flood management in the lower basin is reactive and not anticipatory. This can be attributed to the lack of a flood early warning system in the basin and limited institutional coordination.

Therefore, as a way of mitigating the flood impacts in the lower Athi and lower Tana Basin, the StERC Project is focusing on improving systems for early warning early action.

This will be attained through improving the capacity of county government institutions, partners and communities along the Tana and Athi River basins to undertake anticipatory early actions in advance of a flood event to mitigate impacts on the vulnerable communities.

The Project will support: capacity building for stakeholders to interpret early warning information and integrate it in decision making, defining flood early actions at different lead times and forecast thresholds and also development of county-owned early warning communication strategies to strengthen the communication of early warning information to the at risk communities.

5.0 RECOMMENDATIONS

From the analysis we make the following recommendations in an effort to enhance flood forecasting and anticipatory action in the two basins;

- To formalize and strengthen informal FEWS, the StERC Project should work with some of the technical and community members involved in informal FEWS in determining the forecast probability threshold that should trigger early actions.
- To formalize the existing communication systems within the lower Tana and lower Athi basins, the StERC Project should consider integrating these systems into the flood early warning communication strategies.
- Currently, within the two basins, flood risk management stakeholders are convened under the drought risk management structures. However, the drought risk structures do not adequately address the flood risk management and hence, there is a need to develop effective flood risk management structures within the basins. This will enhance coordination in relation to data sharing, preparedness and response flood related impacts.

Currently, within the two basins, flood risk management stakeholders are convened under the drought risk management structures.

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