INTEGRATING FORECAST BASED ACTION IN AN EXISTING EARLY WARNING SYSTEM: LEARNING THE CONTEXT

Kenya Red Cross

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LIST OF ABBREVIATIONS

AU	African Union
CSG	County Steering Group
DDRSI	Drought Disaster Resilience and Sustainability Initiative
DEWS	Drought Early Warning System
DRM	Drought Risk Management
EDE	Ending Drought Emergencies
EMDAT	Emergency Events Database
FbA	Forecast-based Action
ForPAc	Forecast-based Preparedness
HFA	Hyogo Framework of Action
IGAD	Intergovernmental Authority on Development
KAS	Knowledge, Attitude, Skills
KMD	Kenya Meteorological Department
NDMA	National Drought Management Authority
NDMP	National Drought Management Policies
NGOs	Non-Governmental Organisations
OLM	Outcome Logic Model
OND	October-November-December
PIPA	Participatory Impact Pathway Analysis
UNW-DPC	UN-Water Decade Programme on Capacity Development

1.0 BACKGROUND

1.0.1 Natural Disasters

Globally, natural disasters have continued to increase over time (Figure 1) and they are exacting a heavy toll on countries and vulnerable communities[1]. Climate related disasters such as floods and droughts have become increasingly frequent since the late 1990s, pushing the average number of disasters per year to 329 in the last 20-years, this has doubled if compared to disasters experienced between 1978 and 1997 .

From 1998 to 2017 floods affected the highest number of people, estimated to be more than two billion while drought affected 1.5 billion people (Figure 2). Over the same period, climate-related disasters caused over US$ 2,245 billion losses, this increased from US$ 895 billion of losses reported between 1978 and 1997[2].

Floods are a rapid onset disaster, while drought develops slowly, worsens gradually, and results in destruction of livelihoods, economic loss and death if not properly addressed. Between 1994 and 2013, more than one billion people were affected by drought worldwide, with Africa, accounting for 41% of all drought events[3]. Globally, drought events have increased in frequency (Figure 3), severity, duration and spatial extent. The frequent drought events significantly reduce recovery time for governments and communities hence threaten sustainable economic development by diminishing the ability of communities to absorb climatic shocks and adapt to a changing climate[4]. Further, the rapid population growth in most parts of Africa is a challenge multiplier when it comes to impacts of drought.

In Kenya, a number of natural hazards are experienced, the most common being weather related, including floods, droughts, landslides, lightening/thunderstorms, wild fires, and strong winds[5]. In the recent past these hazards have increased in number, frequency and complexity. The impacts of the hazards have become more severe with more deaths of people and animals, loss of livelihoods and destruction of infrastructure resulting in losses of varying magnitudes.

Drought is the most prevalent natural hazard in Kenya and is one of the biggest threats to Kenya's Vision 2030. Drought mostly affects the Arid and Semi-Arid lands (ASALs) that represent more than 80% of Kenya's landmass and support over 30% of the total population. Also, nearly half of the population whose livelihood is livestock rearing reside in the ASALs. Due to harsh weather conditions experienced in the ASALs, the fragile ecosystems, poor infrastructure and historical marginalisation communities are vulnerable to droughts.

In the recent past, the frequency of drought events in Kenya has increased to every 2-3 years. Additionally, drought is complex due to its cascading impacts that adversely affects almost all sectors of the economy, among others, agricultural production, public water supply, energy production, transportation, tourism, human health, biodiversity and natural ecosystem[6]. These impacts develop slowly, and are often indirect and can linger for long times after the end of the drought itself. Drought impacts often result in severe economic losses, environmental damage and human suffering however, compared to impacts of other hazards like floods they are generally less visible and are not immediately quantifiable in economic terms[7]. This points to the need for better drought risk management to mitigate its impacts on vulnerable communities, the economy and economic development.

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[1]'Sendai Framework for Disaster Risk Reduction 2015- 2030', 37.
[2]'61119_credeconomiclosses.Pdf' <https://www.unisdr.org/files/61119_credeconomiclosses.pdf> [accessed 9 August 2019]
[3]Tefera Darge Delbiso and others, 'Drought and Child Mortality: A Meta-Analysis of Small-Scale Surveys from Ethiopia', Scientific Reports, 7.1 (2017) <https://doi.org/10.1038/s41598-017-02271-5>.
[4]'African_drought_white_paper.Pdf' <https://www.unccd.int/sites/default/files/relevant-links/2018-07/African_drought_white_paper.pdf> [accessed 11 August 2019].
[5]'Project on Disasters.Pdf' <https://meteorology.uonbi.ac.ke/sites/default/files/cbps/sps/meteorology/Project%20on%20Disasters.pdf> [accessed 3 October 2019].
[6]'UNW-DPC_NDMP_Country_Report_Kenya_2014.Pdf' <http://www.droughtmanagement.info/literature/UNW-DPC_NDMP_Country_Report_Kenya_2014.pdf> [accessed 3 October 2019].
[7]Jürgen V Vogt and others, 'Drought Risk Assessment and Management', 68.

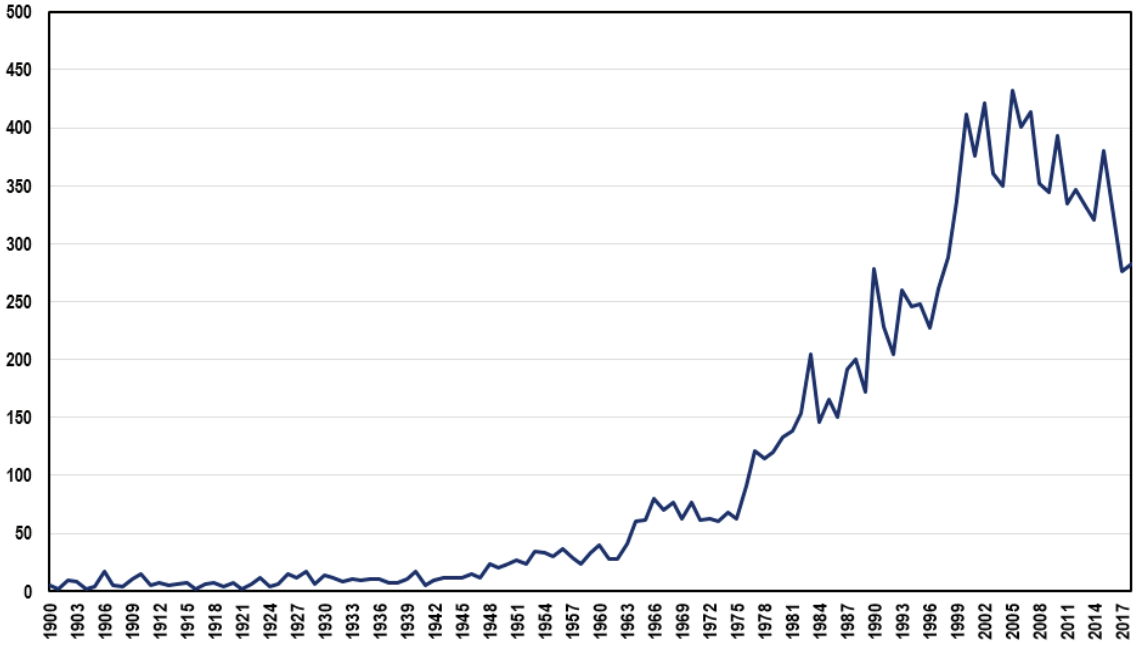

Figure 1: Number of natural disasters reported globally from 1900 to 2018. *Data Source; EMDAT (2019)*

1.0.2 Drought Risk Management

Most countries across the world are still adopting the crisis management approach in their drought management efforts. This approach has been criticized due to its reactive nature with researchers emphasizing the need to shift from the crisis management approach to a strategic approach in relation to drought management. The crisis management approach is largely ineffective as it focuses on response activities rather than long-term developmental activities involving planning, mitigation, and disaster preparedness[8].

In Kenya, after the 2010-2011 devastating drought, the Government launched a Medium Term Plan for Drought Risk Management and Ending Drought Emergencies (EDE) for 2013-2017. The EDE commits to end drought as an emergency by the year 2022, by using two approaches; strengthening the basic foundations for growth and development, such as security, infrastructure and human capital and strengthening the institutional and financing framework for drought risk management (DRM).

In line with the EDE's approach of strengthening institutional framework, the National Drought Management Authority (NDMA) was established, with a mandate to provide leadership and coordinate drought risk management plans, interventions, polices and stakeholders across national and county levels. So far NDMA has established offices in 23 ASAL counties which are considered to be highly vulnerable to drought. NDMA implements strategic projects that reduce risk or strengthen preparedness to drought, and provides drought information by generating, consolidating and disseminating drought early warning information through publishing monthly bulletins that communicate the current drought status (Normal, Alerts, Alarm, Emergency and Recovery).

The EDE strategy was aligned with regional and international frameworks[9], for example, the African Union Agenda 2063 priority on climate resilience and natural disaster preparedness and prevention and on renewable energy. Also, IGAD's Drought Disaster Resilience and Sustainability Initiative (DDRSI) which is a plan and commitment to end drought emergencies, build drought resilience and achieve growth and sustainable

[8]'Doris Wangari Ndegwa and Dr Jesse Maina Kinyua, 'Strategic Measures Employed by the National Drought Management Authority for Drought Mitigation in Kenya', 6.1 (2018), 11.
[9]'New Approaches Needed to Address Drought Emergencies in Kenya', Kenya Institute of Public Research <https://kippra.or.ke/new-approaches-needed-to-address-drought-emergencies-in-kenya/> [accessed 4 October 2019].

development in the IGAD region. Globally, the strategy was aligned with the 2005-2015 Hyogo Framework of Action (HFA), which described and detailed the work that was required from different sectors and actors to reduce disaster losses. Its goal was to substantially reduce disaster losses by 2015 by building the resilience of nations and communities to disasters. This means reducing loss of lives and social, economic, and environmental assets when hazards strike.

By 2015 when the HFA ended many countries had made moderate progress in disaster risk governance and policy formulation, risk identification, assessment and early warning. However, progress proved to be much slower in reducing the underlying risk factors. This gap resulted mainly from the weak integration of disaster risk reduction into broader development planning and sectors. As a result, the overall economic impacts of disasters continued to rise as the vulnerability and exposure of populations and assets increased[10]. This was witnessed in Kenya during the 2016/2017 drought event, that affected 23 of 47 counties and 2.7 million people were declared to be food insecure. This was despite the existence of institutional and financial frameworks for drought management.

The Sendai Framework Sendai Framework for Disaster Risk Reduction 2015-2030, which is a successor to the HFA, was agreed upon by 187 United Nations member states in 2015. The framework focuses on risk reduction by implementing anticipatory risk reduction actions at all levels to reduce existing multi-hazard risks and prevent new risks. To align to this focus of disaster risk reduction instead of disaster response, humanitarian organizations are increasingly moving towards anticipatory approaches to managing hazards and disasters, typified by approaches such as Forecast-based Action (FbA), which aims to maximize the window of opportunity presented by climate and weather forecasts for taking mitigative actions prior to a hazard event occurring[11]. Anticipatory approaches are diverse but have in common three key pillars of i) pre-agreed planning and protocols ii) a fast, evidence-based decision-making process (which in the case of climate

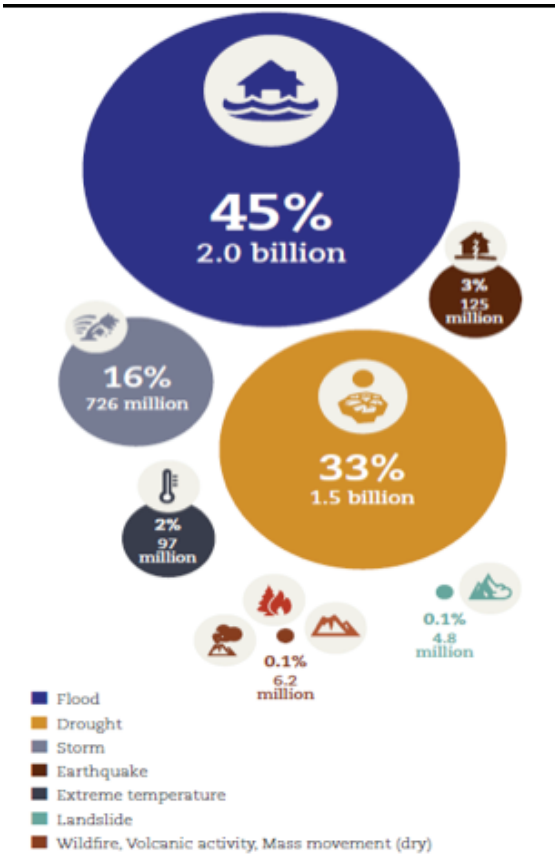

Figure 2: Number of people affected per disaster type from 1998 to 2017

hazards often includes pre-agreed forecast-based triggers) and iii) pre-agreed finance.

The actions and forecast-based triggers for action are agreed upon in advance and on the basis of an analysis of the risk, setting some kind of threshold for the forecast and the likely impact of the actions. Early actions based on forecasts have ranged from increasing organizational capacities, to delivering food and non-food items, cash transfers and scaling up social protection mechanisms where they exist6. The FbA approach is aligned with Priority 3 and 4 of the Sendai Framework, which are "Investing in disaster risk reduction for resilience" and "Enhancing disaster preparedness for effective response and to Build Back Better in recovery, rehabilitation and reconstruction"[12].

[10]'Final Summary Report RLP 9-11 October 2017.Pdf' <https://www.unescap.org/sites/default/files/Final%20summary%20report%20RLP%209-11%20October%202017.pdf> [accessed 4 October 2019].
[11]E. Coughlan de Perez and others, 'Forecast-Based Financing: An Approach for Catalyzing Humanitarian Action Based on Extreme Weather and Climate Forecasts', Natural Hazards and Earth System Sciences, 15.4 (2015), 895–904 <https://doi.org/10.5194/nhess-15-895-2015>.
[12]'Sendai Framework for Disaster Risk Reduction 2015- 2030'.

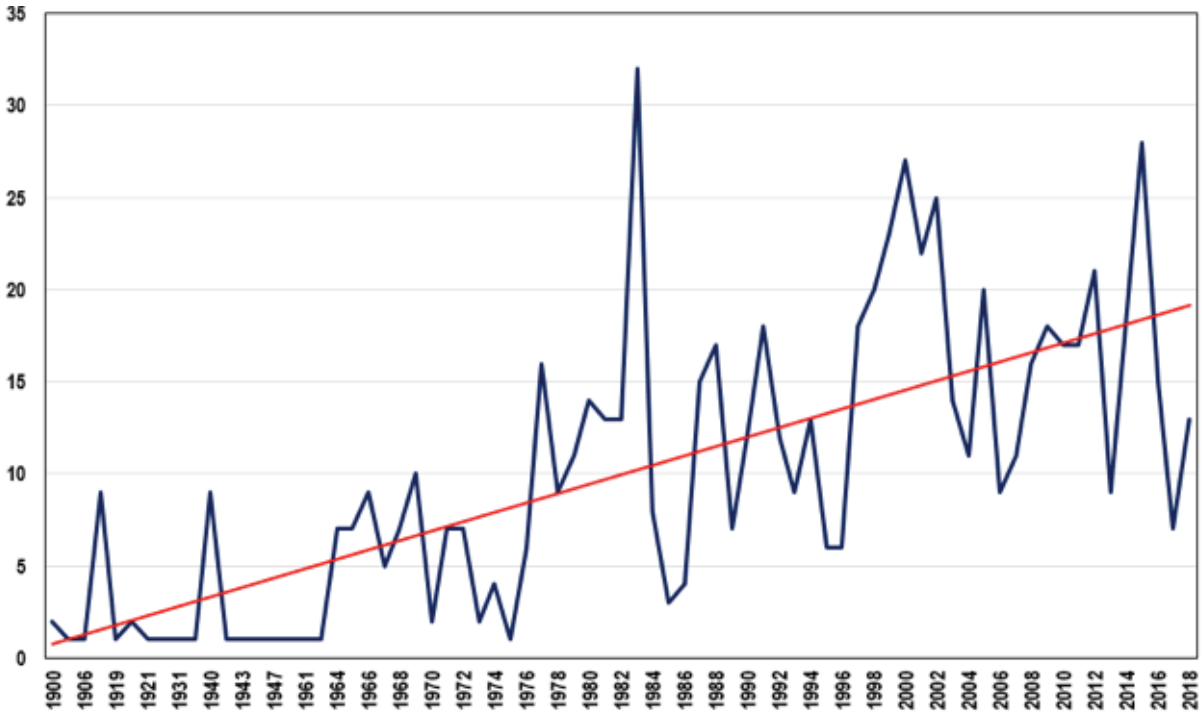

Figure 3: Number of droughts reported globally from 1900 to 2018. Source; EMDAT (2019)

Despite the growing interest in FbA in order to reduce the impacts of climate related disasters on people's lives and livelihoods and the burden of humanitarian response, most FbA projects within the Red Cross Red Crescent Movement have been pilots and mostly focused on floods, cold waves and cyclones. Drought has had limited focus in the movement although some organisations like the Food and Agricultural Organization have implemented some pilot projects for example, the early warning early action pilot implemented in Kenya, Somalia and Ethiopia in 2017[13].

[13]'CA0227EN.Pdf' <http://www.fao.org/3/ca0227en/CA0227EN.pdf> [accessed 18 June 2019].

Box 1: The Towards Forecast Based Preparedness Action (ForPAc) Project

The Towards Forecast Based Preparedness Action (ForPAc) Project is a research consortium made up of institutions in the United Kingdom, Kenya and the Greater Horn of Africa region, including universities, national meteorological agencies such as the UK Met Office and the Kenya Meteorological Department and humanitarian organization the Kenya Red Cross (for full project membership see www.forpac.org)

The project aims to address limitations to taking early action on climate information. Firstly, by improving the availability of decision-relevant climate information by piloting research forecasts for extreme flood and drought events. Secondly, the project is promoting the use of climate information by identifying and addressing barriers to preparedness action in existing early warning systems in Kenya.

The project's pilot work on drought is currently focused on Kitui county. This aims to promote systematic early action in the operational Drought Early Warning System (DEWS) managed by the National Drought Management Authority (NDMA). Flood focused case studies are also being undertaken in Nairobi County and the Nzoia River basin.

Drought despite having major impacts to vulnerable communities and slowing economic development of Countries gets less focus because it's a slow onset disaster. This makes it hard to clearly distinguish the different phases of the disaster cycle, thus making it more complicated to determine which actions are feasible and when they are needed. Humanitarian organisations are also slow in responding to droughts; in some instances, they wait for governments to declare it as a disaster, hence the need for a quicker and efficient system for accessing funds. Which is exactly the idea behind FbA, having funds that can be released immediately the first warning of a hazard is issued, as they can then be used to initiate early actions. The ForPAc project (Box 1) has been exploring the potential for a more anticipatory drought risk management in Kitui County based on climate and weather forecasts.

2.0 KITUI CASE STUDY

Kitui County is an arid and semi-arid area, and thus prone to frequent and prolonged droughts. As a result, crop failure and lack of pastures for livestock threaten food security efforts. The County has experienced increased frequencies of drought caused by poor management of water catchment areas, inappropriate soil conservation measures, deforestation and general land degradation[14].

Kitui County is one of the 23 Counties where the National Drought Management Authority (NDMA) that's mandated to provide leadership and coordinate drought risk management plans, interventions, polices and stakeholders across national and county level operates. The Kitui NDMA office operates the County's DEWS, which aggregates data and information monthly from sentinel sites and key sectors like education, agriculture, health, livestock, security and health. Currently, the DEWS monitor biophysical, production, access and utilization indicators. Biophysical indicators are used to monitor progression of the drought hazard while production, utility and access indicators monitor the impacts of the drought. For each indicator, thresholds are set to define three drought stages: alert, alarm and emergency.

The County has an operational County Steering Group (CSG) comprising of County key ministries, Non-Governmental Organisations (NGOs), Kenya Meteorological Department (KMD), the County Commissioner and NDMA's County officers. The CSG coordinates and oversee drought related interventions in the county, as well as validation and approval of monthly bulletins and post-rain season assessment reports. The bulletins and reports inform drought management plans and activities in the County. Additionally, the CSG participates in the development of a multi-stakeholder county drought contingency plan. The Contingency plan details actions for each key sector in each drought phase scenario and a comprehensive budget for each action.

In an effort to understand the County's drought management process, that is, what indicators, triggers and thresholds are used, which weather

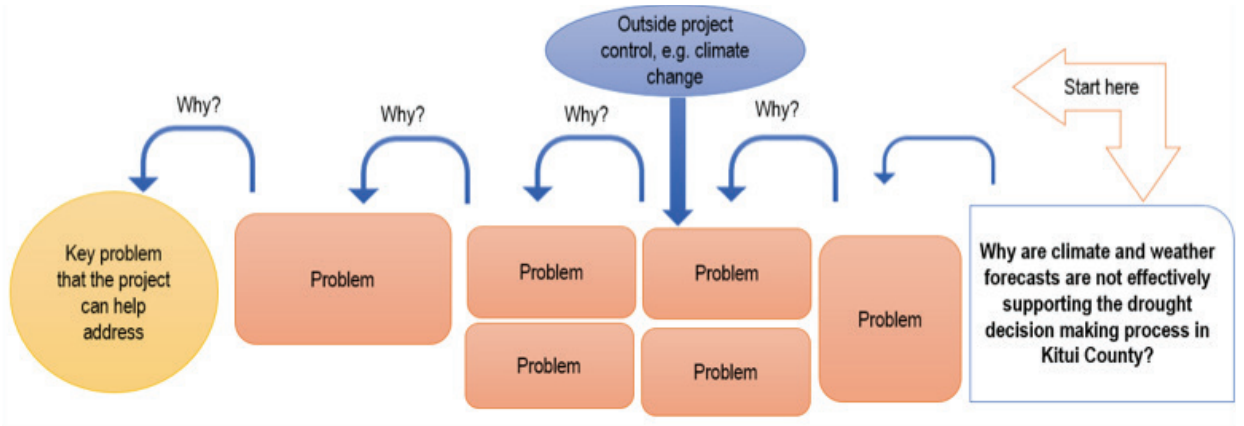

Figure 4: Sample problem tree. *Source; ForPAc project*

[14]'KITUI COUNTY INTEGRATED DEVELOPMENT PLAN July 2014(1).Pdf' <http://www.kituicountyassembly.org/userfiles/KITUI%20COUNTY%20INTEGRATED%20DEVELOPMENT%20PLAN%20July%202014(1).pdf> [accessed 15 August 2019].

Figure 5: Participants mapping out the drought decision making process during the Kitui PIPA Workshop

and climate forecasts are used and when they are used, which actors are involved and where finances come from and hence identify entry points for FbA, ForPAc conducted a Participatory Impact Pathway Analysis (PIPA) workshop. The specific aims of PIPA were; to map the current drought preparedness decision making process in Kitui County and to understand the constraints that are preventing forecasts from effectively informing this process.

2.0.1 Participatory Impact Pathway Analysis (PIPA)

Participatory Impact Pathway Analysis (PIPA) is a relatively new project planning approach that details how a project will develop its research outputs. It begins with a stakeholder participatory workshop where participants construct problem trees, carry out a visioning exercise and draw network maps to help them clarify their 'impact pathways'[15].

A problem tree is a participatory tool used to map out the main problems, along with their causes and effects. The tool helps in understanding complex issues and underlying problems in a project and how these might be overcome. Some of the issues will be outside the project (but impact it), while other issues are areas the project is seeking to address. The problem tree starts with one general problem and the participants must ask as series of why till they get to a problem the project can address, a branch in the problem tree ends when a problem that the project will directly address is arrived at (Figure 4). All the elements then feed into an outcomes logic model, that describes the project's medium term objectives in terms of: which actors need to change, what changes are needed and the strategies needed to achieve the changes.

In the ForPAc's PIPA workshop, stakeholders first mapped out the drought decision making process in the County which helped better understand what activities are done when, by who and where weather and climate forecasts are used in the process (Figure 5). Since the project's focus is on the use of climate and weather to make drought management more anticipatory, the problem tree focused on the reason why climate and weather forecasts are not effectively supporting the drought decision making process in Kitui County (Figure 6).

2.0.1.1 Emerging issues from the PIPA in Kitui

Responsive drought management. While the drought decision making process in Kitui is clear in terms of the activities undertaken, stakeholders involved, their mandate and the source of finances, many of these activities are geared towards response and not early action. The principal NDMA drought-preparedness activities, as mapped by stakeholders in the workshop were mapped on a seasonal calendar along with agricultural, livestock and other

[15]'11.5 Participatory Impact Pathway Analysis.Pdf' <https://cgspace.cgiar.org/bitstream/handle/10568/33649/11.5%20Participatory%20impact%20pathway%20analysis.pdf?sequence=1> [accessed 16 August 2019].

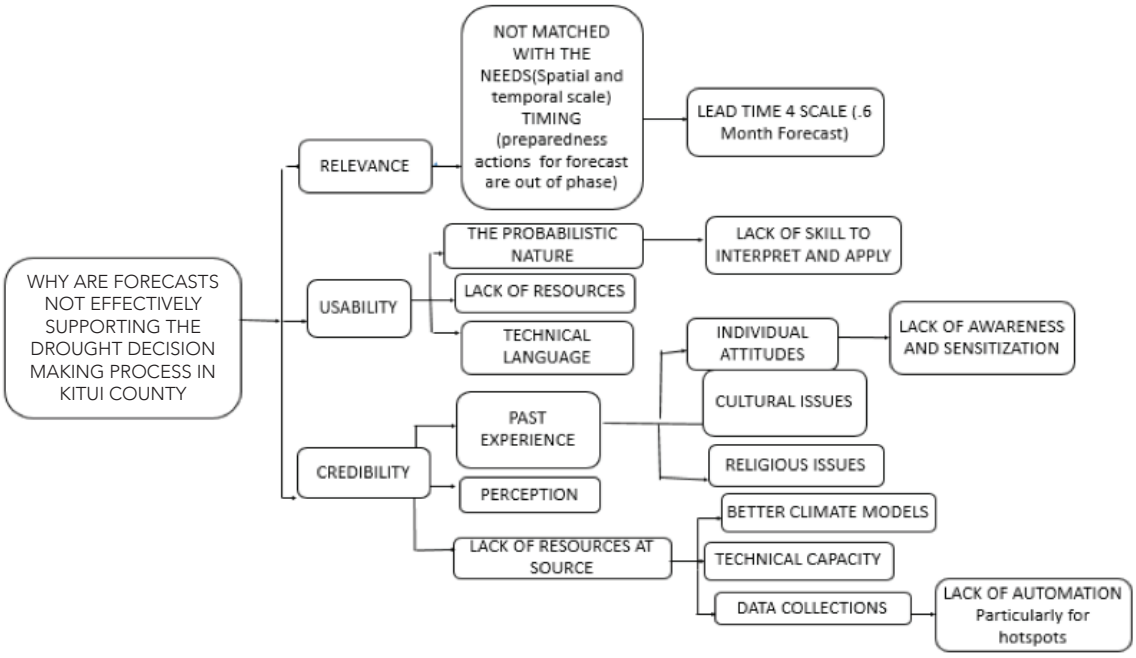

Figure 6: Problem tree from the PIPA Kitui Workshop

livelihood activities (Figure 7). The annual rainfall seasons, the provision of regional, national and County seasonal forecasts were also included.

Climate and weather forecast are hardly used in the drought decision-making process. Weather and climate forecasts are not used in the process because of barriers such as: lack of technical capacity to interpret the probabilistic forecasts, lack of trust in the forecasts, there are no policies and standard operating procedures guiding the use of forecasts, the forecasts do not give information about the indicators used in the drought decision making process and the release of forecasts is not synchronized with when the forecasts are needed in the process. Forecasts are mostly needed when the contingency plan is prepared in July and during the long rains and short rains assessments in July and February respectively as indicted by the yellow stars in Figure 7. In the assessments the forecast can inform the food security prognosis for the next six months.

An entry point for FbA in the drought early warning system. An entry point for using forecast in the process that gives a large anticipatory window for preparedness actions to be initiated was identified. Research that has been carried out by the project has shown that the October-November-December (OND) rainy season has higher predictability as early as July (Kilavi et al., 2018)[16] this is due to the well know influence of global oceans on the OND rainfall in East Africa. An OND forecast issued as early as July would be integrated in contingency planning and the long rains assessment thus giving stakeholders ample time to initiate drought preparedness actions. These early forecast would also be aligned with Kenya's finance and budgeting calendar; thus money can be set aside for preparedness actions identified.

2.0.1.2 Way forward from PIPA

During the visioning exercise, participants recognized that for climate and weather forecast to effectively inform the drought decision-making process, the following are required:

- Development and implementation of Standard Operating Procedures and policies to support use of climate information in county drought preparedness planning and decision making processes.
- Strengthening the provision of timely, accurate, reliable and credible climate information.

[16]'329335905_Extreme_Rainfall_and_Flooding_over_Central_Kenya_Including_Nairobi_City_during_the_Long-Rains_Season_2018_Causes_Predictability_and_Potential_for_Early_Warning_and_Actions.Pdf' <].

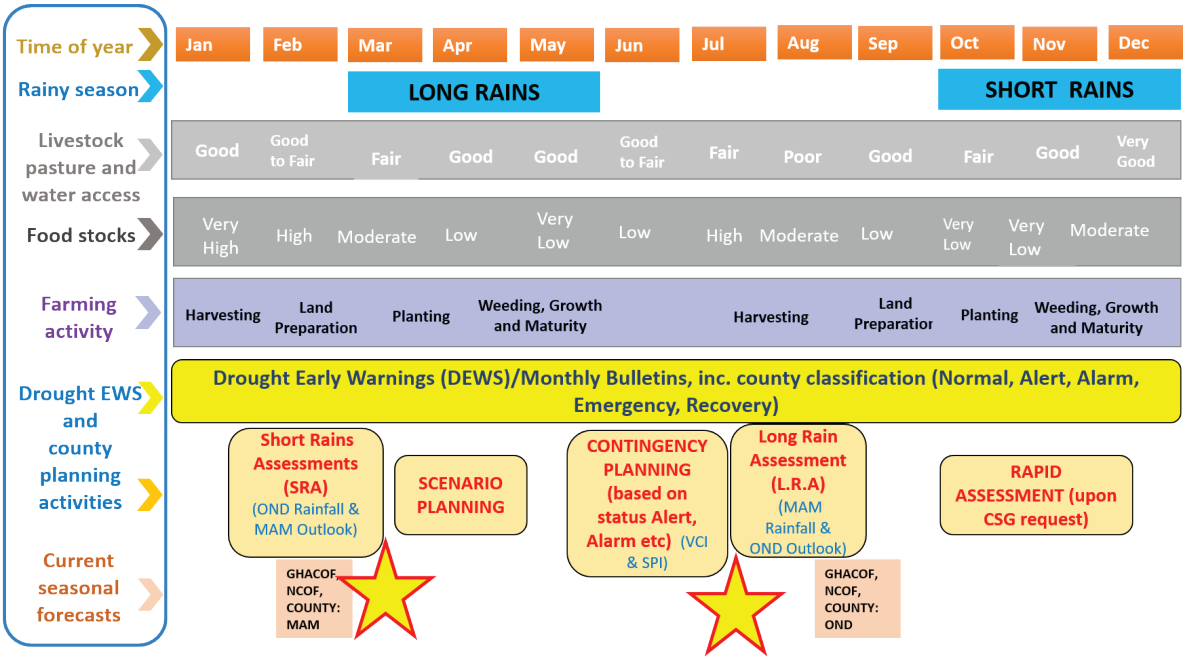

Figure 7: Schematic of annual climate, livelihoods, drought risk management and seasonal forecasts for Kitui County, developed with stakeholders

Table 1: Outcome Logic Model

Actor	Change in Practice required to achieve the Project's Vision	Change in Knowledge, Attitude, Skills (KAS) required to support this change
KMD	• Strengthened provision of timely, accurate, reliable and credible climate information • Routine communication of forecast skill to forecast-users • Systematic inclusion of probabilities within forecasts • Create a feedback channel and routinely seek users' feedback. • Provide information on temporal distribution of rainfall	• Acceptance that policymakers and practitioners need probabilities to enable forecast-based actions • Where feasible, enhance skill to meet decision makers' requirements • Enhance research on temporal distribution of rainfall
NDMA	• Systematic integration of climate forecasts across Drought Preparedness Planning	• Strengthened capacities to interpret climate forecasts and effectively integrate them within preparedness decision-making processes
NDMA and KMD	• Alignment in timing of forecast production and use across drought preparedness processes • If feasible increase the forecast period to 6 months to cater for food security prognosis.	• Enhanced mutual recognition of the need for strengthened collaboration in policies and practice

The outcomes of the workshop also informed the Outcome Logic Model (OLM) for the project. The OLM helped identify which actors in the drought management needed to change and what changes are needed (Table 1). Major changes are required in two organisations that are crucial in drought management; Kenya Meteorological Department (KMD) and National Drought Management Authority (NDMA). The key change identified is the need to strengthen collaboration in policies and practice amongst these institutions, this will enhance production of user centered products and in a metrics that is actionable in their context. KMD also needs to create a feedback loop for the users of weather and climate forecasts to systematically give views that will help improve the forecasts.

3.0 RECOMMENDATIONS

When integrating FbA in an existing early warning system it is vital to get a better understanding of the existing system; the processes involved, stakeholders and the information used. Engaging stakeholders in a participatory process will help to:

- Get stakeholders buy-in for the new approach. This will ensure better and sustainable engagements through the FbA process.
- Create a conducive platform to learn how the early warning system works, what information is used, the sources of the information and the strengths and weakness of the system.
- Identify the feasible entry points for FbA in the system.
- Understand the political environment of the system and also identify possible champions for FbA in the existing system.

4.0 CONCLUSIONS

Engaging diverse stakeholders involved in an existing early warning system to learn how it works can be challenging because of the difference in perspectives and knowledge. However, this initial participatory engagement is fundamental in; ensuring inclusion of all relevant actors, creating a common understanding from the beginning, co-exploring the problems and/ or issues in the system that can be addressed by FbA and co-designing the integration of FbA. Additionally, it ensures the buy-in of the stakeholders, which is crucial for the overall success in stakeholder engagement during the process. Further, the involvement of stakeholders from the beginning might be the key to sustainability of the initiative past the lifetime of the project because they are involved in problem identification and solution development. The solutions developed have a higher chance of being accepted and absorbed.

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