CONFERENCE PROCEEDINGS SERIES

KIPPRA

The KENYA INSTITUTE for PUBLIC POLICY RESEARCH and ANALYSIS

# BUILDING RESILIENCE TO MITIGATE THE IMPACT OF DROUGHTS AND FLOODS

PROCEEDINGS OF THE KIPPRA REGIONAL CONFERENCE HELD FROM 5TH – 7TH JUNE 2018 NAIROBI, KENYA

CP/08/2018

# BUILDING RESILIENCE TO MITIGATE THE IMPACT OF DROUGHTS AND FLOODS

## PROCEEDINGS OF THE KIPPRA REGIONAL CONFERENCE HELD FROM 5TH – 7TH JUNE 2018, NAIROBI, KENYA


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**Kenya Institute for Public Policy Research and Analysis**

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# KIPPRA in Brief

The Kenya Institute for Public Policy Research and Analysis (KIPPRA) is an autonomous institute whose primary mission is to conduct public policy research leading to policy advice. KIPPRA's mission is to produce consistently high-quality analysis of key issues of public policy and to contribute to the achievement of national long-term development objectives by positively influencing the decision-making process. These goals are met through effective dissemination of recommendations resulting from analysis and by training policy analysts in the public sector. KIPPRA therefore produces a body of well-researched and documented information on public policy, and in the process assists in formulating long-term strategic perspectives. KIPPRA serves as a centralized source from which the Government and the private sector may obtain information and advice on public policy issues.

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***6TH JUNE 2018, NAIROBI***

Fellow Cabinet Secretaries;
Chief Administrative Secretaries;
Principal Secretaries;
Executive Director, Kenya Institute for Public Policy Research and Analysis (KIPPRA)
Representatives of Ministries, Departments and Agencies;
Representatives of Development Partners;
Distinguished Guests;
All Protocols Observed;

*Ladies and Gentlemen.*

It gives me great pleasure to join you in this annual conference on building resilience to mitigate the impact of droughts and floods in Kenya. This conference comes at a time when the country is experiencing floods after a prolonged drought spell that started in 2016. I wish to extend my welcome and acknowledge your participation in this important conference.

*Ladies and Gentlemen*

Kenya's geography makes it highly vulnerable to climate-induced hazards, namely droughts and floods. This is because over 80 per cent of the country is arid and semi-arid lands which receive erratic rains, and drought is a common defining feature. Given the fragility of the country's environment and soils, whenever it rains, the run-off causes floods with downstream communities living on flood-prone areas bearing the brunt of the effects.

Indeed, we have a long history of these hazards, with major droughts recorded in 1975, 1983, 1999-2001 and 2016-2017. Flood episodes define Kenya's pre-independence, with the 1961 flooding (commonly known as Uhuru floods) being the most intense to date. Other flood events in the county include the El Niño-related floods of 1997/98, that of 2003 and the 2018 floods that affected various parts of the county.

These events have negative effects on the economic sector manifested in the disruption of production flows which results in production losses, increased

operational costs, lost income, unemployment, among others. For example, in 2004, extreme drought was reported between May and July, which coincided with the planting season in most parts of the country. This resulted in the agricultural sector growing by a mere 1.6 per cent during the year as compared to 6.9 per cent in 2005 and 6.4 per cent in 2010, which were considered normal production years.

On average, it is estimated that the country losses between 2 per cent and 2.8 per cent per annum of GDP because of climate-related hazards. More importantly, these hazards cause macroeconomic imbalances in the fiscal sector and the external sector. Droughts reduce government revenues following decline in tax collections brought about by production losses and destruction of productive fixtures. Expenditures also increase especially those related to building resilience and mitigation measures necessitated by the disasters.

Most projections show that the occurrence of these events will be more frequent and severe and will complicate government efforts to transform the economy towards realizing the Vision 2030 targets, the "Big Four" agenda and the Sustainable Development Goals.

In response, the government has prioritized mitigating droughts and floods in our development agenda and is one of the key flagship projects under the Kenya Vision 2030, and the current Medium-Term Plan III (2018-2022). Several county governments have also integrated climate hazards in their County Integrated Development Plans (CIDPs).

As you are aware, an estimated 3 to 4 million Kenyans are affected annually by disasters that disrupt livelihoods. More than 70 per cent of natural disasters that occur in Kenya are because of extreme climatic events that include droughts and floods. Between 2008 and 2011, the total drought loss and damage amounted to Ksh 968.6 billion and resulted to the reduction of our Gross Domestic Product (GDP) growth rate from an average of 6.5 per cent in 2006/2007 to an average of 3.8 per cent between 2008 and 2012. On average, the economic cost of droughts and floods alone is estimated to create a long term fiscal liability equivalent to about 2.4 per cent of GDP each year.

*Ladies and Gentlemen*

This Conference comes at an opportune time when Kenya has made and continues to make great strides in ensuring that development gains and the Kenyan citizens are protected from the negative impacts of droughts and floods.

The Government through the Ministry of Interior and Coordination of National Government has developed the national Disaster Risk Management (DRM)

Policy 2017. The Policy, which was recently approved by Cabinet, will serve as the overarching framework on Disaster Risk Management for the country.

The aim of the DRM Policy is to build a safe and disaster-resilient nation through establishment of a robust DRM system that contributes to and protects the achievement of Kenya's national development. It seeks to substantially reduce natural and human-induced disaster risks and associated losses in social, economic and environmental assets at National and County levels through the establishment of an integrated multi-hazards DRM approach.

*Ladies and Gentlemen*

To mobilize resources to mitigate the impact of drought risks, the Government established the National Drought Management Authority to exercise coordination over all matters relating to drought management, including implementation of policies and programmes. In addition, a National Drought Emergency Fund (NDEF) was established with an allocation of Ksh 2 billion from the exchequer. To operationalize the NDEF, the National Treasury and Planning has developed the National Drought Emergency Fund Regulations 2018 that were recently approved by Cabinet.

The National Drought Emergency Fund Regulations propose that resources to the National Drought Emergency Fund shall be allocated to various drought risk management components. These include: resilience and preparedness measures, response interventions as well as recovery interventions.

*Ladies and Gentlemen*

The National Treasury and Planning has made significant progress in integrating Disaster Risk Management in planning and budgeting at both national and sub-national levels to reduce risks. We recognize that not all risks can be entirely prevented and this prompted the Government to develop a Disaster Risk Financing Strategy to more effectively manage any residual risks.

This Strategy, the first of its kind in Kenya and in Africa, seeks to proactively mitigate disasters, long term economic impacts and ultimately to defend the welfare and improve the resilience of the Kenyan people especially the poorest and most vulnerable. Our Goal is to increase the ability of the National and County Governments to respond effectively to disasters, thereby protecting development goals, (and ensuring) fiscal stability and well-being of all citizens.

The Strategy sets out four strategic priorities going forward, over the medium term:

(i) Ensure a coordinated approach to disaster risk financing across National and County Government institutions managing various disaster risk financing instruments;

(ii) Improve sovereign financing capacity by strengthening and expanding the National and County Government's portfolio of disaster risk financing instruments;

(iii) Support key programmes to protect the most vulnerable populations from the impacts of disasters and contribute to building resilience; and

(iv) Enhance the capacity of National Government Ministries, Departments and Agencies, and County Governments to respond to disasters.

*Ladies and Gentlemen*

In addition, as part of the Country's disaster risk financing instruments, the Government provides an allocation of Ksh 5 billion every financial year towards the Contingencies Fund. This Fund established under the Constitution of Kenya is aimed at responding to the impacts of all disasters including droughts and floods.

The Government also supports other disaster risk financing instruments including the Kenya Livestock Insurance Programme (KLIP), Kenya Agricultural Insurance and Risk Management Programme (KAIRMP), the Scalable Component of the Hunger Safety Net Programme (HSNP), among others.

I would also encourage County Governments to consider establishing County Emergency Funds to complement resilience efforts being undertaken by the National Government as articulated in the Public Finance Management (PFM) Act 2012.

The Government continues to build resilience towards droughts and floods by supporting the mainstreaming of climate change mitigation and adaptation into the Medium-Term Plan (MTP) III 2018-2022. The MTP process included a Sector Working Group on Climate Change to support the implementation of the Climate Change Act 2016 that calls for mainstreaming of climate change mitigation and adaptation across all sectors of the economy.

*Ladies and Gentlemen*

As I conclude, it is evident that addressing disaster-related issues will be key in realizing the "Big Four" agenda and ensuring macroeconomic stability which is a key enabler for development.

It is my sincere hope that you will use the opportunity availed by this conference to share experiences in responding to emergencies of droughts and floods and explore existing gaps in policy and institutional structures that hinder building

resilience. May we learn from various experiences and know what else is required to enhance coordination among key players. We should also consider other disasters that Kenya is predisposed to such as landslides, disease outbreaks, epidemics, seismic shocks, fires, terrorism, conflicts, industrial and structural incidences, among others.

I wish to thank the Kenya Institute for Public Policy Research and Analysis, and other Partners for organizing this important Conference. For those visiting Nairobi for the first time, please find time to enjoy our hospitality and visit our tourism attractions in the city and beyond.

I wish you fruitful and candid deliberations. I now declare this Conference officially opened.

May God Bless You All

# KEYNOTE ADDRESS

***ADAPTED FROM THE KEYNOTE ADDRESS BY DR JULIUS MUIA, EBS, PRINCIPAL SECRETARY, STATE DEPARTMENT FOR PLANNING, THE NATIONAL TREASURY AND PLANNING***

*Distinguished Guests*

*Ladies and Gentlemen*

It is a great pleasure for me to join you today at this conference on building resilience to mitigate the impact of droughts and floods. I note that this conference comes at a time when the region and particularly Kenya has been suffering from frequent events of droughts and floods.

I commend KIPPRA, the National Drought Management Authority and the Agricultural Finance Corporation for their partnership in convening such a timely forum.

*Ladies and Gentlemen*

As we celebrate the World Environment Day today, there is a lot to reflect on the effects of climate change, particularly droughts and floods. This is due to the apparent increase in the frequency and intensity of droughts and floods and the resultant destruction of the livelihoods. This is not just for those in the agricultural sector which is heavily impacted but also those in various points in the value chain for various agricultural products.

Indeed, the fact that drought and floods seem to follow each other more closely and with amplified intensity implies that the destruction is sometimes reinforced, raising the subsequent costs of economic recovery.

*Ladies and Gentlemen*

In view of the significant impact of droughts and floods, the Vision 2030, which is Kenya's long-term development blueprint, identifies ending emergencies from such occurrences as a priority in meeting the development goal of becoming an upper middle-income country. Furthermore, achievement of Kenya's "Big Four" priority on food and nutritional security is highly dependent on mitigation of droughts and floods. This is also in line with the SDG Goal 13 on Climate Action, whose target is to strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries.

*Ladies and Gentlemen*

In the last two decades, Kenya has witnessed several episodes of droughts with an average of one episode in every two years. It has also been the case that

prolonged dry weather spells are usually followed by episodes of severe floods either immediately or a few years after. Recent weather patterns indicate that in almost every year, Kenya deals with either drought or floods.

For example, about 20 years ago, the 1999 to 2001 drought in Kenya was estimated to have affected about 4.4 million people, destroying nearly two thirds of livestock in the arid and semi-arid lands and causing massive crop failures in most parts of the Rift Valley, Coast, Eastern and Central regions of the country. Similarly, 10 years later, the 2011 drought led to severe food shortages which affected about 3.75 million Kenyans. It is estimated that this drought had a combined negative economic impact of between 0.7 to 1.0 per cent of Kenya's GDP.

Six years later, the recent drought spell which started in the last quarter of 2016 forced the Government to declare a national emergency in mid-February 2017 with 23 counties out of 47 having been affected. The number of flood-insecure people was estimated at about 2.7 million.

Kenya also has a long history of floods. For example, following the 2001 drought, the 2003 floods destroyed large parts of the eastern embankments (dykes) constructed in the 1970s to control water flows and displaced 25,000 people. Following the 2016 drought, heavy floods in 2017 were experienced in Kwale, Mombasa, Taita Taveta and Garissa counties, among others. The floods that accompanied the 2018 long rain season led to substantial destruction of infrastructure, including bridges and roads. In addition, many families were rendered homeless while others have lost lives including from the Solai dam incident in Nakuru which claimed about 48 lives. This flooding also affected agriculture and related outputs.

*Ladies and Gentlemen*

It is evident that when droughts and floods occur, they typically set in motion a complex chain of events that disrupt family livelihoods, local economy and in severe cases, the national economy.

Floods cause widespread destruction, resulting in the loss of both animal and human life, and damage to property and critical public infrastructure such as roads, bridges, schools, health facilities, electricity connection and water. In most, if not all the cases, this has always resulted in significant economic losses both directly and indirectly.

Evidence shows that devastating droughts are harmful for agriculture, especially in rain-fed agricultural systems and may further create problems in water supply as well as power supply when there is high reliance on hydroelectricity. In addition, due to scarcity of food, droughts increase the level of malnutrition especially in the ASALs. Furthermore, severe drought situations in Kenya lead to sporadic conflicts among communities seeking pasture for livestock.

*Ladies and Gentlemen*

The most obvious and direct macroeconomic cost of droughts and floods is the reduction in productivity of key sectors that have notable contribution to the Gross Domestic Product. In Kenya, agriculture and agroprocessing industry are key contributors to GDP and are both vulnerable to droughts and floods.

There are significant fiscal implications as well. For example, to mitigate food shortages resulting from the drought experienced in 2017, the Government allowed duty free imports of essential food items (maize, wheat, sugar, and milk) and introduced a temporary subsidy on maize meal prices. In addition, the National Cereals and Produce Board (NCPB) released maize from the strategic reserves. Further, Red Cross and companies donating to such agencies saw their donations exempted from income tax.

The droughts and floods between November 2016 and April 2018 are estimated to have affected over 3.4 million people and cost the Government over Ksh 20 billion. The National Government further allocated Ksh 1.5 billion for flood victims and another Ksh 1 billion to Red Cross for supporting the evacuation and counselling of victims.

One of the strategies that has been used to reduce loss of livestock during such calamities is livestock off-take. In this arrangement, the Government buys the livestock and sells the animals to the Kenya Meat Commission through commercial off-take. The farmers use the proceeds from such sales to restock when the droughts and floods are over. To help the pastoralists in the ASALs, the Government in 2017/2018 allocated Ksh 600 million for purchase of livestock during the dry season. In addition, Ksh 215 million in insurance payouts across six (6) counties were made by the end of February 2017 through the Kenya Livestock Insurance Programme (KLIP) to minimize livestock-related losses.

Further, the National Treasury established the National Drought Emergency Fund in 2017 through the Public Finance Management Regulations. Every year, the National Assembly appropriates Ksh 2 billion to the Fund. The objectives of the Fund are: (1) to facilitate timely response to drought during its different stages; (2) to provide for a common basket emergency fund to minimize the negative effects of droughts; (3) to provide funds for capacity and technical expertise development to improve on drought management; and (4) to finance the establishment, management and coordination of projects, activities or programmes to further the foregoing purposes.

Given that droughts and floods are considered as national disasters, they are catered for within the National Government Contingency Fund, and for 2018/2019, Ksh 5 billion has been set aside.

In the 2018 Budget Policy Statement, the Government has also prioritized construction of large-scale dams across the country to harvest flood waters for storage and use in periods of drought. Protection of wetlands and water towers across the country is also a priority as well as the recently launched National Tree Planting Drive in May 2018 by His Excellency the President to increase forest cover in the country.

*Ladies and Gentlemen*

Institution-wise, the Government has set up various institutions to deal with emergencies. These include the National Drought Management Authority (NDMA), the National Disaster Operation Centre (NDOC) and the National Disaster Management Unit (NDMU).

Regarding policy, the Government has deliberately increased its efforts in the development of a Comprehensive Disaster Risk Management Framework. This includes the enactment of the Disaster Risk Management Bill which has been approved by the Cabinet and is to be tabled in Parliament for further discussion.

The Government has also embarked on mainstreaming climate change mitigation and adaptation strategies in all national development plans and programmes including the Medium-Term Plan III 2018-2022 of the Vision 2030. Going forward, the County Governments will also be required to mainstream disaster risk management within their County Integrated Development Plans.

Kenya is also signatory to global agreements and frameworks towards building resilience to risks posed by droughts and floods. These include the Sustainable Development Goals (SDGs), the United Nations Framework Convention on Climate Change (UNFCCC) Paris Agreement and the Sendai Framework for Disaster Risk Reduction.

Finally, and in conclusion, it is important to reiterate that the discussions during this conference are very timely and important. We all look forward to innovative and sustainable action areas that will be proposed to enhance the current Government efforts in ending the emergence and mitigation of droughts and floods. A special appeal is that we all pay attention to environmental degradation which is a major cause of the greater phenomenon of climate change. This is because conserving the environment, mitigating and adapting to climate change will reduce vulnerability against some effects of droughts and floods.

# FOREWORD

One of the key mandates of KIPPRA is to organize symposia, conferences, workshops and other meetings to promote the exchange of views on issues relating to public policy research and analysis. Although organizing a conference of this magnitude is resource-intensive and time consuming, KIPPRA endeavours to organize annual conferences on pertinent policy issues to serve as a point of communication and encourage the exchange of views between the national government, county governments, the private sector and other bodies or agencies of the national and county governments on matters relating to public policy research and analysis.

This year's conference themed "Building Resilience to Mitigate the Impact of Drought and Floods" began at a time when the world was celebrating the World Environment Day (5th June). The day reminds us that we must take actions to protect the environment, and KIPPRA chose this day deliberately to promote exchange of policy views on matters related to climate change, which is a key environmental challenge.

Climate change has various harmful impacts including change in seasons and frequent occurrence of droughts and floods and change in the overall weather patterns.

In Kenya, most severe droughts have often been followed with severe flooding. As a country, we often experience landslides, collapse of infrastructure, and traffic jams during the rains, after which follows a prolonged drought spell that often leads to death of livestock and disruption of livelihood for the majority, especially those depending on agriculture.

The resilience of the communities affected is tested each time there is a drought or flooding. Therefore, there is need for continuous dialogue on the mechanisms for building resilience of the communities and the economy to these impacts of climate change manifested through droughts and floods.

This conference brings together diverse stakeholders to share their views, experiences and showcase products in contributing towards ending emergencies of droughts and floods. The commitment of the government to address the challenges of droughts and floods are clearly demonstrated with the implementation of the Kenya Vision 2030.

In the last two medium term plans of the Kenya Vision 2030 (MTP I and MTP II), the government has prioritized ending emergencies of droughts as a key element in achieving the national development agenda. The MTP III that is being finalized further aims to build on the progress achieved under the first two medium term

plans. In May 2018, the President led the country in the national tree planning day to ensure Kenya increases forest coverage from the current 7 per cent to the recommended minimum of 10 per cent to mitigate the effects of environmental challenges.

The "Big Four" agenda launched by the government in 2018 has climate change adaptation as an important enabler, given its implications on achieving food security, growing the manufacturing sector, ensuring universal healthcare, and developing decent housing.

We are glad that the Conference brings together diverse stakeholders who share rich experiences and will deliberate on actionable areas and good practices across the region on matters relating to mitigation of impacts of drought and floods. The Conference provides a platform for building networks among stakeholders championing policy development to mitigate the impact of droughts and floods.

The successful organization of this conference would not have been possible without the dedication and commitment of many actors who have spent time and resources to ensure that the event achieves its objectives. While it may not be possible to highlight the unique contributions of everybody, on behalf of the KIPPRA Board of Directors, Management and Staff, we would like to sincerely thank individuals and institutions who played a role in organizing the Conference.

We acknowledge the KIPPRA Board of Directors for providing leadership and oversight in the preparation of this conference.

The preparation of the conference was made possible through financial support from Kenya Electricity Generating Company (KenGen), National Drought Management Authority (NDMA) through the European Union (EU), Commercial Bank of Africa (CBA), Agricultural Finance Corporation (AFC) and Agriculture and Food Authority (AFA). We are very grateful for their generous support.

We sincerely thank the Chief Guest, Cabinet Secretary National Treasury and Planning, Mr Henry Rotich (EGH), for gracing and officially opening the conference. We extend sincere appreciation to the Principal Secretary, State Department of Planning Dr Julius Muia, for giving the keynote remarks at the beginning of the conference, for providing support in fulfilment of KIPPRA's mandate, and for his guidance and encouragement to KIPPRA.

We wish to express gratitude to the presenters and panellists who dived deep into the topics and provided invaluable insights that enabled the identification of Actionable Areas for this conference that will be useful in informing policy formulation and implementation.

We thank the exhibitors who show-cased the effects of drought and floods, and Ms Winfred the headmistress of Mtito Andei and Ms Jane Adika popularly known for the *Serikali Saidia* slogan. You all made an unforgettable mark at the conference.

We thank the entire KIPPRA staff that worked to ensure the success of the conference. Special thanks go to the Research and Survey Committee and the Conference Committee. The preparations for the conference took months and throughout they remained determined and resilient.

We would like to convey our gratitude to the Master of Ceremony, Michael Oyier, for his dedication and effective time management. We sincerely thank the sign language interpreters Annah Mwenesi and Vincent Ochieng (nominated by the Kenya Institute of Special Education), and Jackline Njue, Joseph Kimathi and Alice Kimani (nominated by the National Council for Persons with Disabilities).

Finally, we extend appreciation to the Hilton Hotel for their cooperation in the organization of the event, and the media for their presence and for giving excellent coverage of the event, and good entertainment by the vibrant and patriotic NHIF Choir and the lively young men *Bendi Huru*.

Thank You All

**Dr Rose Ngugi**

**Executive Director, KIPPRA**

# EXECUTIVE SUMMARY

The Kenya Institute for Public Policy Research and Analysis (KIPPRA) Annual Regional Conference was held from 5-7 June 2018. The theme of the conference was ***"Building Resilience to Mitigate the Impact of Drought and Floods"***.

Changes in weather patterns in many regions in Sub-Saharan Africa have led to persistent occurrences of droughts and floods which have become more severe, culminating as emergencies as they cause loss in lives, livelihoods and infrastructure. For Kenya, more than 70 per cent of natural disasters that occur are because of extreme climatic events that include droughts and floods. The emergencies could complicate the realization of Sustainable Development Goals (SDGs) that aim to achieve a better and more sustainable future for all; and the Kenya Vision 2030 and Big Four Agenda that aim to move the country to a middle -income economy.

The conference was aimed at:

(i) Identifying and discussing lessons from good practices across the region;

(ii) Disseminating research results and successful interventions;

(ii) Providing a platform for networking among the relevant stakeholders in the area;

(iv) Generating evidence and deliberations that inform robust recommendations for policy actions on mitigating the impacts of drought and floods.

Over 150 institutions including international organizations such as the World Food Programme, United Nations and International Development Research Centre (IDRC) were represented, as well as academia, regional think tanks, and various public and public-sector stakeholders.

During the official opening, the Chief Guest, Cabinet Secretary, the National Treasury and Planning, Mr Henry Rotich (EGH), pointed to various actions that the government has undertaken in ending emergencies of droughts and floods. These include the recently approved (May 2018) National Disaster Risk Management (DRM) Policy 2017 which is the over-arching framework on Disaster Risk Management for the country, establishment of the National Drought Emergency Fund (NDEF) with an allocation of Ksh 2 billion, and approval of the National Drought Emergency Fund Regulations 2018 to operationalize the Fund.

Other interventions include the establishment in 2011 of the National Drought Management Authority (NDMA) to coordinate all matters relating to drought management, including implementation of policies and programmes. The

government also allocates Ksh 5 billion annually towards the Contingencies Fund to respond to disasters, integration of disaster risk management in planning and budgeting in both national and sub-national levels to reduce risks, and the development of a Disaster Risk Financing Strategy to proactively mitigate disasters by increasing the national and county governments' ability to respond to disasters. At global level, Kenya is a signatory to the Sendai Framework for Disaster Risk Reduction 2015–2030.

These initiatives have come in the wake of major occurrences of droughts and floods recorded in 1999-2001 and 2016-2017 for droughts while flood events related to the El-Nino phenomenon were experienced in 1997/98 and 2003. The Cabinet Secretary noted that prolonged drought and devastating floods disrupts the livelihoods of millions of Kenyans and cause significant economic losses. For instance, between 2008 and 2011, the total drought loss and damage amounted to Ksh 968.6 billion. On average, the economic cost of droughts and floods alone is estimated to create a long term fiscal liability equivalent to about 2.4 per cent of GDP annually.

## Economic Impacts and Costs of Droughts and Floods

The conference benefited from various presentations on the impacts of droughts and floods. Participants discussed at length the reasons droughts and floods scale up to emergencies. It was noted that interventions that are often reactive rather than preventive, are uncoordinated and weak. Efforts to build people's resilience to disasters are often not successful or are largely ineffective. The need to strengthen monitoring and assessment of early warnings signs was emphasised. Curbing degradation of the environment and promoting integrated land and water management would help ameliorate the impacts of climate change.

In MTP III, Kenya will place more priority on climate change governance and coordination, and financing of climate change interventions, including capacity building, public awareness and climate change monitoring, among other interventions. Implementation of the National Climate Change Action Plan will also be prioritized.

To adequately respond to climate changes, Kenya and other regional countries need to strengthen data collection and analysis. Proper forecasting will help reduce the impact of weather-related disasters and assist in planning.

From an economic perspective, the cost of recovery from droughts and floods is about seven times higher than the cost of preventing the negative effects. The economic effects of droughts and floods manifest in disruption of production leading to production losses, income losses and increased operational costs,

culminating into reduced Gross Domestic Product (GDP). Agriculture is the sector most affected by droughts and floods, yet it is the mainstay of Kenya's economy, contributing on average 30 per cent of GDP. Other major sectors such as manufacturing have strong linkages with agriculture by way of dependence on raw materials from the agriculture sector. Thus, growth in agriculture and other sectors of the economy usually slow down in periods of droughts and floods. Moreover, public expenditure increases as the government undertakes interventions on droughts and floods. These episodes also affect the external sector in form of imports, especially of food to cater for shortfalls in domestic production.

From a social perspective, droughts and floods affect schooling and healthcare provision. These disasters, for example, destroy infrastructure such as roads and classrooms, making access to education difficult. They are often accompanied with a rise in prevalence of water-borne diseases. Women and children are often disproportionately vulnerable to the effects of droughts and floods due to their limited social capacity to cope with such disasters. Other most vulnerable population groups include the elderly, and persons with disabilities. The unique vulnerabilities among population subgroups should be considered during disaster management.

### Coping Mechanisms at the Households, Firms and Community Levels

The sessions on impact of climate change sought to explore various scenarios of climate change in the region and propose actions to minimize the loss and damage caused by droughts and floods. Losses from droughts and floods and other weather-related events in Kenya are estimated at between 2 -3% of GDP. The adaptive measures to mitigate the effects include early warning systems and sustainable use of water resources, among others. The costs of adaptation are high, estimated at 0.5 per cent of GDP.

While most regions in Africa have huge potential to produce enough food, the agricultural production system has largely remained rain-fed, therefore heightening food insecurity in the event of rain failure.

The EAC region is a net importer of food products due to challenges such as under-investment in agriculture. Moreover, food trade within the region faces challenges of external tariffs and other restrictions on movement of goods and labour.

The session explored the various coping mechanisms employed by households and firms in the face of droughts and floods. First, the role of community participation in identifying and nurturing coping mechanisms was underscored. This ensures that interventions are relevant and have community ownership. Second, enhanced

collaborations among key institutions was emphasized to build synergy and avoid duplication.

Some of the coping mechanisms discussed include: micro-insurance of farmers by using satellite technology to monitor the performance of crops during a drought period and form the basis for crop insurance compensation; use of satellite imagery to assess forage availability, and develop index-based livestock insurance to enable pastoralists recover from the effects of droughts; and financial instruments for coping with climate disaster risks, such as contingency funds. It was observed that the number of financial institutions providing index-based insurance is growing.

**Coordination and Institutional Framework for Disaster Risk Management**

This session focused on understanding disaster risk management, coordination, and the institutional frameworks in the region. It was pointed out that disaster risk management in Kenya and the wider East African region often focuses on provision of emergency responses rather than mitigation of risk. There is need therefore to create a national policy and legal framework for disaster risk management with clear responsibilities, resources, and capacities decentralized at all levels.

While Kenya has many disaster preparedness agencies, partnership and collaboration mechanisms are weak. There is lack of standardization of disaster risk management responses. While there are standard operating procedures and sufficient data on disaster preparedness, low levels of awareness and use of scientific data undermine disaster risk management efforts.

Adoption of ICT will play the critical role in providing early warning and facilitating disaster relief efforts. The role of ICT in the pre-disaster phase through early warning involves such activities as remote sensing for disaster prediction, data acquisition and processing, testing, probability modelling, among others.

During the disaster phase, ICT plays a critical role in many aspects, such as communication. Cellular or mobile technologies are especially useful because they are portable especially in situations where telecommunication infrastructure has been destroyed by floods.

There is increasing use of digital maps to provide geographic data and navigation, and to map out disaster areas. Digital maps could also be used to map out dense vegetation areas, density of vegetation, etc. Small unmanned vehicles (drones) are also finding application in disaster risk management, for example to collect data in disaster affected areas or hard to reach areas.

## Way Forward

The three-day Conference deliberations came up with thirteen (13) action areas, which have bee detailed towards the end of this conference proceedings. The action areas can be synthesized into the following six (6) areas for further action and follow up.

1. ***Strengthening Coordination and Adopting Comprehensive Approaches to Disaster Risk Management:*** Strengthening coordination between the national and county governments is necessary given that both levels of government have a role to play in disaster management function as per the Fourth Schedule of the Constitution of Kenya 2010. Given the intertwined nature of droughts and floods, the mandates of the institutions set up should cover both disasters. Kenya and the region should respond with multi-sectoral approaches and move quickly towards mainstreaming the management of risks from natural hazards into all aspects of development planning and in all sectors of the economy. Countries should ensure a balanced approach that incorporates structural measures, and community-based prevention measures, emergency preparation, insurance, and other non-structural measures such as education and training or land use regulation.

2. ***Leveraging on technology:*** Implementation of various pilot projects has demonstrated that technology can improve the resilience of affected communities, particularly those prone to droughts and floods. Opportunities exist in integrating satellite-based applications to support disaster reduction measures. This will require investments in research and development to enable identification of appropriate technologies while blending modern and traditional technologies to enhance their relevance and increase uptake. In particular, strengthening early warning systems (EWS) should be a priority in planning for, responding to and recovering from the adverse impacts of weather-related hazards. The system could be expanded to cover the country's diverse agroclimatic zones. One way of scaling up EWS is through use of remote sensing technologies and mobile phone applications.

3. ***Mainstreaming Interventions for Vulnerable Groups and Designing Programmes that Promote Gender Empowerment in Building Resilience:*** Special interest groups such as women and persons with disabilities (PWDs) are disproportionately affected by droughts and floods. It is therefore important to understand the vulnerable nature of these groups to disasters and integrate their concerns into disaster management at all levels. Incidences of droughts and floods worsen the burden for women because of challenges in accessing food, sanitation and health services,

especially when households are far away from health facilities and other social amenities. The problem is more complex among pastoral communities that migrate with livestock in search for water and pasture, leaving women to take more male responsibilities. There is need to mainstream gender in the interventions. Collecting comprehensive information on most vulnerable groups is therefore imperative.

4. ***Enhancing Coping Mechanisms:*** Deepening the use of financial instruments including insurance and credit will play a key role in building robust coping mechanisms, at the household and firm level, against impacts of droughts and floods. Because weather-related private insurance and credit mechanisms are at infancy stage, government support is required to increase participation in disaster risk financing. There is need for greater collaboration among regulatory agencies, industry associations, and developers of financial products to increase awareness and financial literacy.

5. ***Strengthening Research and Development and Improving Knowledge Sharing:*** Investments in disaster risk reduction research is key while at the same time strengthening the link between research, policy and industry. Generation of localized data across the various agroclimatic zones will serve to specifically address the needs of local communities. Coupling this should be a framework for data and knowledge sharing across the various players.

6. ***Promoting Sustainable Environmental Management and Land Use Planning:*** Efforts to reclaim lost forests and wetlands should be expedited, alongside programmes to increase the country's tree cover, to enable them perform their flood and drought mitigation functions. Geothermal, solar and wind power usage could be scaled up to increase their overall share in the country's energy mix and help diversify the sources of energy. There is also opportunity to reposition the fodder value chain by strengthening investments in fodder and production of fodder seeds for large-scale pasture fodder production at the national and county levels, especially in areas abundant with idle land. Policies need to be put in place to promote water harvesting during the rains, and ensure appropriate utilization of water. Revisiting the design and building codes is important in ensuring that buildings are climate-resilient. There is need for community involvement in cost-effective planning for housing development especially in the ASALs, and integrate development of housing schemes as a resilience measure in mitigating the impacts of drought and floods.

# ABBREVIATIONS AND ACRONYMS

| | |
|---|---|
| ACPC | African Climate Policy Centre |
| AFC | Agricultural Finance Corporation |
| AfDB | Africa Development Bank |
| AMREF | African Medical Research Foundation |
| ASALs | Arid and Semi-Arid Lands |
| CA | Communications Authority |
| CAADP | Comprehensive Africa Agricultural Development Programme |
| CBOs | Community-Based Organizations |
| COMESA | Common Market for Eastern and Southern Africa |
| EAC | East African Community |
| FAO | Food and Agriculture Organization |
| GDP | Gross Domestic Product |
| ICT | Information and Communication Technology |
| IDPs | Internally Displaced Persons |
| IDRC | International Development Research Centre |
| IDDRSI | IGAD Drought Disaster Resilience Sustainability Initiative |
| IEA | Institute of Economic Affairs |
| IGAD | Inter-Governmental Authority on Development |
| ILRI | International Livestock Research Institute |
| KAM | Kenya Association of Manufacturers |
| KALRO | Kenya Agriculture and Livestock Research Organization |
| KBA | Kenya Bankers Association |
| KEPSA | Kenya Private Sector Alliance |
| KIPPRA | Kenya Institute for Public Policy Research and Analysis |
| KLIP | Kenya Livestock Insurance Programme |
| KMC | Kenya Meat Commission |
| KMD | Kenya Meteorological Department |
| KNBS | Kenya National Bureau of Statistics |
| KNCCI | Kenya National Chamber of Commerce and Industry |
| KTDA | Kenya Tea Development Authority |
| KUSCCO | Kenya Union of Savings and Credit Cooperatives |
| KWFT | Kenya Women Finance Trust |
| MTP | Medium Term Plan |
| NCPWD | National Council for Persons with Disabilities |
| NDMA | National Drought Management Authority |
| NDOC | National Disaster Operations Centre |
| NGEC | National Gender and Equality Commission |
| NGOs | Non-Governmental Organizations |
| PDNA | Post-Disaster Needs Assessment |
| PFM | Public Finance Management |
| PPPs | Public Private Partnerships |
| PWDs | Persons with Disabilities |
| RECs | Regional Economic Communities |
| SDGs | Sustainable Development Goals |
| SEKU | South Eastern Kenya University |
| SOAS | School of Oriental and African Studies |
| SSA | Sub-Saharan Africa |
| UNECA | United Nations Economic Commission for Africa |
| UNFCCC | United Nations Framework Convention on Climate Change |
| UoN | University of Nairobi |
| USAID | United States Agency for International Development |

# CHAPTER 1: INTRODUCTION

## 1.1 Background

Kenya, like many other countries in Sub-Saharan Africa, is prone to extreme weather conditions. Occurrences of drought and floods have increased in intensity and frequency, and the impact on livelihoods especially those that are dependent on agriculture has been significant.

In the recent past, Kenya has experienced severe droughts in 1983/84, 1991/92, 1995/96, 1999/2000, 2004, 2005/2006, 2009, 2011 and the latest in 2016/2017. The drought experienced in 1999-2000 was estimated to have affected 4.4 million people, killed nearly 60-70 per cent of livestock in the Arid and Semi-Arid Lands (ASALs), and caused crop failure in most parts of the Rift Valley, Coast, Eastern and Central regions of the country. Similarly, the 2011 drought and its related shocks led to severe food shortages, which affected about 3.75 million Kenyans. The drought had a combined economic impact of approximately 0.7-1.0 per cent of GDP. During the 2017 drought, the Kenya Red Cross estimated that 2.7 million people in 23 out of the 47 counties required food assistance. Furthermore, the severe drought experienced in 2017 saw sporadic conflicts in Laikipia County when cattle herders invaded private ranches, wildlife reserves and private farms to seek pasture for their livestock.

At the same time, Kenya has had a long history of floods. Severe floods were experienced in 1982, 1985, 1997/98, 2002, 2006 and 2017. In early 2018, Kenya experienced floods with the onset of the long rain season.

It is evident that prolonged dry weather spells are occasionally followed by episodes of floods either immediately or few years later. For instance, immediately following the 1995/96 drought, the El-Nino related floods in 1997/98 struck with widespread devastating effect, destroying infrastructure and creating and an epidemic of Rift Valley Fever that adversely affected Kenya's livestock. The Kenya Red Cross estimates that the 1997/98 El-Nino floods resulted in 300 deaths and damages worth US$ 670 million and US$ 236 million to infrastructure and the agricultural sector, respectively. During the 2003 floods, part of the earth embankments (dykes) constructed in the 1970s to control water flows were destroyed and 25,000 people were displaced. In 2017, Kenya experienced heavy floods in Kwale, Mombasa, Taita Taveta and Garissa counties.

The coverage and impacts of these droughts and floods have persisted, raising concerns over the effectiveness of the resilience measures put in place to mitigate them over the years. Many Sub-Saharan Africa (SSA) countries are signatories to

global agreements and frameworks towards building resilience to risks posed by droughts and floods. These include the Sustainable Development Goals (SDGs), the United Nations Framework Convention on Climate Change (UNFCCC) Paris Agreement, and the Sendai Framework for Disaster Risk Reduction. Regional Economic Communities (RECs) are also in the process of updating their disaster plans to align to the Sendai Framework that sets targets for disaster reduction. Further, the African Union's Africa Regional Strategy for Disaster Risk Reduction seeks to integrate disaster risk management into development.

Kenya has put in place legislations and relevant institutions to deal with disasters and emergencies. The National Drought Management Authority (NDMA) coordinates all activities related to drought management while the National Disaster Operations Centre (NDOC) coordinates the national effort in addressing the emergencies and disasters resulting from floods and other incidents. Despite the existing policy and legislative measures, occurrences of drought and floods have often resulted in emergency situations.

As such, all stakeholders need to have a discourse on how to end the emergencies of drought and floods. The conference themed ***"Building Resilience to Mitigate the Impact of Drought and Floods"*** provides that platform for stakeholders to deliberate on impactful strategies.

## 1.2 Theme, Objectives and Outcomes

The conference provided a forum for discussions on various issues that need to be considered in a policy framework to end emergencies of drought and floods. The following aspects formed the theme of the conference.

(i) Emergencies of drought and floods, the role of the government, domestic agencies and regional agencies

(ii) Socio-economic cost of droughts and floods at fiscal, household and firm levels

(iii) Gender dynamics, changing roles and the community

(iv) Impact on children, elderly and other vulnerable groups on matters such as schooling, health services, social protection and other related issues

(v) Food security, agriculture systems and climate change

(vi) Coping mechanisms and the role of culture

(vii) Adaptation and mitigation strategies, both formal and informal

(viii) Coordination and institutional framework for disaster risk management at sub-national, national and regional levels

The following were the expected outcomes from the conference:

(i) Lessons from good practices across the region

(ii) Dissemination of research results and successful interventions

(iii) Deepen the platform for networking among relevant stakeholders in the area

(iv) Identification of priority action areas for policy considerations

## 1.3 Themes Discussed

The themes selected for panel discussions captured critical aspects that need to be considered while addressing emergencies of droughts and floods. The occurrences of droughts and floods impact significantly on livelihoods especially for those dependent on the agricultural sector. They impact on food security and health have implications on agroprocessing, which is a key factor in growing the manufacturing sector. As such, building resilience to mitigate the impacts of droughts and floods is a priority in achieving the objectives of the "Big Four" agenda.

### *Theme 1: The role of the government, private sector, domestic and international agencies in ending emergencies of drought and floods*

This theme focused on the country's drought and flood emergency management systems, their effectiveness, actors involved, their roles in facilitating multi-agency response to emergencies, and their preparedness and capacity to respond to droughts and floods.

The management of emergencies arising from droughts and floods can characteristically be organized into five stages. These are: prevention, protection, preparedness, response and recovery. The response to these emergencies will typically require effective coordination among several institutional and non-institutional actors.

According to the Sendai Framework for Disaster Risk Reduction, managing risks is a shared responsibility between government and relevant stakeholders, although the State has the overall responsibility for reducing disaster risk. Non-State actors also play a very important role as enablers in providing support to States in accordance with national policies, laws and regulations, and in implementation of the risk reduction framework at local, national and regional levels. Their

commitment, goodwill, knowledge, experience and resources is required.

### *Theme 2: Socio-economic costs at household, firms and national level and programmes (schooling, health services, and social protection) with occurrences of droughts and floods emergencies*

Natural disasters such as floods and droughts typically set in motion a complex chain of events that can disrupt family livelihoods, local economy and, in severe cases, the national economy. Floods can cause widespread destruction resulting in the loss of both animal and human life. They cause damage to personal property and critical public infrastructure such as roads, bridges, health, electricity and water infrastructure.

This theme discussed the costs of drought and flood emergencies, and the losses that stem from such emergencies. Losses occur predominantly through destruction of an economy's wealth (physical assets) that helps generate income (buildings, roads, farmland, bridges, utilities, industries, forests and other natural resources). Costs arise when the reconstruction is undertaken to replace, repair or reinforce those tangible assets that are destroyed by floods.

### *Theme 3: The impact of drought and floods emergencies on gender dynamics and changing roles in the community*

This theme discussed the barriers that women face in restoring their livelihoods after droughts and floods.

Women are more vulnerable to natural disasters such as droughts and floods due to the asymmetrical power relations based on their gender. Women and girls are particularly exposed to climate-related disaster risks such as droughts and floods and are more likely to suffer higher rates of mortality, morbidity and economic damage.

Given that they bear the burden of ensuring the family gets food, water and other supplies and are engaged in low-wage activities, the role of the community in helping women to cope with impacts of natural disasters is important.

### *Theme 4: The impact of droughts and floods on vulnerable groups (poor, children, elderly, physically challenged)*

This theme discussed the mechanisms that make the elderly, the disabled and children the most vulnerable to droughts and floods. The relationship between

economic powerlessness and vulnerability to disaster for these groups was also discussed.

Natural disasters tend to hit the poorest and the most marginalized demographics the hardest. While everyone living in disaster-prone areas is vulnerable to the impacts of droughts and floods, some groups such as the poor, children, the elderly, and persons living with disabilities are more vulnerable. They are also more at risk of death during floods and droughts disasters.

### *Theme 5: The implications of climate change, and droughts and floods on food security, agriculture systems and trade*

This theme discussed the immediate impact of climate change on agricultural systems and food security. The focus of discussion was on how erratic rainfall affects crop production and livelihoods and how droughts and floods undermine farm yields and the national harvest. The discussions explored various mechanisms households use to cope with emergencies of droughts and floods.

Climatic hazards such as droughts and floods have always been a matter of concern to the human population. Even with significant achievements in science and technology, people continue to suffer the consequences of severe droughts and floods. Floods endanger human life and cause damage to settlements, roads and transport networks. Devastating droughts are harmful for agriculture and may create problems in water supply. Shifting rainfall patterns also reduce yields because lower rainfall reduces soil moisture or increased rainfall waterlogs soils. In rainfed agricultural systems, erratic rainfall can have devastating impacts on affected livelihoods and local economies. Droughts or floods can have catastrophic localized consequences in regions where food insecurity is already high and markets do not function well.

### *Theme 6: Drought and floods emergencies: Coping mechanisms by households and the role of culture*

There are many ways households use to cope with droughts and floods. Apart from mitigation and transfer strategies that are undertaken before the onset of droughts or floods, coping entails those activities undertaken by households after drought/flood has occurred as losses arise. It is aimed at assisting households and communities in dealing with the adverse effects of droughts/floods.

The coping strategies could be economic, social, cultural or technological in

nature. Households threatened by drought and famine deploy a variety of coping strategies progressively as the crisis worsens.

### *Theme 7: Drought and floods emergencies: Adaptation and mitigation strategies, both formal and informal*

This theme focused on adaptation and mitigation strategies for drought and flood disaster preparedness to improve community resilience to natural disasters.

Improving community resilience to droughts and floods requires proactive adaptation and mitigation measures to counter the impacts of climate hazards. Many communities are dynamic and respond to changes in environmental factors. Resilient communities can withstand hazards and continue to operate under stress, adapt, and recover after a crisis while others may not. Building and maintaining disaster resilience depends on adaptation strategies the community integrates in their mitigation plans.

### *Theme 8: Coordination and institutional framework for disaster risk management at sub-national, national and regional levels*

This theme focused on institutional arrangements and national policies for flood and drought emergency management in Kenya and how effective they have been in managing disaster risks. The aim was to bring out the preparedness plans for droughts and floods by various agencies at different levels of government; national and county.

The institutional, policy and legal framework in the context of droughts and floods has the essential role of planning, implementation and monitoring the processes of disaster coordination among all stakeholders and integrates Disaster Risk Management (DRM) efforts into the development of policies and programmes that aim at reducing the level of vulnerability of its people.

# CHAPTER 2: OVERVIEW OF DEVELOPMENTS AND EMERGING ISSUES RELATED TO DROUGHTS AND FLOODS IN THE REGION

## 2.1 DROUGHTS AND FLOODS AS EMERGENCIES

### 2.1.1 Overview of how droughts and floods become emergencies

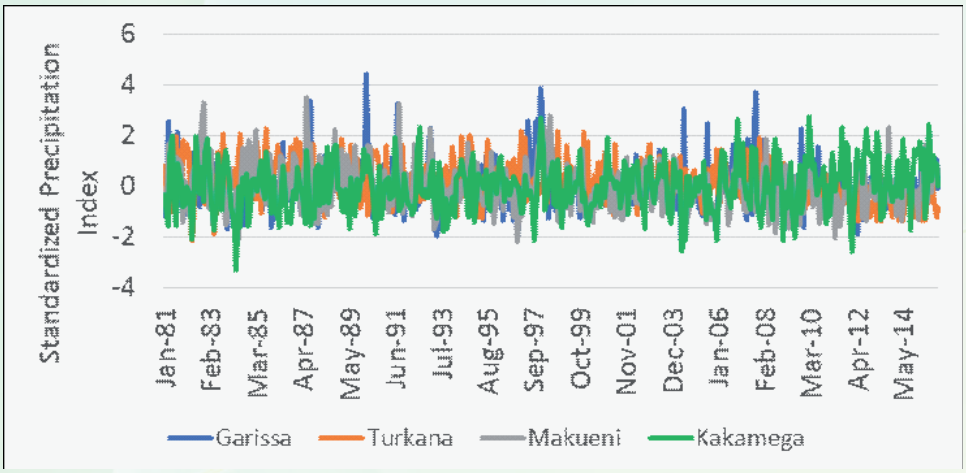
To provide an understanding of why floods and droughts scale up to emergencies, John Nyangena, a Policy Analyst at KIPPRA, made a presentation highlighting the trends and patterns of drought and floods in Kenya, focusing on changes in weather patterns and climate change hazards. Conceptually drought embodies deficiency of precipitation over an extended period, usually a season or more, which results in a water shortage for some activity, group, or environmental sectors.

Floods embody temporary inundation of water from a river, stream, lake, ocean or flash floods onto lands not normally covered by water. Some of the unique features that make Kenya vulnerable to droughts and floods include unplanned urbanization, unsustainable land use practices, poor watershed management, destruction of catchments and the reactive disaster management approaches as opposed to being proactive. This is besides the geographical features of the country that make it vulnerable to droughts. For instance, it was observed that Kenya is 80 per cent ASALs, with 23 counties located in these areas, despite the country lying on the equator. This means that, relatively, only 20 per cent of the country's surface area receives high and regular rainfall.

Figure 2.1 shows the trends of droughts and floods in Kenya. Using rainfall data for the period January 1981 and December 2015 obtained from Climate Hazards Group InfraRed Precipitation with Stations (CHIRPS) database covering Garissa, Turkana, Makueni and Kakamega counties, pixels in each county were averaged to obtain monthly rainfall after which it was transformed into a gamma distribution function to generate Standardized Precipitation Index (SPI). The drought conditions were categorized using World Metrological Organizations schemes. An SPI value greater than 2 indicates extremely wet weather while a value lower than -2 indicates dry months.

From Figure 2.1, it is evident that Kenya has a long history of floods and droughts, yet they remain an emergency every time they occur. This is not unique to Kenya, and therefore the adoption of the Sendai Framework on Disaster Risk Reduction

**Figure 2.1: Trends of droughts and floods in Kenya**




adopted at the 3rd UN World Conference on Disaster Risk Reduction. Locally, a summit on the Horn of Africa crisis in 2011 adopted a Nairobi Strategy which stated that "While droughts may be an unavoidable natural phenomenon, their impact can be mitigated by human action. Droughts need not, and should not, be an emergency". The focus should be on preventive rather than reactive, and holistic rather than emergency-oriented approaches.

Floods and droughts will likely become more frequent and more severe due to climate change. However, since droughts evolve slowly, their impacts can be monitored and reduced. There is therefore need to strengthen people's resilience to droughts and scale up monitoring and response initiatives. There are opportunities to reduce exposure to vulnerabilities which include timely and consistent responses at the onset of a drought, which evolves slowly. There is also a need to strengthen monitoring and assessment of floods and droughts, curb degradation of the environment, and promote integrated land and water management including irrigation.

Some of the challenges that need to be addressed border on low participation levels of the relevant stakeholders at community level and among county governments. Efforts should be directed at strengthening institutional frameworks both at national and county levels which will be critical in coordinating response. Funds set aside to deal with the disasters are inadequate, and there is high reliance on donor funding. Investment in infrastructure and human development were identified as key in managing the disasters. This ties in with better economic and urban development choices.

### 2.1.2 Past and projected variability in rainfall and temperature over East Africa

The presentation was made by Dr Victor Ongoma from South Eastern Kenya University (SEKU) on trends in rainfall and temperature between 1951 and 2010. There has been decreased average rainfall over the East Africa region during the period, but there was an increase in mean temperature. The long rains season between March and May (MAM) registered low rainfall while June, July and August experienced higher temperatures. However, it was noted that the performance of the CMIP models from which these results were obtained tended to over-estimate and under-estimate the rainfall in the months of MAM. Projections based on CRU model showed that temperatures will continue to record anomalies, but rainfall patterns will improve and there was a possibility of a rise in temperatures by between 1.5–2°C.

From the discussions, it was observed that there was need to develop policies rather than strategies on emergencies resulting from droughts and floods. Greater insight was needed on climate change with clear understanding on the differences between climate change and climate variability. Regional models are also necessary for climate-related modelling and, in this case, reliance on short-term modelling was deemed more accurate compared to long-term modelling. However, caution needs to be taken on the rainfall data used, and this would require institutional collaboration.

### 2.1.3 Kenya's achievements with ending emergencies of droughts and floods: A Vision 2030 flagship

A presentation on 'What Kenya has Achieved with Ending Emergencies of Drought and Floods' was made by Veronica Okoth, Director, Economic and Macroeconomic Pillar, of the Vision 2030 Delivery Secretariat. Droughts and floods have implications for the achievement of the Kenya Vision 2030 aspirations of transforming the economy into one that is globally competitive and with a high quality of life. The channels through which droughts and floods affect achievements of the Kenya Vision 2030 include the economic pillar (especially agriculture), the social pillar (loss of lives and weakened human capital) and the enablers (destruction of infrastructure). The agriculture sector which is prone to droughts is a key component of the economic pillar of the Vision 2030. Extreme weather and climate changes also affect the entire economy, which relies on agricultural products. Climate change adaptation is anchored in the social pillar. The negative impacts of droughts and floods such as loss of lives contributes to weakening of human capital that would otherwise support achievements of the

Vision 2030. In 2018, for example, floods caused loss of 80 lives, displaced 45,219 households, and made 29 schools and 33 health facilities inaccessible.

The economic cost of droughts and floods in Kenya is estimated to contribute to long-term fiscal liability of about 2-2.8 per cent of GDP annually. Droughts alone are estimated to cost about 8 per cent of GDP every five (5) years, while estimated costs of floods are about 5.5 per cent of GDP every seven (7) years. A number of factors contribute to severity of droughts and floods in Kenya, including unique eco-climatic conditions, with 80 per cent of the land being ASALs characterized by annual rainfalls of 200mm-500mm, inadequate storage capacity, deforestation, poor management of catchment areas and land degradation upstream, and excess surface water runoff due to deforestation.

Various programmes were implemented during the first ten (10) years of the Kenya Vision 2030, including establishment of the National Drought Early Warning System (launch of a web-based early warning information system database that uses mobile phones in 2016/17); Rapid Drought and Food Security Assessments, implementation of the Hunger Safety Net Programme (HSNP) in four poorest counties (Turkana, Wajir, Mandera, Marsabit); Asset Creation Programme that benefited 117,500 households in 2016/17 and facilitated construction of rain water harvesting structures in 1,000 project sites across 14 ASAL counties; Rapid Preparedness Infrastructure Programming; Adaption to Climate Change initiatives such as County Climate Change Finance (CCCF); National Drought Contingency Fund; and adoption of climate change programmes.

More policy efforts are, however, required during the MTP III 2018-2022. Priority programmes for 2018-2022 includes climate change governance and coordination aimed at enhancing governance coordination and financing of climate change; capacity building and public awareness on climate change adaptation; climate change monitoring and verification; green innovations and technologies programme; formulation and implementation of National Climate Change Action Plan; and strengthening and continued implementation of policies and programmes that have been initiated. In conclusion, it was emphasized that devolution should be recognized as an asset that could be harnessed to tackle the impacts of droughts and floods.

### 2.1.4 The changing weather patterns: What we need to know

Representing the Kenya Meteorological Department (KMD), Mr Peter Ambenje began his presentation on the changing weather patterns in Kenya by underscoring the centrality of rainfall as the most important climatological parameter in Kenya, exhibiting both the greatest variations in space and time. He emphasized that

the space-time distribution of Kenya's total rainfall is closely associated with similar distributions in socio-economic activities and general water use. He also emphasized the criticality of temperature as the second most important climatological variable in Kenya, affecting evapo-transpiration, soil moisture and water availability. Both parameters have the longest history in respect of data collection in Kenya. Through a graph of the spatial mean annual rainfall distribution in Kenya, Mr Ambenje posited that the optimal distribution of socio-economic activities in Kenya was dictated by the country's climatic configurations.

On the causes of climatic changes, there is the influence of natural changes in the general circulation system, which at times has resulted in communities in some locations having to deal with periodic failure of seasonal rains and related drought, crop failure and famine while other communities are faced with acute periods of excessive rainfall, resulting in major flooding and related losses of human life and property. Such variabilities have generally increased in Kenya.

The presentation underscored that a major motivation for understanding changing weather patterns is to strengthen weather forecasting by providing reliable information regarding probable future weather conditions and inputting past and present weather data into forecasting models. Forecasting will help in reducing the impacts of weather-related disasters and assist in planning and taking advantage of favourable weather conditions to maximize economic productivity in its various forms. However, merely having the capacity to forecast alone is an insufficient resource for Disaster Risk Management. Rather, there is need to combine predictive capacity with adequate levels of preparation to negotiate the forecasted changes.

The time series of total annual rainfall in Kenya demonstrates a steady decline, which the presentation attributed mainly to decreases in total rainfall between March and May (MAM) which accounts for most rainfall in Kenya and increase in overall rainfall experienced between October and December (OND), spurred by intensifying El-Nino events in the Pacific Ocean. There is, however, a general rise in the intensity of rainfall across all locations, as distinct from the duration of rainfall. Concerning changes in annual temperature patterns, a rise in the maximal temperatures was observable across the country as demonstrated through temperature readings from Nyahururu, Narok, Dagoretti and Nakuru. This increase in temperature had resulted in areas that never had malaria increasingly becoming prone to malaria. The Kenya Meteorological Department and Kenya Medical Research Institute (KEMRI) are working closely to apply weather data towards developing early interventions in malaria-prone parts of the country. Other beneficiaries of data generated through this partnership include organizations such as the Kenya Red Cross Society.

The number of consecutive wet days (CWD) and consecutive dry days (CDD) had exhibited rising trends, suggesting fewer day-to-day changes in weather conditions and more salient chronic weather changes.

In concluding, the presentation underscored the need for broader recognition that Kenya's climate and weather patterns, and global climatic conditions generally, were experiencing unequivocal changes. With such changes comes the need for urgent action to avert climate-related catastrophes. It is therefore important that climate-proofing all climate sensitive socio-economic activities is imperative if sustainable development is to be realized.

## 2.2 ECONOMIC IMPACT OF DROUGHTS AND FLOODS

### 2.2.1 Introduction

The conference deliberations on the economic impact of droughts and floods benefitted from three main presentations. The Principal Secretary, State Department of Planning, Dr Julius Muia, made the keynote address on the "Macroeconomic costs of droughts and floods: The Kenya experience", which was followed by a presentation by Dr Naomi Mathenge, a Policy Analyst at KIPPRA, on the "Implications of drought and floods on key macroeconomic variables". Thereafter, Mr Job Wanjohi, Head of Policy, Research and Advocacy at the Kenya Association of Manufacturers (KAM) highlighted the "Implications of drought and floods on the cost of doing business".

Overall, adverse weather conditions have negative effects on economies, the society and the environment. Droughts and floods, the most common adverse weather conditions in Kenya and in most of Africa, often have negative economic and social consequences. For example, the economic costs are manifested in disruption of production flows resulting in production losses, income losses, loss of employment, and increased operational costs. The effects on society, while largely negative, have come to be identified as part and parcel of daily lives, and communities have developed various coping mechanisms. Interestingly also, certain communities in Kenya have adapted to naming new born children after such disasters, making these disasters intertwined with their culture and tradition. The negative consequences are felt in different social aspects including education, housing, health, etc. The conference brought to the fore the economic and social costs emanating from droughts and floods, highlighting the different experiences and responses by different social groups.

Societies respond differently to adverse weather conditions. Some population groups are more vulnerable owing to the nature of their livelihoods. For example, households living in the ASALs are highly predisposed to the negative effects of

droughts and floods. Communities living in hilly ecological zones are also highly prone to landslides, and those on flat terrains are prone to flooding. Moreover, men, women, boys and girls experience the effects of adverse weather conditions differently, making their responses varied. Thus, certain population groups are more vulnerable and mitigation and resilience measures should therefore be differentiated. The capacities of the various population groups as first responders of the effects of droughts and floods differ.

### 2.2.2 Economic impact of droughts and floods in Kenya

From an economic perspective, the cost of recovery from droughts and floods were noted to be seven (7) times higher than the cost of preventing the negative effects. This reflects the importance of building capacities for the economy to be well cushioned from the negative effects of these disasters. Building capacity and resilience requires concerted efforts at national and county governments. At the national level, several strategies have been put in place. These include the Galana Kulalu project, a Vision 2030 flagship project aimed at expanding the area of land under irrigation. The project aims to mitigate the negative effects of droughts. Provision of drought-resistant seeds to farmers is another programme aimed at ensuring adequate food supply.

The Principal Secretary, State Department of Planning, The National Treasury and Planning, Dr Julius Muia noted that the effects of drought and floods are not only felt in the agricultural sector but also in other sectors that depend on agricultural outputs. Mitigation measures are key in facilitating the achievement of Kenya's development priority areas with a special focus on food and nutritional security. Besides droughts causing severe food shortages affecting millions of Kenyans, the livestock sector also suffers untold livestock deaths. The scarcity of pasture for livestock gives rise to resource conflicts among communities that heavily rely on livestock for their livelihoods. The ripple effects include disruption of livelihoods, which is a threat to peace and security.

It is not only in the agricultural sector where the effects of drought and floods are felt. Depressed rainfall often leads to disruption of water supply. In a country with a heavy reliance on hydro-electricity power generation, the effects of droughts and floods are widespread and include power shortages felt by both households and firms. Floods, for instance, lead to disruption of infrastructure such as roads, bridges, schools, health facilities and electricity connections. Rebuilding infrastructure is costlier than ensuring it is not destroyed. There is also the loss of lives, destruction of homes leading to internal displacements of communities.

The above effects affect the local economy of the affected regions and, in most cases, this extends to the national economy. The macroeconomic effects at the national level are mainly manifested in reduction of GDP arising from productivity losses in the sectors. Such losses necessitate government intervention to cushion communities from further effects. The interventions often include increased expenditures that have fiscal implications. Drought and flood disasters also reduce government revenues from production taxes and import duty as the government often must import essential food stuffs such as maize, wheat, sugar and milk. Increased expenditures that have been witnessed in the face of droughts and floods include food relief donations, evacuation for flood victims and restoration of infrastructure such as bridges that have been swept away by floods.

With this background and given the frequent occurrence of both droughts and floods, the government is actively engaged in building resilience towards their negative effects. The Kenya Vision 2030 identifies ending drought emergencies as a programme that will ensure preparedness in the face of national disasters, thus minimizing the need for *ad hoc* responses that impact negatively on the macroeconomic indicators. In the Medium-Term Plan (MTP III) of the Kenya Vision 2030, drought management is identified as key in ensuring food security. Also, the Sustainable Development Goal (SDG) 13 on climate action recognizes the need to build capacity on resilience and adaptation measures given that climate change is a reality and there is no country that is not experiencing adverse weather conditions.

Other measures that have put Kenya at the forefront in responding to droughts and floods include the National Drought Management Authority (NDMA) which was established in 2011 with the mandate of ensuring that droughts cease being emergencies in the country. In 2016, the National Drought Emergency Fund was established through the Public Finance Management (PFM) Regulations as a way of consolidating funds meant for mitigating the effects of droughts. This will ensure timely response to drought-related needs. The Fund is also expected to be used for development of capacity and technical expertise to improve drought management.

Other measures undertaken by the government include livestock off-take in ASALs, where the government buys livestock from herders before they become emaciated and sells them to the Kenya Meat Commission (KMC). The proceeds that the herders get can then be used for restocking when adverse weather subsides. Besides livestock offtake, the Kenya Livestock Insurance Programme (KLIP) has been used for insurance pay-outs to reduce livestock-related losses. Through the National Drought Contingency Fund, the government sets aside funds every year that cater for national disasters, under which droughts and floods are classified.

Long term measures are, however, needed to mitigate the effects of droughts, and the government has prioritized construction of large-scale dams for water harvesting across the country. Such water can be used during drought periods. At institutional level, the National Drought Management Authority (NDMA) and the National Disaster Operation Centre (NDOC) have been established mainly to, among other things, coordinate the national effort in reducing the impact of the rains and widespread infrastructural and environmental destructions.

While the above measures have gone a long way in helping build resilience and coping mechanisms, the government has continued to strengthen its response by putting in place policies and strengthening existing frameworks for managing national disasters. For example, the enactment of the Disaster Risk Management Bill was approved by the Cabinet and is awaiting tabling in Parliament for further discussion. Climate change mitigation and adaptation strategies have been mainstreamed in various national development plans and programmes and will further be cascaded to county governments. The above measures and frameworks have not been confined to national borders. Globally, Kenya is a signatory to agreements and frameworks that relate building resilience including SDGs, the United Nations Framework Convention on Climate Change (UNFCCC), the Paris Agreement, and the Sendai Framework for Disaster Risk Reduction.

The specific effects on macroeconomic variables were highlighted through a presentation by Dr Naomi Mathenge, a Policy Analyst at KIPPRA. Even though droughts and floods do not occur in isolation, and at times they occur in tandem with other events that have effects on economic systems, including political instability, high international commodity prices, and global downturns, among others, it was possible to isolate patterns in the disruption of production flows, decline in revenues, and higher operational costs that typify disaster periods. The economic effects of droughts and floods are manifested in the disruption of production flows, production losses, income losses, and increased operational costs.

Kenya's economic structure heavily relies on the agriculture sector and thus adverse weather conditions either in form of droughts or floods significantly affect economic performance. The contribution of the agricultural sector to GDP averaged 25.9 per cent between 2002 and 2017. However, given the backward and forward linkages among the sectors, effects on the agricultural sector have a spillover effect on other sectors such as manufacturing. While sectors such as manufacturing may not be directly affected by neither floods nor droughts, their linkages with sectors directly affected (e.g. agriculture, transport, hydro electricity production, etc) exposes them to the adverse effects.

As noted previously, the macroeconomic effects at the national level are mainly manifested in reduction of GDP arising from productivity losses in the sectors, resulting in macroeconomic imbalances. The imbalances, though often temporary in nature, arise either directly from the natural disasters and/or from government's efforts to mitigate the economy against the negative effects of droughts or floods. The main imbalances occur in the fiscal, and the external sectors.

It is important to note that macroeconomic stability is a necessary condition for the overall performance of the economy. The next sub-section presents some of the effects observed during disaster periods.

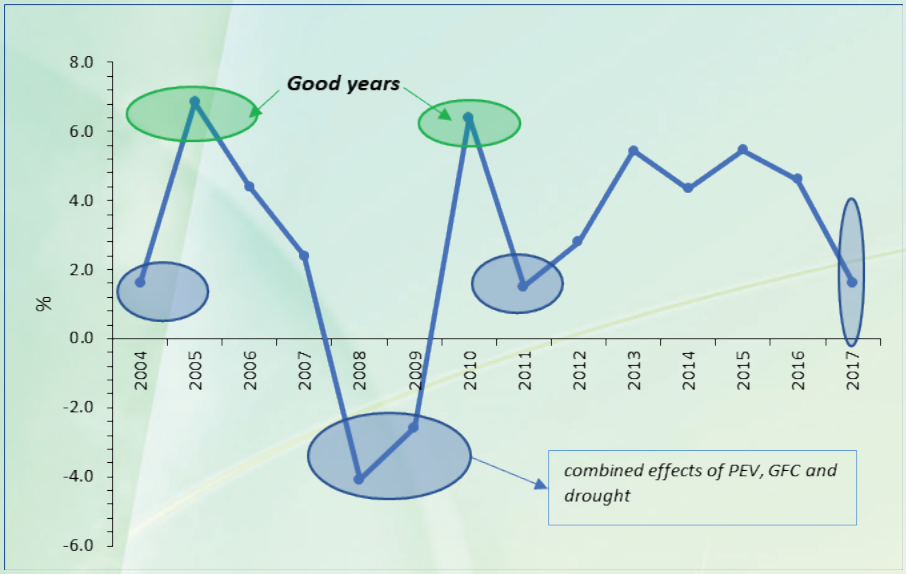
### 2.2.3 Sectoral effects of droughts and floods

The agricultural sector is an important part of the Kenyan economy, contributing an average of 30 per cent of GDP. The average contribution for 2013-2017 was 29.54 per cent. Trends in agricultural performance show depressed growth rates during periods of adverse weather conditions. Figures 2.2, 2.3 and 2.4 show the performance in the agriculture sector with special focus on crop production. Growth in agriculture slows down in times of droughts and floods as observed in 2004, 2008/9, 2011 and most recently in 2016/17 with growth in crop production being more affected compared to growth in livestock. Comparing specific crops, Figure 2.4 shows that maize production, which is a staple crop in the country, declines during periods of adverse weather conditions. However, to complement the decreased production in maize, imports (as will be shown later) increase, with the government waiving import duty to encourage importation. This is necessitated by the need to ensure food security.

The effects on the other sectors, Figures 2.5 and 2.6, show that electricity generation during periods of drought declines due to over-reliance on hydro-generated power. Prior to 2014, the main source of electricity generation in Kenya was hydro power generation. However, renewable energy sources from mainly geothermal are gaining prominence as important sources of electricity supply. Wind energy started contributing to the national grid in 2016.

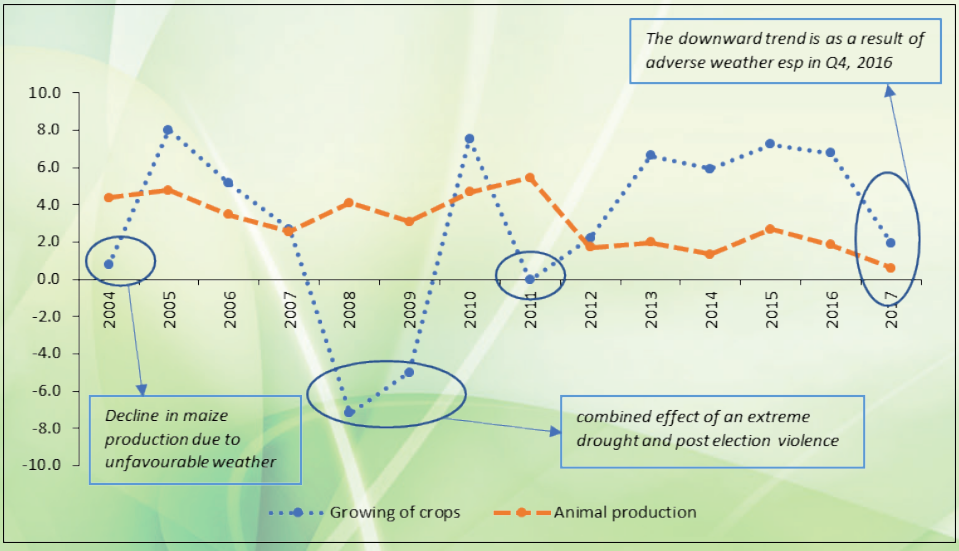
The manufacturing sector has linkages with the agricultural sector by way of provision of raw materials for the agroprocessing industry. The sector is also highly affected by availability and cost of water and energy which feed into the cost of doing business. Figure 2.5 shows that the sector experienced declining growth during the prolonged drought period of 2008-2011 compared to previous periods. Likewise, there was also a decline in 2016 especially for the manufacture of food, beverages and tobacco.

**Figure 2.2: Growth rate (%) of agriculture, forestry and fishing**



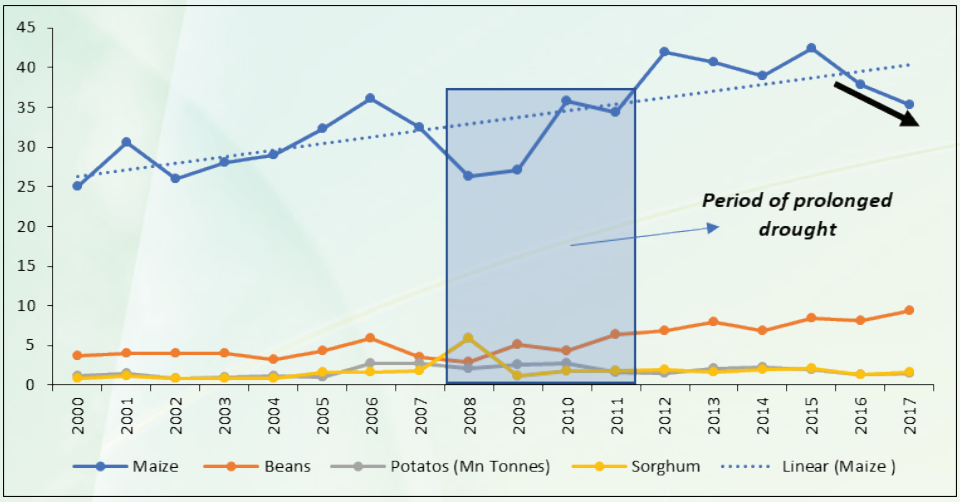

*Data Source: Kenya National Bureau of Statistics (Various), Economic Survey*

**Figure 2.3: Growth rate (%) of crop and animal production, 2004 to 2017**



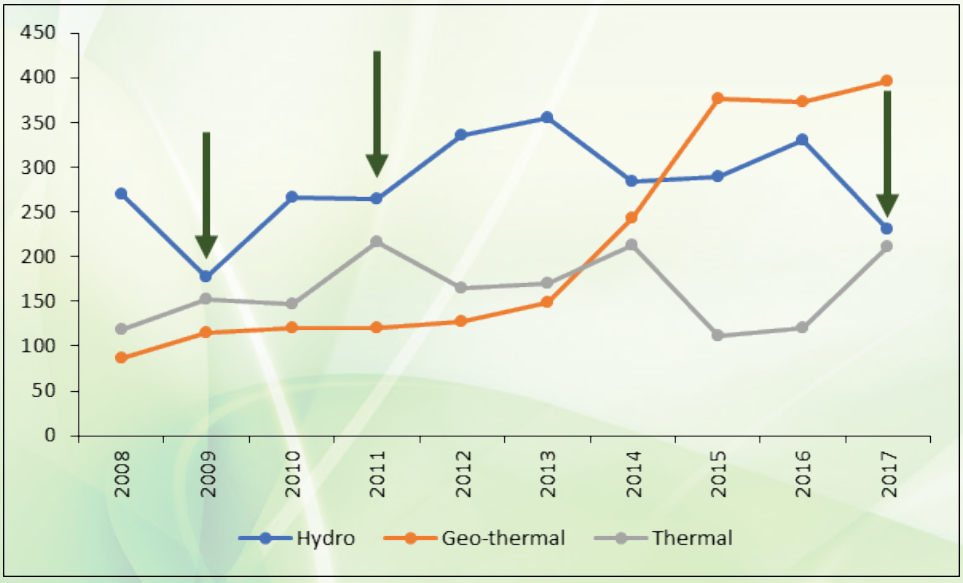

*Data Source: Kenya National Bureau of Statistics (Various), Economic Survey*

**Figure 2.4: Estimated production of selected agricultural commodities (million bags)**



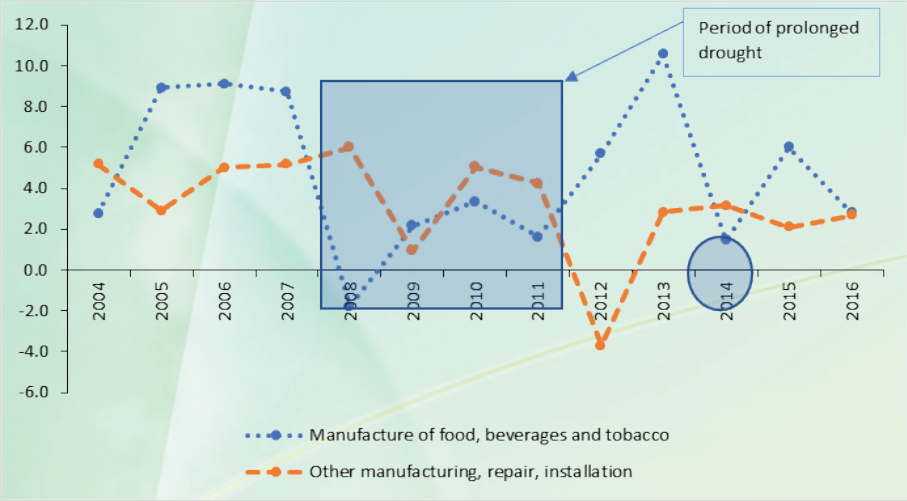

*Data Source: Kenya National Bureau of Statistics (Various), Economic Survey*

**Figure 2.5: Monthly average electricity generation by source, 2008 to 2017**




*Data Source: Kenya National Bureau of Statistics (Various), Economic Survey*

**Figure 2.6: Growth rate (%) of the manufacturing sector, 2004 to 2016**




*Data Source: Kenya National Bureau of Statistics (Various), Economic Survey*

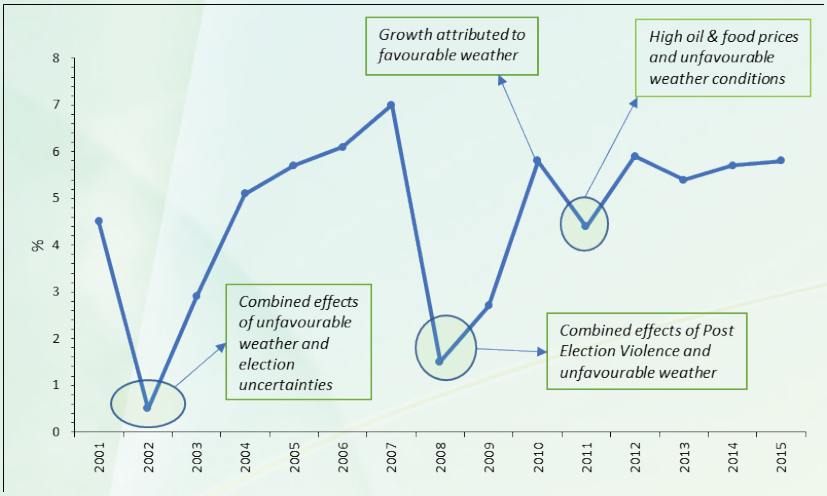
### 2.2.4 Overall effect on GDP

A decline in sectoral growth is manifested in slowed GDP growth rate. From a field survey carried out on post-disaster needs assessment (PDNA) for Kenya, it is estimated that because of the 2008–2011 drought, the losses and damages incurred by the economy amounted to US$ 12.1 billion, with the livestock sector absorbing 72 per cent of the losses. At the same time, GDP growth rate slowed down by 2.8 per cent per annum across all sectors. From Figure 2.7, economic growth declined during the years when there were unfavourable weather conditions, even though the unfavourable weather was combined with other events during the period.

### 2.2.5 Effects on public finance

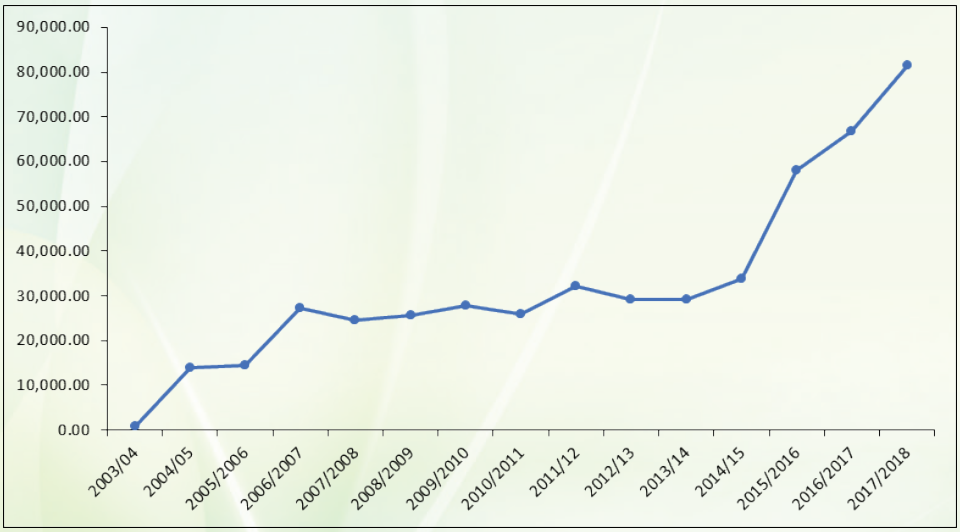
Public expenditure increases as the government undertakes temporary measures to address production losses and destruction of productive fixtures. This includes expenditure on resilience and mitigation measures to cushion consumers from escalating prices caused by supply constraints. Such expenditures are mostly on relief food and cash transfer programmes. Figure 2.8 shows expenditures on social benefits for the period 2003/2004 to 2017/2018. The largest share is usually for normal cash transfers mainly to older persons, and this has been increasing almost every year. The Hunger Safety Net Programme which targets poor households is extended to affected households whenever there is a drought. Such transfers for drought-related measures are then withdrawn once normalcy returns.

**Figure 2.7: GDP growth rate (%), 2001 to 2015**




*Data Source: Kenya National Bureau of Statistics (Various), Economic Survey*

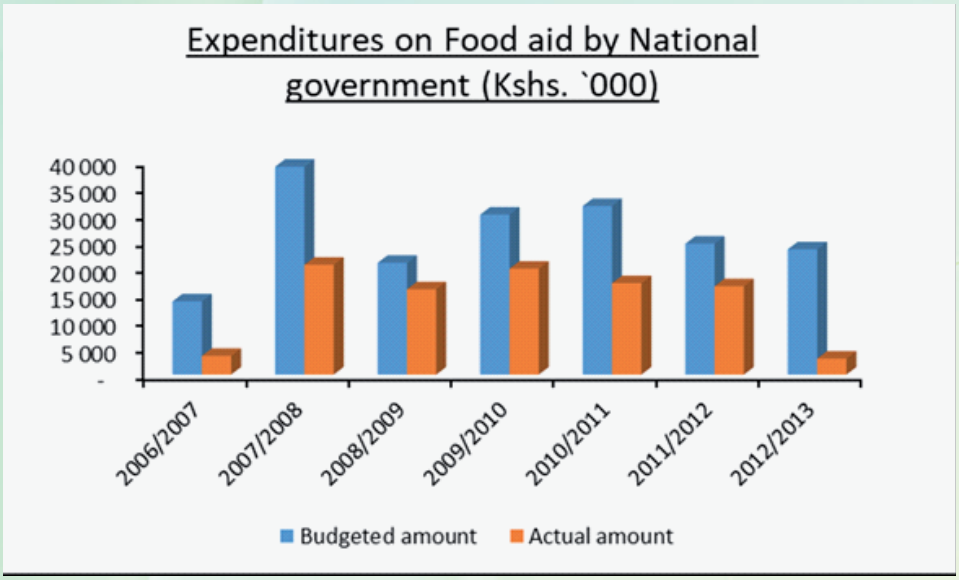
**Figure 2.8: Expenditures on social benefits**




*Data Source: Kenya National Bureau of Statistics (Various), Economic Survey*

Figure 2.9 shows the expenditures on food aid by the national government between 2006/07 and 2012/13. In 2017, the government declared drought a national disaster and Ksh 11 billion was set aside to cater for drought-related interventions, including providing food rations and cash transfers to affected households. Likewise, in 2018, Ksh 4 billion was set aside for drought-related activities, out of which Ksh 2.5 billion was for relief food and cash transfers. To

**Figure 2.9: Expenditures on food aid by the national government**

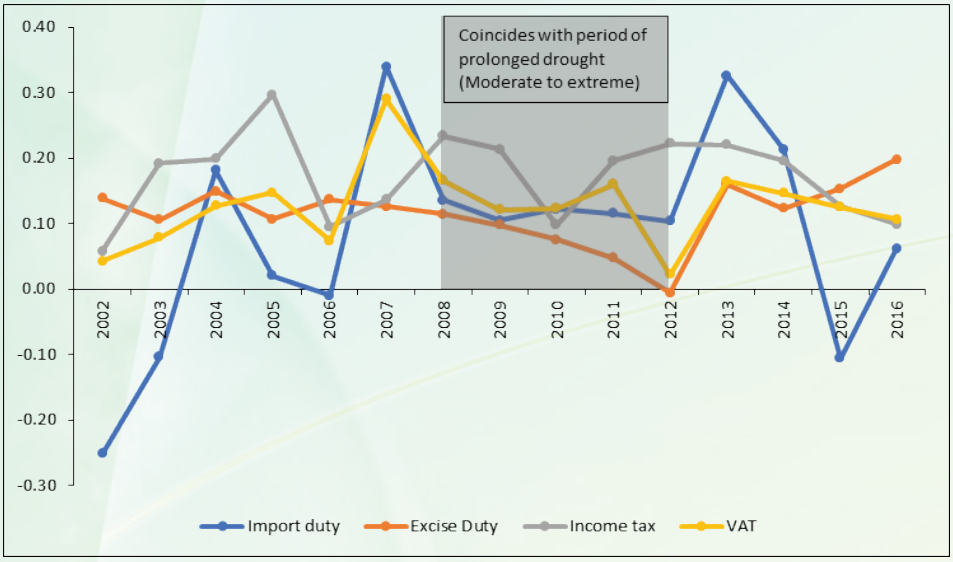



*Data Source: Kenya National Bureau of Statistics (Various), Economic Survey*

meet these expenditures, the government can either borrow (domestically or externally) or re-allocate expenditures from other programmes as provided for in the PFM Act (2012). The fiscal responsibility principles provide for deviations from financial objectives of public revenues "only on a temporary basis and only where such deviation is caused by a major natural disaster, other significant unforeseen event...." (PFM Act, 2012).

On the revenue side, natural disasters reduce government revenue following decreases in tax revenue collections brought about by production losses and destruction of productive fixtures. For example, the prolonged drought of 2008-2011 slowed down growth of tax revenues especially from VAT and Excise duty. Notable during this period were the tax exemptions given to importers. For example, between February 2007 and February 2008, importers of raw/mill sugar could import up to 89,000 metric tonnes duty free from COMESA Free Trade Area countries to curb the rising prices caused by drought (Kenya Gazette, Vol CXIX-No. 47). Likewise, duty on imported maize was suspended in 2009, 2011 and 2017, and maize flour and bread were zero rated in 2017 to curb rising prices. Despite the increase in imports to cater for production deficits, growth in imports duty fell during these periods as shown in Figure 2.10, with direct implications on fiscal balance.

**Figure 2.10: Growth rate (%) of selected tax revenues**




*Data Source: Kenya National Bureau of Statistics (Various), Economic Survey*

### 2.2.6 Effects on the external sector

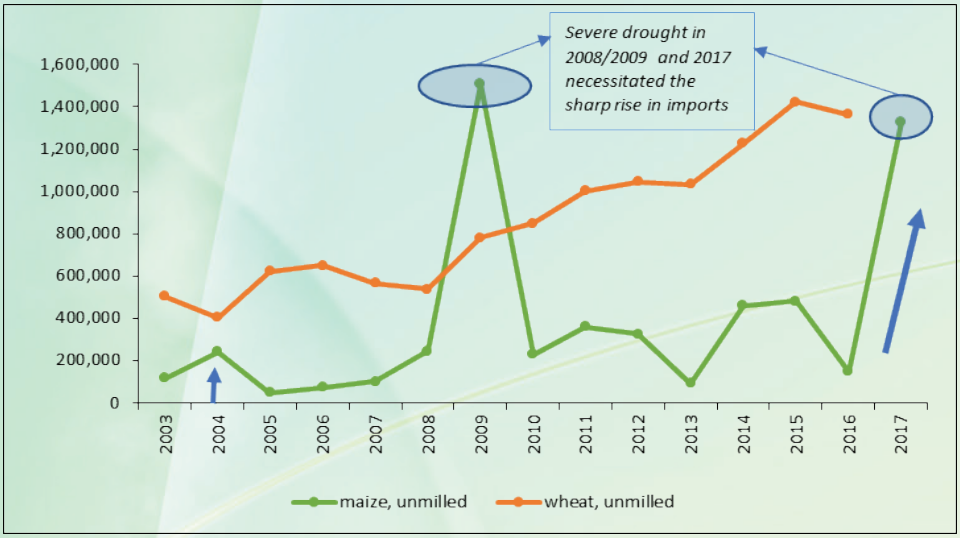
As noted earlier, adverse weather conditions necessitate an increase in imports, especially food imports to cater for the shortfall in production. Likewise, interruptions in production arising from the effects of droughts and floods lead to decrease in the exports of certain products. Such effects exert pressure on the exchange rate, leading to a depreciation of the Kenya shilling against major currencies, especially if exports of other major items decline.

Figure 2.11 shows the direct imports of wheat and maize during the period 2003 to 2016. From the figure, it is obvious that wheat imports have been on the rise. However, maize imports are episodic, with sharp increases during drought years as observed for 2004, 2009 and 2017.

Looking at the cost of imports, Figure 2.12 shows that the cost of imports of raw maize increased drastically during drought periods. Comparing this with the domestic exports of unmilled maize, the drought period is characterized by declines as shown in Figure 2.13.

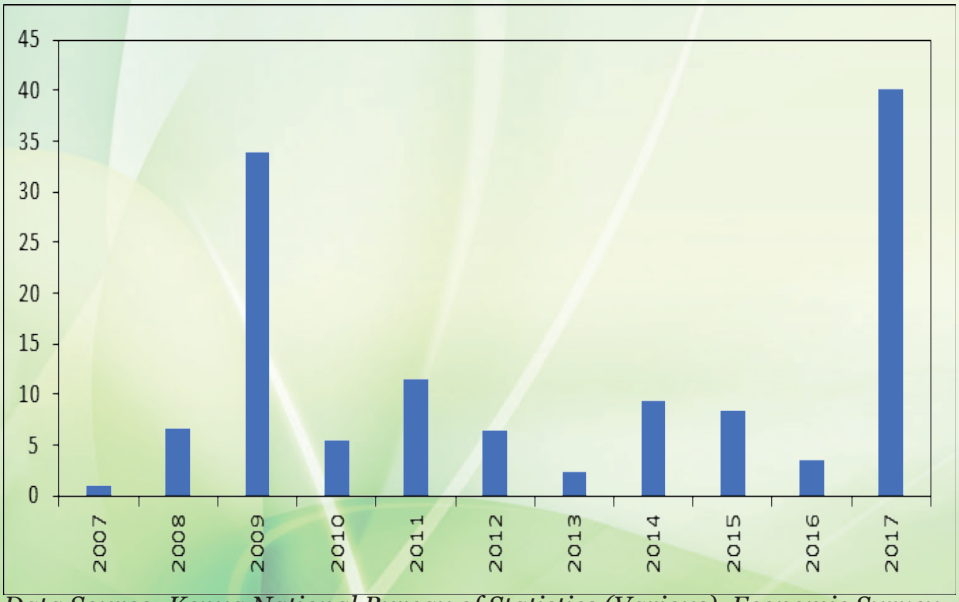
As may have been observed from the preceding part of this sub-section, it is not all gloom as some sectors perform better during drought, such as horticulture (Figure 2.14). However, the net effect of drought is generally negative.

**Figure 2.11: Direct imports of selected products, 2003 to 2016**



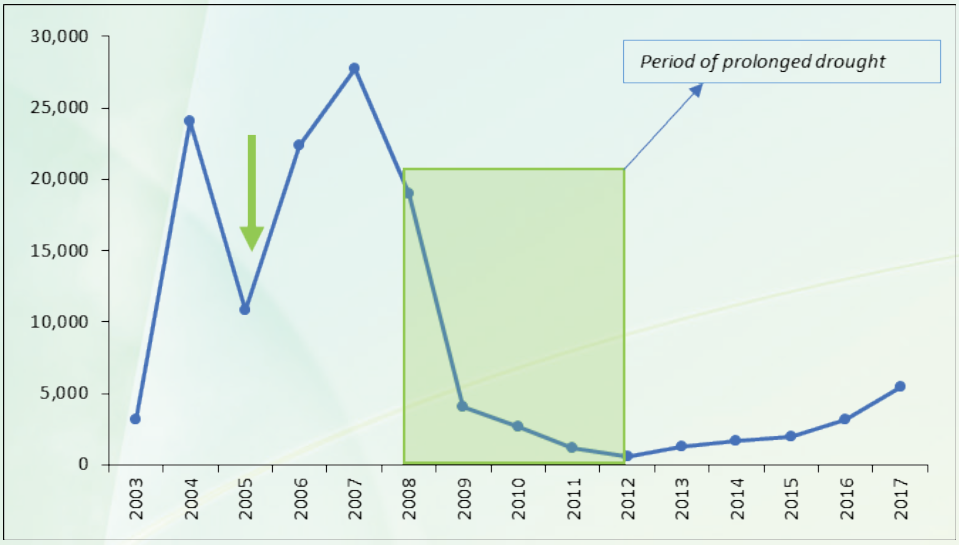

*Data Source: Central Bank of Kenya*

**Figure 2.12: Cost of import of raw maize (Ksh billions), 2007 to 2017**



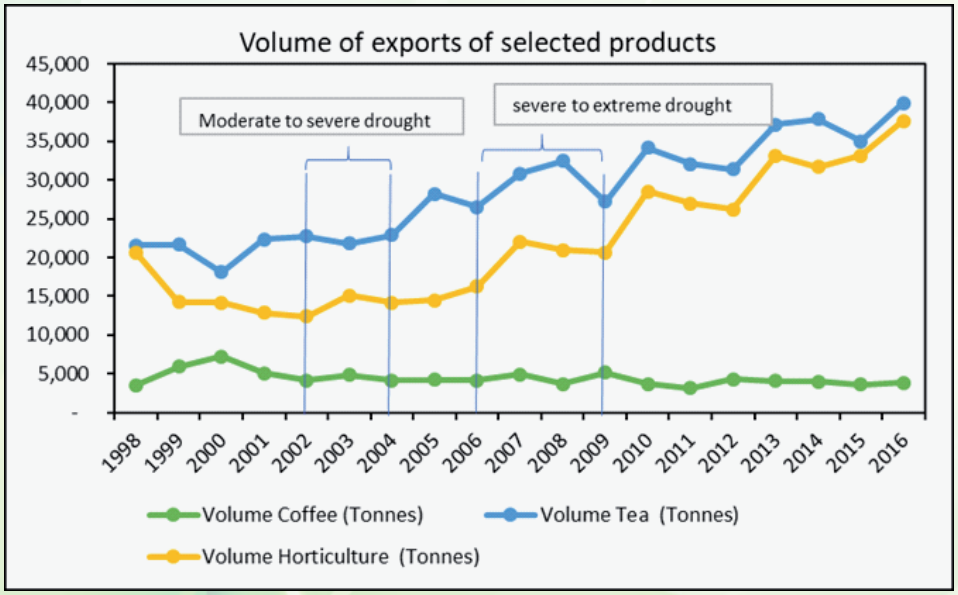

*Data Source: Kenya National Bureau of Statistics (Various), Economic Survey*

**Figure 2.13: Domestic export of unmilled maize (tonnes), 2003 to 2017**




*Data Source: Kenya National Bureau of Statistics (Various), Economic Survey*

**Figure 2.14: Volume of exports of selected products, 1998 to 2016**




*Data Source: Kenya National Bureau of Statistics (Various), Economic Survey*

Overall, increased imports and reduced exports during droughts compound the imbalance observed on the current account.

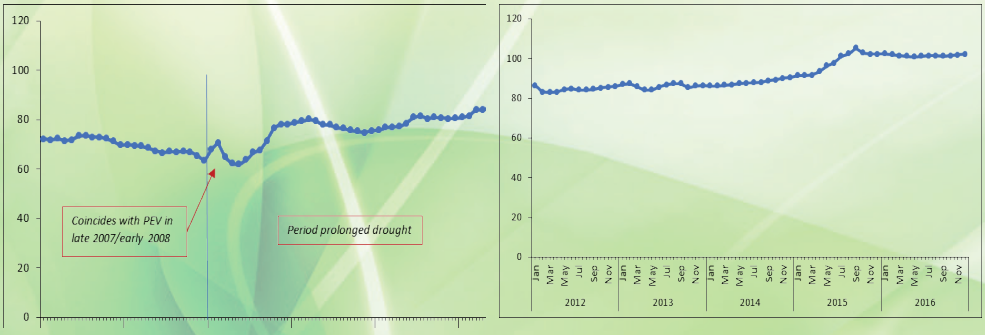
The effects on exports and imports exert pressure on the exchange rate, leading to a depreciation of the Kenya shilling against major currencies, especially if exports of other major items decline. Figure 2.15 shows the trends on the exchange rate (Kenya shilling against the US$).

### 2.2.7 Effect on prices and inflation

The effects on prices and inflation are felt due to supply constraints brought about by crop failure that results to reduced production and increased costs of production. For example, food and electricity prices are bound to rise due to food shortages and reduced hydro power generation. With reduced and unreliable hydro power, there is bound to be an increase in industrial costs as firms seek alternatives, mainly thermal power that relies on imported fuel. The combined effects will be inflationary pressure on domestic prices. Initial insights on the effect of disasters reveal that inflation was high during all drought years, mainly fuelled by increased food prices as shown in Figures 2.16 - 2.18. For example, food inflation rose in 2017 mainly due to increases in the prices of maize flour, sugar and beef with a 36 per cent share of food inflation in overall inflation.

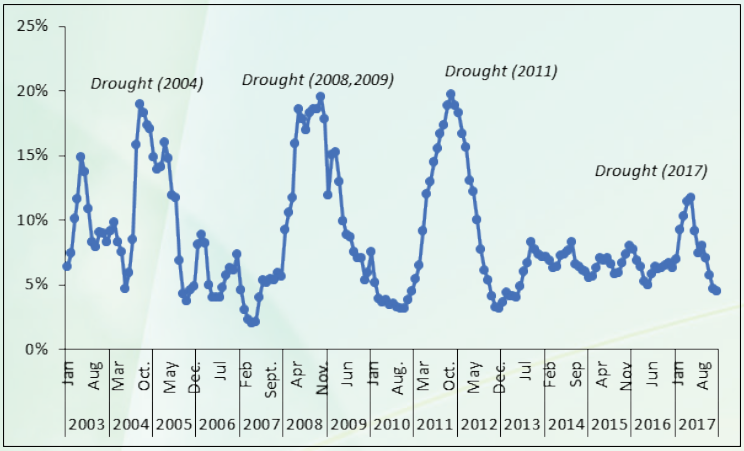
To provide further insights on the sectoral effects, Mr Job Wanjohi, Head of Policy, Research and Advocacy at the Kenya Association of Manufacturers (KAM) made a presentation on the implications of droughts and floods on the cost of doing business, with focus on the manufacturing sector. It was noted that 45 per cent of output from the manufacturing sector is agrobased, making it vulnerable to weather-related shocks. This was reinforced further by Ms Veronica Okoth

**Figure 2.15: Monthly average exchange rate**



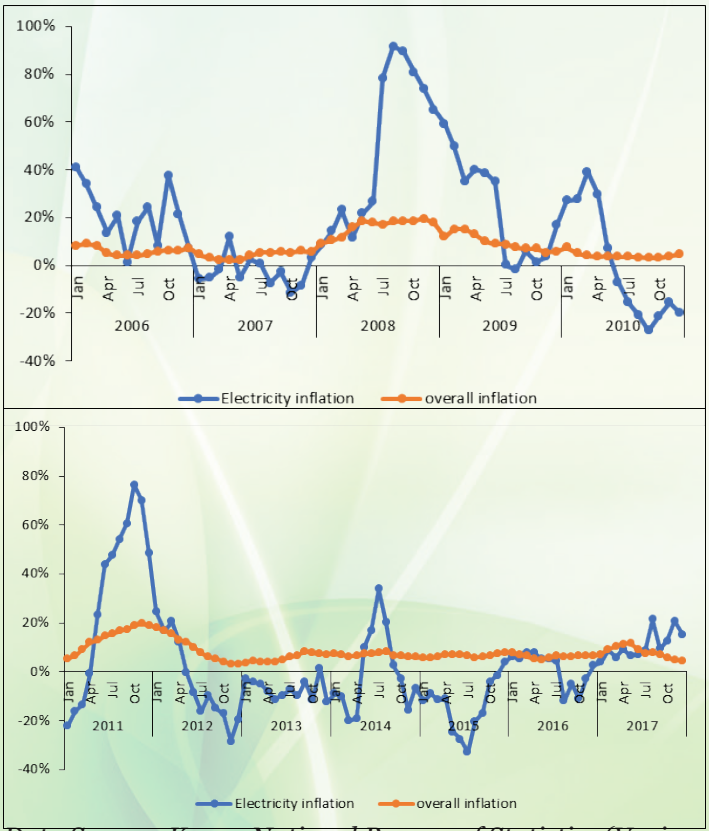

*Data Source: Central Bank of Kenya*

**Figure 2.16: Overall inflation, 2003 to 2017**



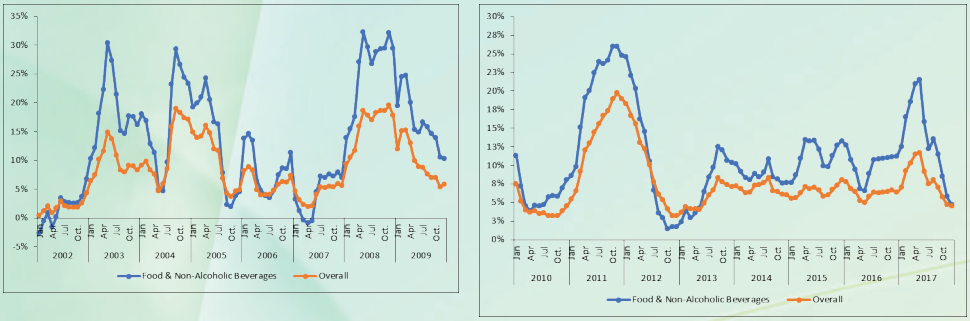

*Data Source: Kenya National Bureau of Statistics (Various), Economic Survey*

**Figure 2.17: Overall electricity inflation, 2006-2010**




*Data Source: Kenya National Bureau of Statistics (Various), Economic Survey*

**Figure 2.18: Overall and food inflation**




*Data Source: Kenya National Bureau of Statistics (Various), Economic Survey*

representing the Kenya Vision 2030 Delivery Secretariat who observed that with the manufacturing sector being over 45 per cent agrobased, weather-related vulnerabilities of the agriculture and electricity sectors needed to be addressed. Among the solutions that can be adopted for building the manufacturing sector resilience include construction of more durable roads, sustainable harvesting of forests, food storage and reduction of post-harvest losses coupled with early warning systems.

Another element that was noted to be a key concern was the energy-intensive dependence of the manufacturing sector, with an average of 60 per cent energy input by many firms. High energy costs affect the competitiveness of the manufacturing sector; Kenyan products are often 12 per cent off the international price competitiveness. As such, the move to renewable energy sources was most welcome. The government needs to reduce the cost of production through incentives and low-cost electricity.

The manufacturing sector is key in building resilience towards droughts and floods, and KAM participates in subsidy programmes alongside the government. This shows that public-private partnerships (PPPs) can be crucial in handling drought emergencies.

The conclusions drawn from the presentations on the economic impacts of droughts and floods indicate that there is need to increase efforts in managing and responding to the disasters. Other measures that can be put in place include improvement of infrastructure development, especially transport, ICT and storage facilities with the objective of developing more resilient infrastructure.

In addition, there is need to integrate research and development into drought management and response, including but not limited to research on fast-growing and drought-resistant crops that have higher productivity. Findings from such research should be implemented as this will be key in ensuring a sustained supply

of alternative food products. Energy diversification is also key especially with the vast renewable energy resources such as geo-thermal, wind and solar energy, and these should be scaled up.

With 80 per cent of Kenya being ASALs, it was observed that there are crops which can be grown in these areas, especially the drought resistant crops. The government could consider enhancing irrigation to ensure constant supply of food.

An adaptation plan for the shocks is necessary. As demonstrated by Mr Kwame Owino of the Institute of Economic Affairs (IEA) Kenya, there are overlapping risks including political risks, management risks, harvest effects, and industry level effects. Drought and floods reinforce the political environment.

It was also noted that weather forecasts cannot be ignored without risk. The Kenya Meteorological Department (KMD) has been consistent in early warning systems (EWS) and, as an example, it was noted that KenGen is able to obtain information in advance from KMD and hence can manage electricity production. What is needed are multi-purpose water harvesting measures that can take care of drought periods.

Discussions were also held on the possibility of introducing price control measures to curb rising food prices during periods of droughts. It was, however, noted that prices are derived from cost of production, thus controls will affect investment and production. The conclusions drawn are that Kenya is a market-based economy and price regulation would distort production and distribution processes. Instead of introducing price controls, it would be more prudent to promote resilience through market-based incentives.

It would also be difficult to capture price points if price controls are introduced. Participants were reminded that previous government attempts to control prices have been unsuccessful. For example, rationing for low maize flour in the 1980s was frustrated by market dynamics.

In conclusion, it was noted that supporting the “Big Four” agenda of the government was one way that Kenya can enhance its resilience, as it touched on improving and diversifying capabilities. For example, increasing the share of the manufacturing sector in GDP from the current 9 per cent to the envisaged 15 per cent was one way of diversifying the economy and therefore reducing its over-reliance on agriculture.

The Principal Secretary, State Department of Planning, also noted that information is power and there was need to find ways of disseminating the information in

a sustainable way to individuals, institutions, and county governments and at national level. The Kenya Private Sector Alliance (KEPSA) and the Kenya Association of Manufacturers (KAM) should tap on business opportunities that can exploit incidences of droughts and floods, such as diversification of food crops and production technology.

## 2.3 SOCIAL IMPACT OF DROUGHTS AND FLOODS

### 2.3.1 Showcasing effects of droughts and floods on social lives: Experiences from Mtito Andei Primary School and Kano Plains

**Case Study 1: Ms Winfred Sila, Head Teacher, Mtito Andei Primary School, Kibwezi Sub-County, Makueni County**

Mtito Andei Primary School was started in 1994 and borders Nairobi and Machakos counties. Given its proximity to Tsavo National Park, the school is occasionally invaded by wild animals such as elephants and monkeys. This happens mostly during the dry season as animals search for water. The participants were shown a video of the devastating effects of droughts. Some of the consequences highlighted include:

- Persistent hunger and famine due to very little water to support growing of food. With persistent food shortages, pupils go hungry and this affects their concentration, leading to poor academic performance.
- Poor hygiene due to scarcity of water leads to vulnerability to diseases. Communities turn to untreated water sources, and children often drink untreated water, leading to illness.
- Related to the above is poor public sanitation and hygiene affecting health outcomes especially for school-going children.
- There are rising cases of re-allocation to better regions leading to school drop outs.

Some of the proposed solutions to droughts include:

- Planting trees in a bid to increase forest coverage.
- Crop diversification by adopting drought resistant crops.
- Sinking boreholes to ensure sustainable water supply, and incorporating water harvesting systems in schools.
- Sustainable waste management in schools.
- Strengthening school feeding programmes to retain children in school.
- Livelihood diversification.
- Promote safe healthy schools, which entails safety while in school, health and nutrition, community partnerships and linkages with the community.

It was observed that besides droughts, floods also affect schooling. Some of the notable negative effects include damage to infrastructure, rise in water borne diseases, and water contamination. To curb these effects, there is need to erect flood barriers along rivers, build water reservoirs to collect excess water, and ensure proper maintenance of existing dams to avert catastrophes such as the Solai Dam tragedy in Nakuru County in 2018 which saw the dam breaking down due to excess water, leading to loss of lives and property. There is need to map flood-prone areas and put in place the necessary infrastructure to reduce the risk of such tragedies. It is also necessary to make it a personal initiative to mitigate droughts and floods by taking up small steps such as tree planting, trapping rain water and conserving the environment.

**Case Study 2: Jane Anyango Adika, Makina Sub-location, Nyando, Kisumu County**

Ms Jane Adika famously known as "Serikali Saidia" lives in the flood-prone area of Makina sub-location in Nyando. The area is home to River Nyando which has been known to burst its banks whenever the region experiences above normal rainfall. She narrated her experience of floods having suffered the consequences of flooding every season. She has had her home swept away leaving her and her family homeless and has persistently appealed to the government for help.

She recalled the day flooding took place at her home in 2011/2012. She was at her home at 3 p.m. when a dyke constructed by the government was overwhelmed by the floods, and it started flooding at her homestead. Her home was flooded and household assets were destroyed. Maize which was in the farm, her home and belongings were completely swept away. Her children did not return home from school due to floods, and she did not know where her husband had fled to; in her words she recalled "sikuona bwana karibu" ...."niliita jirani wakakataa"....."hata watoto hawakurudi nyumbani sababu hakuna mahali pa kupitia" ("I did not see my husband nearby"... "I called for help from neighbours but they did not turn up"... "even the children did not come home because there was no place to pass").

She observed that the government has in the past appealed to the residents of the area to move to higher grounds, but it was difficult to convince residents to leave behind their source of livelihoods and move before the floods. However, after the floods, the Kenya Red Cross, alongside the government stepped in to assist in recovery efforts in the form of provision of relief food and household commodities. Despite her home being swept away, there are no efforts to assist in reconstructing her home.

She appealed for more long-term solutions including dealing with increased sedimentation of River Nyando, construction of dykes, and provision of insurance services to assist those affected in reconstructing their lives.

### 2.3.2 Gender and economic livelihoods

Dr Michele Leone, Senior Programme Officer, IDRC Climate Change Programme, made a presentation on gender and economic livelihoods in relation to floods and droughts. In the presentation, it was noted that women and girls are uniquely affected by issues of climate change, and the experiences and responses to risk should depend on such factors as age, gender, household size, economic status, ethnicity, education, class and who heads the household. Ignoring these dynamics may render resilience and adaptation measures unsuccessful.

Other considerations include identifying the most vulnerable and taking into consideration how vulnerabilities get transferred over time and across groups. People's perception in vulnerability matters, and there is need to take this into account in policy and decision making. Women are not necessarily more vulnerable than men. In the ASALs, for example, young men were becoming more vulnerable. Previously, programmes have not been measuring vulnerability across gender groups and social diversity, yet Mr Patrick Lavanghomme from UNICEF noted that natural disasters impact differently on communities depending on their vulnerabilities.

Some of the coping mechanisms adopted by communities include migration and human mobility due to lack of capacity to adapt to the adverse effects of climate change. However, some household dynamics make migration complex, hence different services that target women and children need to be considered.

One key challenge is the availability of disaggregated data on droughts and floods that is important for understanding these diverse gender issues in responding and mitigating the adverse weather-related issues. Some existing assumptions on vulnerabilities were also challenged. These include:

- That women are more vulnerable than men, which was found not to be the case.
- That diversification of sources of livelihoods can enhance resilience. On the contrary, too much diversification of sources of livelihoods as strategies for adaptation can be overwhelming for some gender groups such as women, as more responsibilities are added to them.

### 2.3.3 Effects of droughts and floods on the well-being of children, the elderly, and vulnerable groups

Expounding on the effects of droughts and floods on the well-being of children, the elderly, and vulnerable groups, Mr Patrick Lavanghomme from UNICEF

noted that natural disasters impact differently on different population groups depending on their vulnerabilities. The deprivation index shows that children are more deprived compared to other population groups. Such differences are also observable at household level where food consumption patterns indicate that during droughts, women share their food portions with children, which is a recipe for malnutrition compared to men who eat more. This makes women and children more vulnerable in times of droughts and floods since they receive less resources.

Some of the findings presented from an analysis of the 2016/2017 drought show that:

- 1.6 million children were food insecure by 2017
- 0.5 million children suffered from acute malnutrition and needed treatment
- Nairobi County had the highest number of malnourished children
- There were children with no access to water and clothes, and school feeding programmes were dysfunctional in some schools.

A few negative coping mechanisms were emerging, including separation of children from their homes in search of food, and an increase in street children escaping deprivations at home.

Regarding floods, over 1,000 people were displaced in Tana River and that cholera treatment centres that were set up had turned out to be cholera transmission centres, with children being more vulnerable. Despite the increase in demand for healthcare following disease outbreak, supply of healthcare services decreased as some health facilities were rendered dysfunctional due to flooding.

Likewise, 146,170 children were displaced following the 2018 floods and over 700 schools closed due to flooding. Some schools were also serving as homes to Internally Displaced Persons (IDPs).

Discussions were thereafter held on the social impacts of drought and floods. While the prevailing school of thought supported the view that women were more vulnerable than men in times of disasters, it also mattered what time the disaster occurred. For example, if the disaster occurred at night, then women and children are more vulnerable. In the case of Solai Dam tragedy, for example, more women and children were affected.

There are also some unique differences between men and women, and these should be considered during disaster management. Key among the considerations is how well-equipped the responders were, and whether adequate resources are available. The different experiences of men and women should therefore not be overlooked during disaster management. Other population groups that face

different vulnerabilities during disasters include the poor, children, the elderly, and persons with disability. Natural disasters affect the poor and the marginalized differently and those with mobility disabilities. Children's accessibility to schools is affected, with most opting to remain at home while the elderly die first during droughts due to lack of food. An example was given of a person with disability who lost his job for failing to report to work due to difficulties of movement during the 2018 floods.

A key issue emerging from the discussions was that vulnerable groups are not separated from the non-vulnerable groups when preparing for disasters. There is therefore need to identify the differences in vulnerabilities even when designing preparedness measures, and build capacity among the vulnerable groups on how to be prepared for disasters and the response options available to them.

> Case Study 3: Learning drawn from a pilot study on droughts and floods by Christian Aid
>
> The case study was presented by Sharon Kibor, Programmes Officer, Christian Aid. Following the 2016/2017 drought, Christian Aid and other partners conducted a pilot study to establish the best response measures. It emerged that communities wanted to be the first responders in times of such disasters, and the question was how they could be given an opportunity to design the responses.
>
> The focus therefore should be on building capacities for proper proposal writing to promote demand-led responses. Communities should be given an opportunity to say what they needed as this would make them feel that their needs were met. There is also a need to enhance ownership of interventions, and community cohesion for successful intervention of response measures. It was also observed that this would give women an opportunity to participate.
>
> In the end, the result was that communities visited expressed satisfaction on how the funds had been spent since they had been given a voice.

By building capacity of the local communities as first responders, it is hoped that this would integrate the needs of minority groups, including those living in marginalized areas. The youth, who form an integral part of the society, join disaster organizations such as the Kenya Red Cross and St Johns Ambulance where their capacity as first responders can be strengthened.

Children too should not be left out and they should be empowered on how to adapt. It was concluded that communities require capacity building and integration in disaster management. A case in point was the Solai Dam tragedy where the community responded first. There is need to embrace a bottom-up approach and lessons from the tragedy need to be shared with other communities.

Policy makers, as the actors responsible for implementation of programmes, need their capacity strengthened on adaptive measures. There is need for research linking issues of climate change and disability, considering that there are an estimated 6.6 million persons living with disability.

Mr Paul Odhiambo, a Policy Analyst at KIPPRA, presented findings on the "Changing Gender Roles in Droughts and Floods Situation in Kenya", based on a survey of households conducted by KIPPRA in 2018. The study was carried out in 27 counties in drought and flood-prone regions. Majority of the households sampled were male-headed but it was also observed that female-headed households have been increasing among pastoral communities. However, women participation in decision making and resource use and allocation, investment and planning was still low.

The report showed that women were still in charge of reproductive roles, including food preparation and nutrition; child care, caring of the sick and the elderly; while men dominated economic activities, formal employment, ownership of family business, livestock and control over family agricultural holding. However, the occurrence of droughts and floods has contributed to changing gender roles in disaster-prone counties as women seek alternative means of livelihoods that include running small businesses, casual labour, selling of animals and farm produce.

The communities have come up with coping mechanisms that display gender differences. For example, during the search for alternative livelihoods when droughts strike, men leave their homes with the livestock while women, boys and girls are left behind. This means that the responsibility of taking care of the home during this time is left to the women. Communities are also changing their consumption patterns as a mitigation measure and distributing family members to their relatives who have more food. Diversification of livelihood was another measure by communities, with members engaging in additional income generating activities.

A negative coping mechanism observed at community level was the sale of households' property. This has future implications given that households are left without assets to cushion themselves from future eventualities.

Following discussions from participants, it was noted that gender mainstreaming was important in reducing vulnerabilities, and that women in urban areas and those in rural areas face different vulnerabilities. In most instances, women in rural areas are the most affected when there is drought or flood given that they face difficulties in finding food for their children. In incorporating different genders at policy level, it was noted that in Kenya, for instance, the Disaster Risk

Management Strategy states that the committee must have at least 30 per cent of women representation. However, due to cultural norms, women may not be given an opportunity to contribute in the discussions. They are sidelined when it comes to decision making.

Dr Ben Musonye Akala, a Lecturer in the Department of Environmental Science, School of Environment and Earth Science, Maseno University, Kisumu Kenya presented findings of a study on the "Housing Scheme for Residents: The Centre Nerve of Disaster Preparedness in the ASALs in Kenya". The objective of the study was to examine the current housing plan and propose an alternative housing plan for ASALs people in relation to buffering against droughts and floods-related disaster cycles. The study looked at the current housing patterns for the ASALs where it was observed that their houses were temporary, ancient with no windows for ventilation, and were prone to destruction by winds and floods. The proposal was to have a housing plan consisting of a permanent house with a kitchen, storage area, a recreation facility and with good ventilation.

The study brought out the vulnerabilities of communities living in ASALs whose housing is contrary to Habitat II agenda whose objective is, among other things, to "arrest the deterioration of global human settlements conditions and ultimately create the conditions for achieving improvements in the living environment of all people on a sustainable basis". To build resilience, housing is a key ingredient and therefore the need to integrate housing development while coming up with measures to build resilience.

Participants observed that if the recommendations from the study were to be successful, there was need for the communities in the ASALs to adopt new lifestyle changes that can accommodate the proposed housing plans. However, it was noted that in ASALs, land is communally-owned and questions were raised on the feasibility of such housing scheme given the current land use policies in the region. It was proposed that the government could redefine its policies on land use in ASALs, and housing settlement schemes could be created. A case in point was Makueni County which had embarked on replacing traditional temporary grass thatched housing which are prone to flooding with semi-permanent iron sheets roofed houses which can withstand destruction caused by floods.

Another challenge that erupts during climate hazards such as drought was noted to be conflicts as societies fight over limited resources. Mr Joshua Laichena, a Policy Analyst at KIPPRA, presented findings on "Climate Hazards and Resource Competition: A Catalyst for Conflicts" based on the KIPPRA survey of households in 27 counties in drought and flood-prone regions. The objective was to identify the perceived linkages between resource competition and drought and identify the main actors in the resolution of such conflicts.

Conflicts over water points increase during droughts but there were no remarkable changes in conflict over pasture or land. There emerged differences across regions on the types of conflicts the counties experienced, with Marsabit experiencing increased conflicts over water points compared to other counties. Incidences of livestock theft increased during droughts.

Religious leaders and village elders were identified as key in resolving these conflicts especially those related to conflict over watering points. Community-Based Organizations (CBOs) and Non-Governmental Organizations (NGOs) were also instrumental in resolving conflicts related to livestock theft.

The need for national dialogue involving all stakeholders was emphasized to eradicate conflict over resources. There was also need to integrate climate change adaptation as an integral part of conflict prevention. Going forward, it was underscored that peace building was necessary among communities neighbouring each other in the ASALs.

# CHAPTER 3: CLIMATE CHANGE: AGRICULTURAL SYSTEMS, TRADE AND COPING MECHANISMS AT FIRM AND HOUSEHOLD LEVELS

## 3.1 DROUGHTS AND FLOODS: IMPLICATIONS ON AGRICULTURE AND TRADE

This session entailed presentations and discussions on the implications of droughts and floods on agriculture and trade. The presentations were largely anchored on a three-year study by KIPPRA in five East African countries. The studies were commissioned by the African Climate Policy Centre (ACPC) through the United Nations Economic Commission for Africa (UNECA).

### 3.1.1 Impacts of droughts and floods on agricultural systems and food Security: Emerging issues and interventions

The presentation on 'Impacts of Drought and Floods on Agricultural Systems and Food Security: Emerging Issues and Interventions' was done by James Murombedzi from the ACPC, UNECA. The presentation sought to explore scenarios of climate change in Africa in the context of the Paris Agreement of 2015 that aimed to limit global warming to 2°C and to strive for 1°C if possible. Data limitations were identified as a key constraint to scenario analysis in the African context. Nonetheless scenarios in Africa are based on observations and projections from other continents.

There is a consensus among African climate scientists that 2°C of global warming would lead to around 4°C warming in Africa, calling for urgent interventions towards the Paris Agreement targets. Global warming scenarios resulting from temperature rise of between 1°C and 6°C were provided, with possible chances of avoiding such rises. The presentation noted that there is a zero chance of avoiding 1°C in global warming, which would lead to Saharan intensity heat waves, destruction of agricultural crops and forest cover, and drying up of fresh water from one-third of the World's land surface. There is a 93 per cent chance of avoiding 2°C global warming only if greenhouse emissions are reduced by 60 per cent over the next decade. A rise of 2°C in global warming would lead to polar ice melts, rise in sea levels, threats to water supply and threats of extinctions of more than one-third of all living species. There is a poor chance of 3°C of global warming if temperature rises exceed the 2°C and trigger carbon cycle feedback.

In such instances, an irreversible decline in food production is triggered, salty waters creep into rivers, intensified heat accelerates evaporation and drying up of vegetation and water reservoirs and warming of oceans produces more super hurricanes. There is a poor chance of avoiding 4°C of global warming if temperature rise reaches 3°C, leading to massive thawing of permafrost. The consequences include rapid melting of ice that causes sea levels to rise by 50 meters, crashing of agricultural production in populous countries such as China, prolonged summers with intense heat reaching 45°C in cities, and massive release of carbon from thawing Arctic ice. There are negligible chances of avoiding 5°C of global warming if temperature rise reaches 4°C and releases trapped methane into the atmosphere. The consequences include disappearance of ice sheets from poles, encroachment of deserts into the rain forests, massive submergence of the continent into the sea, extreme temperature rise caused by increased release of methane into the atmosphere, breakdown in economic, social and political order, and increased infighting and regional warfare due to competition for resources. There is a negligible chance of avoiding 6°C of global warming if temperature rise reaches 5°C and releases trapped methane into the atmosphere. The consequences include wiping out of about 95 per cent of species (as in the case of the Permian extinction) due to extreme temperatures and suffocation caused by warm sea waters.

At 2°C global warming, Sub-Saharan Africa would experience significant increase in the number of undernourished people, and occurrence of highly unusual heat events (60-80% of summer months in Central Africa, 40-60% in the Horn of Africa and North Africa, and upto 30% in Southern Africa). At macro level, the costs of extreme weather events include costs of adaptation, infrastructure loss and damage, loss of production and trade flows (including food value chains) and impacts on national growth. At the micro level, the costs would include entitlement failure, loss of property and livelihoods, direct costs of adaptation and loss of lives.

The losses from droughts and floods and other weather-related events in Africa are estimated at 2-3 per cent of GDP. To mitigate the impacts, adaptation measures being employed across Africa include early warning systems to enhance preparedness for extreme weather events, sustainable use of water resources and irrigation, enhanced capacity for water storage, infrastructure development (dykes, seawalls, wave breakers), and improved design and drainage technology of sanitation facilities to reduce the risk of water-borne diseases. It is acknowledged that adaptation measures come at a cost. The annual adaption costs for Sub-Saharan Africa (SSA) are projected to be between US$ 14-15 billion. In Africa, adaption costs are estimated at 0.5% of Gross Domestic Product (GDP) and are expected to reach US$ 70 million by 2045.

The presentation proposed action areas to minimize loss and damage caused by droughts and floods, which include the need to build preventive resilience, managing risk and assisting in rehabilitation and providing redress in the event of permanent loss. These action areas require coordination in building preparatory (ex-ante) resilience (e.g. hazard mapping, measures to make assets more resistant to damage - flood protection walls, sea walls, building dams, strengthening building codes, adjustments in livelihood practices and training); temporarily moving vulnerable assets out of harm's way through adoption of early warning system at local level; and effective institutional arrangements to mitigate loss and damage.

### 3.1.2 A synthesis of the impacts of climate change on agricultural production systems in the East African Community

A presentation on 'A synthesis of the impacts of climate change on agricultural production systems in the EAC' was done by Dr J.N. Ngaina of South Eastern Kenya University (SEKU). The focus was on exploring spatial effects of climate change on agricultural production and food security in the five East African Community (EAC) economies. It specifically looked at the past and future trends of climate change in the EAC region to determine the effects of climate change on maize production in the region. While the region has a huge potential to produce enough food, the agricultural production system in the region has largely remained rain-fed, therefore leading to high food and nutritional insecurity. Major adverse impacts on food production are also expected to result from changes in temperature, moisture levels, ultraviolet radiation, carbon dioxide levels and pests and diseases. The scientific evidence for rapid climate change is evident from rise in global temperature, warming of oceans, rise in sea levels and extreme weather events that adversely affect key socio-economic sectors such as agriculture. Using data from the African Development Bank (AfDB) and FAOSTAT, the presentation highlighted that the agriculture sectors in Kenya, Uganda, Tanzania and Ethiopia have similar characteristics in terms of contribution to employment, GDP, and share of smallholder farmer in agricultural production, but some differences exist in average household agricultural landholding and proportion of agricultural land under irrigation. Kenya and Ethiopia have relatively small proportion of agricultural land under irrigation compared to Uganda and Tanzania. Ethiopia has relatively lower average household agricultural land holding. The presentation aimed at demonstrating that such structural differences can explain differences in agricultural production patterns in the East African region. Precipitation remained highly variable both in space and time, whereas the maximum and minimum temperatures showed increasing trends in the EAC region. The baseline

crop production showed annual percentage change in production, area harvested and yields. The analysis showed declining or stagnating productivity both for cereals and other crops. Maize yield variability in most of the EAC economies was either positive or showed no change. Going forward, the presenter suggested that it is important to facilitate data availability by putting in place appropriate policies on data sharing on matters of climate change and economic activities and harmonize similar projects to create synergy in addressing climate change to minimize duplication of activities. Moreover, assessing the impacts of climate change requires a trans-disciplinary approach to holistically understand the costs and design required interventions.

### 3.1.3 Impact of climate change and agricultural policy on welfare in the East Africa Community

The presentation on the 'Impact of climate change and agricultural policy on welfare in the East Africa Community' was done by Dr Richard Mulwa, University of Nairobi. The presentation was anchored on a study that sought to assess how the welfare of EAC member states would evolve over a thirty-year period (2015-2045) in the five EAC countries using six grain crops – beans, maize, sorghum, millet, wheat and rice, which form the bulk of grains traded in the region. It was contextualized within the African Union (AU) Agenda 2063 priority of food security and the Sustainable Development Goal (SDG) 2 that have set a target of eliminating hunger and ensuring food insecurity by 2025.

Africa faces challenges in meeting the Agenda 2063 and SDGs because the continent fails to produce enough food due to adverse effects of climate change and low adoption of technology. Within the EAC region, 80 per cent of the 143.5 million people live in rural areas and therefore largely depend on agricultural production. Agriculture in EAC accounts for over 30 per cent of the US$ 110.3 billion GDP at current prices. The agricultural sector in the region faces various challenges, including climate change, disease, pests, droughts, unproductive soil, unreliable markets, low area under production (Burundi: 5.5%; Tanzania: 3.3%; Kenya: 1.7%; Rwanda: 0.4%; Uganda: 0.1%; SSA 3.7%). High input prices are also a key challenge, and low fertilizer application rates (Kenya: 31.6Kg/ha; Uganda and Rwanda: 13.7Kg/ha; Burundi: 2.6Kg/ha; Tanzania 1.8Kg/ha. The challenges are compounded by low budgetary allocations by governments (Tanzania: 7.2%; Rwanda: 6.2%; Uganda: 4.5%; Kenya: 4.2%; and Burundi: 2.4%). Some of the efforts aimed at overcoming these challenges include regional and national agricultural policies, climate change policies and strategies, and regional commitments, including the Maputo/Malabo declarations, Comprehensive African Agricultural

Development Programme (CAADP) initiatives and Multilateral Environmental Agreements (MEAs). Despite such initiatives, the impact of climate change and related policies on welfare is not well understood, hence the motivation for the study and the presentation.

The analysis used three scenarios that formed the basis for the research questions. First, the status quo in that regional and national agricultural and climate change policies remain unchanged and climate variables do not change. Second, regional and national agricultural policies change and conform to the Malabo/Maputo declarations and the CAADP initiative (agricultural sector funding rising to 10% of GDP), but climate does not change. Third, regional and national agricultural policies change and climate changes. The findings show that if countries adopt the Maputo Declaration, output will be higher than without implementation of the Declaration. With introduction of climate change factor (maize only) – Kenya will lose 2 per cent of maize production. Going forward, the EAC countries should craft climate change policies and harmonize individual country agricultural policies with regional agricultural policies to boost coordinated agricultural production. They should also allocate more funds to the agricultural sector to boost productivity and prioritize production of grains where countries have comparative advantage. The EAC partner states should draft own climate change policies to complement the already existing regional climate change policy.

### 3.1.4 Implications of trade policies on EAC agricultural trade and food security

A presentation on the 'Implications of trade policies on EAC agricultural trade and food security' was done by Dr Chris H. Onyango, KIPPRA. The study aimed to analyse the implications of trade policies on agricultural products and assess the consequences of climate change on intra-EAC flows of agricultural trade. The presentation highlighted policies governing trade in agricultural products, including the EAC Treaty (agricultural issues are enshrined Articles 74, 75, 76); Customs Union (Article 75); Common Market Protocol (Article 76); EAC Vision 2050 Strategy; and EAC five-year development plans. Intra-EAC trade is minimal at 9-10 per cent of total EAC trade, with total agricultural trade stagnating compared to total merchandise trade. The EAC region remains a net importer of food products, attributable to challenges such as under-investment in agriculture, large share of informal cross border trade, deficits in physical and soft infrastructure, accelerating demands for food by the expanding regional population, and NTBs (bans, standards, etc). In terms of the implications of intra-EAC trade due to climate change over the forecast period of up to 2050, Tanzania will be the main exporter of beans, sorghum and wheat to Rwanda, Burundi and

Kenya; Uganda will be net exporter of maize and rice to Kenya and Rwanda; and Kenya will be a net importer of all commodities from EAC except wheat and millet. These dynamics imply welfare loss for Kenya over the forecast period because of adverse climate change. The priority areas for interventions to deepen trade in agricultural products include review of common external tariffs; trade facilitation programmes; and enhanced trade-related investments focusing on value addition, R&D and extension services; infrastructure development (roads, storage, markets); removal of all forms of restrictions on movements of goods and labour; enhanced compliance on trade rules; and initiatives on access to data required for analyses.

### 3.1.5 Panel discussions

The session was chaired by the Agricultural Food Authority (AFA) and the panellists included Milton Ayieko (Director, Tegemeo Institute), Dr Haile Kibret (Senior Research Fellow and Director of Research at HESPI); Dr Joseph Karugia (Coordinator, ReSASS at ILRI), Dr John Bore (KALRO), and Dr Lutta Mohamed (KALRO).

A key challenge noted was the over-reliance on rain-fed agriculture, making the sector prone to the impacts of droughts. The livestock sector was also noted to be prone to shocks of droughts. The agricultural research expenditure is slowing down and is below the Malabo Declaration. Kenya faces weak policy implementation as evident from experiences of other countries that have borrowed from policies in Kenya with better outcomes.

It is important to understand how the effects and costs of droughts and floods vary across ecological zones given that the impacts on households are likely to vary by ecological zones. Indepth understanding would require analysis at national and regional levels to holistically understand the issues.

Trade in agricultural commodities is still highly protected relative to other commodities, and impacts of trade barriers are relatively high. Government reaction was noted to be usually slow, thus worsening the impact of droughts and floods. Priority policy areas for intervention suggested enhanced preparedness through investments in early warning information and data availability; enhanced coordination of food movement in the EAC region corroborated by mitigation of trade barriers; and adequate budgetary allocations for investment in technology, innovation and management practices in line with the Malabo Declaration (Ethiopia was noted to be doing well compared to Kenya).

Different countries were noted to have different capacities to produce in different agro-ecological zones, which implies that there is need to harness opportunity for

specialization and trade. Agro-ecological zones do not coincide with administrative borders, and therefore there is need for collaborative efforts for the EAC countries to create synergy in agricultural production that are supported by common ecological zones.

The role of institutions to deepen agricultural technology was also emphasized. For instance, KALRO is mandated to develop technologies in agriculture and livestock through extension services. However, extension officers are few and government funding has dwindled. The National Research Fund that was established to address the challenge of fragmented investments in science, innovation and technology also seems to have little impact. Enhancing the capacities of these institutions to support investment in science, innovation and technology to enhance agricultural productivity and introduce crops and livestock with enhanced resilience is fundamental. The weaknesses in such institutions are reflected in low level of competitiveness of local products, which is beyond climate change impacts. The implication, therefore, is that to enhance competitiveness of the agriculture and livestock sectors holistically, there is need to address other constraints that exacerbate adverse impacts of climate change. The importance of extension services was emphasized, given that agricultural practices of the 1990s may not be effective amidst climate change.

The roles of county governments need to be capitalized on given that functions such as agriculture and extension services are devolved. With devolution, farmers have resorted to peer extension or personal experimental approach on what works in agriculture, but such trial and error methods have proved to be ineffective. Innovative approaches such as Fintech need to be employed to help farmers access information to address the gap in extension services. Such initiatives, however, require collaboration between institutions with technical expertise on extension services with those that supply financing to the agricultural sector, such as the Agricultural Finance Corporation.

Concerns were raised on lessons that can be borrowed from cash crops such as tea that tend to perform better relative to food crops, but it was argued that the effects of drought on perennial crops such as tea differ from annual crops such as cereals.

Owing to the significant role of women in small scale farming, the need to undertake gender-based analysis was underscored.

## 3.2 Coping Mechanisms

This plenary session focused on showcasing industry experiences and interventions by county governments and research institutions, and presentation of research findings on coping measures employed by households and firms. The coping

measures explored include both formal and informal adaptation and mitigation strategies. The issues discussed include measures undertaken before occurrences of droughts and floods, and those that are employed after disasters have occurred.

### 3.2.1 Supporting counties to mainstream climate change in planning and implementation

Showcasing the 'Supporting counties to mainstream climate change in planning and implementation' was done by Victor Orindi, Coordinator, Adaptation Consortium.

The objective of the presentation was to showcase initiatives and interventions undertaken by the Adaptation (Ada) Consortium in collaboration with local communities and county governments in Kenya and demonstrate the importance of governance in project implementation. It also aimed to demonstrate how community ownership made the projects sustainable, and how project implementation impacted on lives of the beneficiaries in selected counties where projects have been piloted.

The presentation showcased what Ada was doing with the county governments and local communities in supporting climate change adaptation in an effective manner through community involvement in prioritization of community projects and strengthening of local governance structures that make projects sustainable in the long run. It underscored consultations with the local communities to ensure that projects being undertaken were relevant and had community ownership because they set priorities.

Collaboration with relevant government agencies such as the Kenya Meteorological Department further helped in providing early warning systems.

A number of policy suggestions emanated from the presentation, including the need for enhanced governance in project implementation and involvement of local communities to prioritize projects, and involvement of communities in implementation to ensure ownership and sustainability, and also ensuring projects are designed in a way that they have capacity to build community resilience to climate change. Accountability measures are an important element of project implementation through participation of the project beneficiaries. It is also imperative to involve county governments in implementing projects.

### 3.2.2 A satellite-based resilience strategy for droughts and floods

Showcasing on 'A satellite-based resilience strategy for droughts and floods' was done by Dr Fabio Vescovi of Airbus Defense and Space.

The presentation focused on the International Partnership Programme (IPP) covering Ethiopia-Kenya Project, which uses satellite-derived index values to develop a dashboard of how crops are performing during a drought season. The main objectives of the presentation were to demonstrate building of drought resilience; creation of awareness on how satellite technology can be used to detect drought and form the basis for insurance compensation; and how the satellite-based resilience mechanism makes use of intermediaries in implementation of the strategy.

The key issues emanating from the presentation include the use of a dashboard, which is a web-based tool built on satellite data, modelled data, local data and contextual data. Two market sectors were identified: Micro-insurance for farmers who lack or have limited access to insurance; and government institutions that require information to make decisions on drought and floods. The satellite detects droughts or floods and the information is flagged and is used to compensate farmers. Farmers are ranked before compensation is awarded. Only farmers ranked in the last positions of drought index are entitled to compensation of the amount set by the insurance contract.

The dashboard can also serve government institutions to show how healthy crops are, among other things. The main message/recommendation from the presentation was that such innovative technologies are more effective than the traditional insurance schemes. Some of the specific advantages include bigger regional coverage for economies of scale without the need for insurance surveyor visits, and meteorological stations maintenance and paper work for claims and payouts. The automated claims and payout reports minimize information asymmetry between the insured and the insurer, and also provide early warning of crop failure.

### 3.2.3 Kajiado County drought experiences in 2017, constraints and lessons

Showcasing on 'Kajiado County Drought Experiences in 2017: Constraints and Lessons' was done by Dr Daniel Nyoro, Veterinarian Kajiado County.

The objective of the presentation was to give an account of Kajiado County's drought experience in 2017 and discuss the roles of the stakeholders involved in response during the drought. It presents the extent of damage or losses incurred

and underscores that the amount of resources required for some interventions such as droughts are immense and usually inadequate if solely provided by the government. The County came up with flagship projects to strengthen resilience of livelihoods. It was, however, constrained in planning for the county-wide disaster since the whole county was affected, especially given that funds were not available for drought response. Furthermore, weak monitoring and evaluation framework compounded the response measures. Some policy recommendations were suggested, including sharing of resources, expertise and technical personnel; joint targeting and identification of beneficiaries; coordination of all stakeholders across the County; monitoring and evaluation of intervention programmes; development and updating of contingency plans; and reporting and consolidation of response activities.

### 3.2.4 A new dawn in pastoralism: Producing fodder for enhanced resilience and economic growth

The presentation focused on how fodder production can enhance resilience and spur economic growth. It aimed at demonstrating the importance of the livestock market to the Kenyan economy; enumerating the constraints to livestock farming; presenting the economic impact of the deterioration of livestock farming; and showing the existent policy gaps.

The Kenyan livestock sector contributes 12 per cent to the national GDP, 40% to the agricultural GDP and employs 50 per cent of the agricultural labour force. The development of the livestock sector has been hampered by land degradation resulting from climate change characterized by drought recurrence every 3-4 years and constraints to pastoralism caused by pasture scarcity, resource conflicts and changes in land tenure. Forage deficits in Kenya are estimated at 70 per cent of the total annual fodder requirements of about 5.5 billion bales. The immense fodder deficits are attributable to inadequate fodder production and conservation, overgrazing and poor land management practices and the adverse effects of climate change. Support for fodder production will contribute to policy aspirations at global, regional and national levels as evident from SDGs, the Vision 2030 and the associated medium-term plans, the “Big Four” agenda, and the county integrated development plans. Policy priorities include repositioning the fodder value chain by strengthening investments and agribusiness enterprises in fodder and fodder seeds production, and review and development of supporting policy and institutional framework, research, extension and training to build a robust fodder value chain and well managed pasture lands. Other priority areas for intervention include strengthening of collaborations among all fodder value chain actors such as national and county governments and other partners to synergize

efforts towards curbing the national fodder deficit. The facilitation of mapping and establishment of large-scale pasture fodder production at national level is also imperative.

### 3.2.5 Coping mechanisms: What works for households and firms

The presentation on 'Coping mechanisms for households and firms to mitigate the effects of drought and floods' was done by Adan Shibia, Policy Analyst, KIPPRA.

The presentation focused on identifying the key coping mechanisms deployed by households and firms in mitigating the effects of droughts and floods in Kenya. The findings of the study were based on data sources from a KIPPRA survey data which surveyed about 1,400 households and 800 firms in 27 counties, mainly in drought and flood-prone areas. The analysis corroborated the KIPPRA survey data with the Kenya Integrated Household Budget Survey (KIHBS) 2015/16 data. Alongside the two survey datasets, the analysis also relied on information gathered from key informant interviews and review of secondary literature.

The presentation covered traditional and modern coping mechanisms, such as the use of financial instruments. The findings suggest that households largely either take no action or rely on informal coping mechanisms such as reducing consumption of food and non-food commodities, working for longer hours to earn more money, selling of assets, saving in and borrowing from informal financial groups such as *chamas*, and dependence on transfers from family members and friends. Uptake of formal coping mechanisms such as credit and insurance was minimal. This implies that long-term adaptations are weak, given that informal coping mechanisms are ineffective because the more people are affected by droughts and floods and recurrent nature of droughts and floods means selling of assets, making the households vulnerable in subsequent periods. The main reasons for low usage of formal financial instruments cited by households include low levels of income, or not seeing the benefit of saving for future or uncertain events, low understanding of financial products, high costs of credit and insurance premiums, and religious reasons that prohibit design of the product features such as earning or receiving of interest.

The firms surveyed regarding their coping mechanisms were drawn from the manufacturing, wholesale and retail, and hotel and restaurants sectors and ranged in size from micro enterprises to small and medium-sized enterprises, or firms with a headcount of no more than 50 employees. The analysis based on KIPPRA survey shows that these firms were more severely affected by droughts than floods. Micro enterprises were also more affected than larger firms. Overall, firms in the manufacturing sector faced less severe constraints from floods than

those in the wholesale, retail, hotel and restaurants sectors. Firms attributed their low uptake of credit and insurance facilities as a coping mechanism to high costs of credit, low understanding of how formal financial products such as insurance work, perceived lack of benefits in the formal financial products, inadequate business income to support uptake of formal financial products, and religious reasons. The results from key informant interviews largely corroborate those of the survey analysis in terms of reasons for low uptake of formal financial products. Additional constraints identified include poor infrastructure such as roads and communication networks and insecurity in some remote areas. Reviews of existing interventions included Agriculture and Climate Risk Enterprise (ACRE) Africa, IBLI, Boma Project and the Hunger Safety Net Programme (HSNP). The review of literature on these programmes/interventions suggest the importance of some success factors, including partnerships with clearly defined roles and expectations, the need to address demand barriers (cultural, financial literacy, trust of financial institutions) and the need to leverage on technology and infrastructure development.

### 3.2.6 Plenary discussions

During the plenary discussions, a number of issues were underscored, including the importance of having a common planning and coordination system, strengthening of early warning mechanisms, the need to expand innovative technologies such as those demonstrated by Airbus, clarity on how the funds for mitigating impacts of droughts and floods are determined, and the need to employ complementary measures to support satellite technology to holistically take into account issues such as crop failure. It was clarified that the Airbus technology was yet to be rolled out on a full scale but the plan is to have it rolled out in 2019.

The need to engage county governments to inform policy formulation using the KIPPRA findings was emphasized. It was alluded that KIPPRA is engaged in stakeholder engagement and more ought to be done to engage policy stakeholders at the county level. This would include national level initiatives supporting policy inclusion and public dissemination. The importance of separating positive and negative (e.g. sale of assets and burning of charcoal) coping mechanisms was also underscored. Where there are differences in rankings of coping measures across different surveys, it is important to provide details of what might explain the differences. It was noted that the questions in the KIPPRA survey and KIHBS were not asked the same way, and such aspects explain some differences in the responses.

## 3.3 Adaptations and Mitigation

This plenary session entailed showcasing industry experiences by the Takaful Insurance of Africa and Equity Bank, and demonstration of innovative interventions by universities and research institutions, including the School of Oriental and African Studies (SOAS), University of London, and the International Livestock Research Institute (ILRI). The panellists comprised representatives from Kenya Bankers Association, World Vision, USAID, Insurance Regulatory Authority, British Council and CIC Insurance, and the session was chaired by Prof. Gituro Wainaina.

The chair commenced the session by emphasising that extreme climate change occurrences pose threats to realization of the "Big Four" agenda. He emphasized the importance of initiatives such as planting of indigenous vegetation, building of dams for rain water harvesting, engagement of local communities to gain deeper insights on what works and what does not work in adaptation interventions, the need to leverage on innovative technologies (for early warning data and information dissemination), and strong leadership and institutions to champion implementation of adaptation measures. He noted that planting vegetation, water pans and small dams is not an event but should be an everyday activity that builds better resilience in the long run.

### 3.3.1 Index-Based Livestock Insurance (IBLI): Towards sustainable scaling

Showcasing presentation on the 'Index-Based Livestock Insurance (IBLI): Towards sustainable scaling' was done by Frances Fava, Scientist at ILRI.

The presentation aimed at demonstrating how IBLI works and shared the project experiences. Drought represents the major source of vulnerability for pastoral communities, and the situation is worsened by increasing climate variability, increasing population and evolving land tenure.

Conventional resilience interventions such as food and cash aid, and post-drought livestock restocking are usually slow, inadequate and expensive. There is, therefore, need for insurance as a sustainable intervention that can help pastoralists quickly recover from the shock. Insurance provides a market driven solution that can drive investments.

As opposed to the conventional insurance that makes compensation based on individual losses, the index-based insurance does not insure individual losses and is better suited to the risk profile of pastoral communities. A key advantage of index-based insurance is that the index is objectively verifiable, available at low

cost in real time, and cannot be manipulated by either party to the contract. The satellite imagery is used to assess forage availability and detect drought-related forage scarcity. The unit areas of insurance take into account livestock migration patterns, and compensation is provided early in the season to minimize livestock losses by supporting drought coping strategies.

Since 2008, ILRI has worked with industry and research partners to develop the index-based livestock insurance for pastoralists. The design of IBLI followed a systematic sequence: The product agenda was launched in 2008 with the first commercial launch in 2010 in Marsabit County through a consortium of private partners. In 2011, drought triggered contracts in all covered areas, providing a strong justification for the concept. From 2012, the product was scaled up and rolled out to Isiolo and Wajir. In 2015, Kenya Livestock Index Product (KLIP) issued the first policies to 5,000 pastoralist households across Wajir and Turkana. In 2016 KLIP further scaled to eight (8) other counties.

More than US$ 7 million was disbursed in insurance compensation in 2016/17. The progress of IBLI in Kenya has seen growing interest in Ethiopia, Uganda, Somalia, Niger and Senegal. Key success factors experienced with IBLI include appropriate product design, evidence of value and impact, establishing informed effective demand, low cost, efficient supply chain, policy and institutional framework infrastructure, and response to the needs of the clients. Evidently, IBLI has had impacts on production and welfare and coping strategies at the household level. Some of the established production and welfare impacts include increased herd survival rates, increased investments in livestock, increased productivity in milk, and better nutritional outcomes.

Regarding household coping strategies, some of the impacts include reduced likelihood of distressed livestock sales, and reduction in the likelihood of reducing meals. There is, however, need for more efforts to strengthen deepening and impacts of IBLI, notably the need to support impact evaluation studies, product design and integration into other systems (e.g. early warning), product quality metrics and development of digital platforms and data infrastructure.

### 3.3.2 Climate risk financing: Financial instruments for mitigating and coping with climate disaster risk - What do we know?

Showcasing presentation on ‘Climate risk financing: Financial instruments for mitigating and coping with climate disaster risk - What do we know?’ was done by Christine Oughton, Professor of Management Economics at SOAS University of London.

The presentation aimed to highlight *ex-ante* and *ex-post* disaster risks and financial instruments for coping with climate disaster risks. The Intergovernmental Panel on Climate Change (IPCC) predicts that climate change will increase weather variability and intensity of related extremes. The effects will be felt mostly in African countries, calling for urgent need to mitigate risks by taking measures to reduce climate change and preparedness for climate-related disasters.

Financial instruments can help ensure that the required money is available in time to implement disaster plans and facilitate compensation for losses. *Ex-ante* financial instruments (contingency funds, budget allocations, line of contingent credit, insurance, reinsurance, indexed insurance) are preferred. This ensures that one has a financing plan on how to deal with the disaster. A number of challenges associated with climate risk financing were highlighted. Climate change often leads to large claims payment, and therefore the need to pool risks. Moral hazard may give less incentive for risk mitigation, and it is important to give attention to pricing of products. Adverse selection problems may emerge as only those that feel they will suffer more are likely to buy insurance. On the supply side, 'cherry picking' by private insurers may result to only low risk individuals being covered by insurance. It is vital for public insurance, private insurers, mutual schemes, micro and risk pooling mechanisms to deal with the complexity of climate-related risks.

### 3.3.3 Building resilience to mitigate the impact of droughts and floods: Livestock insurance for pastoralists

Showcasing on 'Building resilience to mitigate the impact of droughts and floods: Livestock insurance for pastoralists' was done by Hassan Bashir, Takaful Insurance of Africa.

The presentation aimed at sharing experiences of the Takaful Insurance of Africa in the roll out of Index-Based Livestock Takaful (IBLT). The livestock covered include goats, sheep, camel and cattle. The IBLT goes beyond livestock compensation to forage scarcity product insurance. The idea is that once a client insures fodder, the livestock can survive for a period. Therefore, livestock insurance is not based on the market value of the livestock. IBLT targets drought risks (which accounts for 80% of livestock loss in Kenya) and started with a pilot project in Wajir in 2013 and, as of June 2018, had scaled up to eight (8) counties (Marsabit, Turkana, Samburu, Isiolo, Mandera, Wajir, Garissa and Tana River).

The product is anchored on a community-based agency model where it is sold at community level through shopkeepers at the village level. The key features of the product include application of mobile technology where a shopkeeper (agent)

uses an android phone application for registration, and monetary transactions are done on mobile money platforms. The compensation is based on an analysis of satellite imagery. With regard to deepening of the product, there are 30,000 families on board as of June 2018 and the number is expected to grow. The impact at the community level includes reduced household distress due to availability of cash resulting from compensations, provision of fodder and water at the height of drought, reduced panic sale of livestock, and enhanced confidence among the pastoralists. Some of the challenges experienced with IBLT include limited geographic diversity, low product understanding among the target clients (product sophistication), and high costs of creating public awareness. So far, insurance pay-outs outstrip premiums, meaning the product is yet to be a profitable venture.

### 3.3.4 Interventions in agricultural adaptation and mitigation for climate change

Showcasing on 'Interventions in agricultural adaptation and mitigation for climate change' was done by Esther Muiruri, General Manager - Marketing and Agribusiness at Equity Bank.

The presentation aimed at sharing financial intermediation experiences from Equity Bank in agricultural financing. Equity Bank has a client base of 11 million customers spread across six (6) countries: Kenya, Rwanda, Uganda, South Sudan, DRC Congo and Tanzania. A key focus of the Bank is in transforming lives of the poor through supply of modern and inclusive financial services. The agricultural financing approach employed by the Bank is guided by the sustainable development goals and the Malabo Declaration commitments.

The key challenges encountered in agricultural financing include production risks linked to natural hazards (droughts and floods), seasonal nature of agricultural activities, and uncertainties in agricultural produce prices. Small scale farmers, especially women, lack collateral for securing credit. Poor infrastructure such as roads, electricity and communication networks in rural areas increase costs of logistics in agricultural produce and limits the ability to reach a large customer base. Low financial literacy levels hamper business management practices and understanding of financial products and requirements for accessing formal financial products.

To overcome the challenges, the Bank has used various measures including building strong partnerships with local and international organizations such as the World Bank, International Fund for Agricultural Development (IFAD), Food and Agricultural Organization (FAO), and International Food Policy Research Institute (IFPRI). This allows integration of the various players in agricultural production

and enhances synergy through forward and backward linkages between value chain actors. The Bank has used complementary measures such as a pool of staff trained on agribusiness, development of customised products (e.g. index-based and crop revenue-based insurance, risk contingent credit). Other innovative approaches used by the Bank to enhance resilience and adaptation include de-risking through financial literacy, financing of energy renewable products, and funding of farmers involved in afforestation programmes. Innovative approaches such as digital banking channels help reduce costs of reaching customers on a large scale.

### 3.3.5 Plenary discussions

The number of financial institutions providing index-based insurance is growing. For example, CIC Insurance is strong in the index-based insurance (covering wheat, groundnuts, lentils, green grams, barley etc), although the company has paid out more than receipts in premiums. More players in agricultural insurance would help in pooling of risks. Although existing industry players in agricultural insurance are largely making losses, there are incentives to remain in the industry given the value to the country and growing customer base. There are also other innovative products such as area yield crop insurance that entail guaranteeing yields for farmers, such that if the yield falls short, farmers are compensated. Use of innovative approaches to reach farmers, such as use of cooperatives as in the case of CIC Insurance, as a channel for aggregating premiums helps reduce transaction costs.

Climate change may hamper the government's "Big Four" agenda. It is important for private sector players such as banks to embrace innovative financial products to finance sectors such as agriculture that are prone to climatic-related shocks. Products that finance projects that create social and economic value to mitigate adverse effects of global warming (e.g. projects that reduce emissions and concentrations of greenhouse gases) need to be deepened. Such initiatives call for concerted efforts between the public and the private sector actors. Climate change risks are predictable and those who view themselves as low risk will not be willing to take products such as insurance, resulting to selection bias. Geographic diversity beyond arid and semi-arid lands (ASALs) for index-based insurance is an important measure in moving the industry players towards profitability trajectory. It is also important for the government to assume part of the risks, given that experiences from other regions show that livestock insurance is not a profitable business venture.

# CHAPTER 4: DISASTER RISK MANAGEMENT: COORDINATION AND INSTITUTIONAL FRAMEWORK

The proceedings of the third and final day of the conference began with a brief recapitulation of the key issues and resolutions that emerged from the second day of the conference, which had as its focus on understanding the relationship between climate change and agricultural systems, trade and coping mechanisms adopted by firms and households in Kenya. The final day of the conference sought to elicit indepth deliberations around disaster risk management coordination and institutional frameworks from a regional perspective.

## 4.1 Disaster Risk Management Framework in the Region

The first session on Regional Disaster Risk Management Frameworks featured four presentations to set the tone for the plenary discussions.

### 4.1.1 Role of ICT in disaster management

Mr Chrispine Ogongo of the Communications Authority of Kenya presented on 'The Role of ICT in Mitigating Disasters' with focus on floods. Within the context of disaster risk management, ICT plays two critical roles in providing early warning to mitigate future and ongoing disasters, and to facilitate disaster relief efforts to mitigate the effects of ongoing disasters. In addition to the threat or actual harm to persons and property, all disasters involve aspects of communication and networking. ICT facilitates exchanges of information about victims between responders and other logistics networks, among others, for the provision of disaster-related services. Ensuring the availability, reliability, resilience, reparability and recoverability of communication networks forms a crucial part of effective and sustainable disaster risk management.

The role of ICT in the pre-disaster phase, through early warning, was discussed at length. This includes use of remote sensing technology for disaster prediction, data acquisition and processing, testing and probability modeling and disaster detection, providing information on factors such as the likelihood and severity of disastrous events. Meteorological departments are key users of predictive ICT capabilities for disaster mitigation in the use of remote sensing and disaster detection systems such as satellite and earth exploration systems, and global observation systems providing data and information for analysis and enhanced

decision making. One example given of this is the collection of measurements and environmental parameters aboard sea, land or aircraft vessels for forecasting by the World Meteorological Association. ICT facilitates the collation and analysis of different ecological parameters across the entire globe, including but not restricted to indications of meteorological rainfall deficiencies, hydrological water deficiencies, agricultural soil moisture, changes in river flow, and any impact on water reserves and ground water levels. ICT can be used to analyze, and model data collected from such systems to predict meteorological short and long-term trends. In parts of the world, ICT is used to facilitate the early detection of tsunamis, through observable changes in deep-sea pressure and temperature sensors which in turn transmit the signals to land. In India, river-side sensors have been put in place to assess changes in water levels and the resultant information transmitted to the public to warn them of the need to move to safer grounds.

The role of ICT in mitigating the impact of disasters was also underscored. While communication is essential during disasters, it is often harder in such times due to high demand for communication channels from frantic efforts to reach victims, resulting in network congestion. Crucial to effective coordination of disaster management efforts is the deployment of diverse technologies to provide numerous channels of communication. Cellular or mobile technologies are particularly useful due to their portability to affected areas or situations where pre-existing communications infrastructure has been damaged. As an example, helicopters can be used to carry mobile signals to facilitate communication in disaster areas where telecommunication infrastructure has been destroyed. Another crucial technology concerns mass communication or notification systems which, for instance, enable the dispatch of standardized SMS to affected persons. Satellite mobile system phones and walkie-talkies can also provide communication channels restricted to disaster locations. Finally, broadcasting can enable travel advisories to be issued to the public within disaster-affected regions.

The presentation concluded by emphasizing that ICT plays a critical role in situations that would benefit from early detection systems, the distribution of emergency alert messages, and coordination of relief efforts. Some challenges that impede the effective deployment of ICT applications for disaster risk management include network congestion, high demand for real-time information, and damage to communications infrastructure during disasters. It follows than an important area for further investigation is to understand how ICT can be deployed reliably, despite the paradox of excessive demand during emergencies. Such challenges, nevertheless, create room for innovations to pre-existing disaster coping mechanisms even as ICT continues to cement its place as a fundamental part of creating sustainable capacity for disaster risk management.

### 4.1.2 Role of technology in disaster management

Mr Lincoln Njogu of the Innovation Hub (iHub) Kenya made a presentation on 'Situating Technology's Place in the Management of Droughts and Floods in Kenya'. The presentation emphasized the current role and promise of nascent technologies in managing disasters. Key highlights were made regarding various applications of technology in disaster management, including the provision of charts and trends for data analysis, GSM technology to facilitate the transmission of community-wide alerts, satellite technology enabling remote sensing, and emerging technologies increasingly applied at different stages of the disaster management continuum.

On emerging technologies, attention was drawn to the increasing use of digital maps that provide geographic data during disasters and also provide advice related to navigation. These digital maps are increasingly ubiquitous on mobile platforms and provide dynamic information, including through crowd-sourced information. Examples were given of how a Kenyan-based crowd-sourcing digital mapping platform, *Ushahidi*, was used to highlight incidences of post-election violence between 2007/8 in Kenya, based on the aggregation and mapping of emails and SMSs obtained from the Kenyan public. Further, it was highlighted that *Ushahidi* had also been used in responding to the devastating earthquake in Haiti in 2010. Reference was also made to a separate platform, Afriscount, a mobile-based application created by PCI Global and iHub, currently being used by semi-nomadic pastoralists to locate and navigate to areas of dense vegetation based on satellite data.

Another emerging technology with potential to impact disaster management concerns Big Data, described as the use of large groups of unstructured data from varied sources (including social media data) to facilitate data-driven decision-making.

The Internet of Things (IoT) which describes the increasing tendency for varied devices to be connected to the internet was also cited for its potential benefits for disaster management. The increasing direct integration of the physical world into computer-based systems through 2G, 3G and 4G internet capabilities will facilitate automations such as technology produced by Greenhouse, a Kenyan technology enabling remote access to greenhouse readings and automated control of plant watering devices.

A fourth emerging technology that yields promise for disaster management relates to the use of drones or small unmanned vehicles which facilitate the surveillance of large tracts of land at a lower expense than the high costs of procuring satellite. Drones have the potential to facilitate surveillance in hard-to-reach rescue

locations and provide aerial analytics as currently undertaken by a South Africa-based company, Aerobotics.

Blockchain was highlighted as a fifth emerging technology with existing benefits for disaster management. By providing a comprehensive and highly secure list of records, blockchain offers a single, reliable reference point for information regarding farmers or distributors within a community for use by organizations such as non-governmental agencies. Use of blockchain would facilitate disaster management solutions derived from the bottom-up and involving a communitarian and human-centric approach and partnerships. Organizations such as iHub are currently involved in development of local innovation hubs in disaster-prone regions such as Marsabit and Garissa to facilitate community involvement in disaster preparation and resilience.

### 4.1.3 Managing disaster risk management in the region: Emerging issues and challenges

#### New Partnership for Africa's Development (NEPAD)

Mr Osiemo from the New Partnership for Africa's Development (NEPAD) made a presentation on emerging issues and challenges encountered in coordinating disaster risk management across the East Africa region. Kenya has witnessed increasing risks of natural disasters in terms of the diversity, frequency and intensity of such disasters. This raises the need for serious attention to disaster risk management at the national, sub-national and community level without which future disasters would likely become even more serious. The effects of disasters, ranging from loss of livelihood and other economic losses, to environmental damage and humanitarian losses within the region were attributed to both natural causes such as floods and artificial sources such as poor infrastructure, the unplanned nature of some settlements, and terrorism.

Reflecting on past practices, the speaker underscored a bias in disaster management towards provision of emergency responses rather than risk mitigation. Recent efforts to mitigate disasters in the region have suffered from poor implementation of policy recommendations, inadequate local capacities to identify and design appropriate risk coping mechanisms, the exacerbation of climate change impacts, low political and economic commitment because of competing policy needs and priorities, and poor cooperation and information sharing among disaster management agencies.

Reference was made to several potential remedies for weak disaster risk management, including the creation of a national policy and legal framework for disaster risk management with decentralized responsibilities and capacities at all

levels. It is also necessary to provide adequate resources to implement disaster risk management plans and activities at all administrative levels, ensure adequate community participation, create a functioning multi-sectoral technological platform for disaster risk management, and use of hazard data and vulnerability information to identify, assess and complement national, local risk assessments based on disaster management. There is also need to put in place systems to monitor and archive data and disseminate knowledge to promote a culture of safety and resilience at all levels. School curricula and professional training should embrace disaster risk management concepts.

### 4.1.4 Mainstreaming disaster risk management in national development goals – Development Initiatives Africa

Dr Karen Rono, Regional Technical Lead at Development Initiatives Africa, made a presentation on 'Mainstreaming Disaster Risk Management in National Development Goals'. The presentation was based centered on findings of a one-year study funded by the UK Department for International Development (DfID) comparing disaster preparedness policies and practices in Kenya.

The study relied on focus group discussions at the community level, key informant interviews with government officers and politicians, and financial analyses. Consequently, the study covered both knowledge management aspects related to disaster preparedness (e.g. the existence of early warning systems, risk assessments, contingency plans, standard operating procedures, adequate community skills and key partnerships), and aspects related to legal and governance frameworks (e.g. key implementing institutions at the national and sub-national levels, how these actors work together, the degree of financial investments made, approaches to costing and the nature of principles guiding investments and costing).

Disaster preparedness was defined as being the knowledge and capacity to anticipate, respond to and recover from imminent and current hazards. Dr Rono highlighted the degree to which respondents in the study felt Kenya is prepared to deal with floods, droughts and disease outbreaks. While respondents felt that Kenya was generally ill-prepared for disasters, they deemed that the country was better prepared to handle drought-related disasters than addressing either floods or disease outbreaks. It was postulated that the reasons for this difference in perceptions may be linked to views that drought has a slow-onset, in contrast to floods and disease which seemingly tend to catch people off-guard, and to the greater public awareness of the existence of a National Drought Management Authority (NDMA).

As examples of challenges to mainstreaming disaster risk management in Kenya's national development goals, the presentation underscored the critical absence in Kenya of a culture of preparedness, in preference of more reactive approaches to disaster management. There is a dearth of incentives for multi-agency collaboration and partnerships stemming from a competitive climate among agencies involved in disaster risk management. While Kenya has a multiplicity of disaster preparedness agencies, the study highlighted weak partnerships and coordination between the NDMA focused on drought-relief. The Ministry of Water, and the Water Resources Management Authority (WRMA) are concerned with mitigating floods; the Division of Disease Surveillance and Epidemic Response Unit and the Division of Health Emergencies and Disaster Risk Management are tasked with addressing human disease; the Directorate of Veterinary Services counteracts animal diseases; and disaster risk management agencies such as the National Disaster Operations Centre (NDOC), National Disaster Management Unit (NDMU) and the Kenya Red Cross Society (KRCS) are cross-cutting.

There is lack of standardization in disaster risk management procedures between counties and agencies, and the absence of standard goals to guide disaster risk management at the county level. Similarly, there is lack of consistency in the provision of disaster risk management services, evidenced by the operation of the NDMA under the Ministry of Public Service in certain counties and under the Ministry of Environment in other instances. While there are standard operating procedures and sufficient data on disaster preparedness, low levels of awareness and use of scientific data undermine disaster risk management efforts. While Kenya is ahead of her peers in ratifying international commitments such as the Sendai Framework, and Africa Risk Capacity, disaster risk management practices are hampered by low levels of public awareness. Consequently, recent passage of legal frameworks to address disasters, while reflecting good political will, may similarly fail to realize anticipated gains in disaster risk management. Additional funding from contingency, insurance and donor allocations is also required, even though allocations by foreign donor towards disaster risk management in Kenya have steadily risen to US$ 26 million.

Dr Rono indicated that there are benefits to be realized at the county level in ensuring community and gender-based inclusion, which could be attained by approaching community self-help groups. The study recommends that efforts be made to challenge detrimental cultural perceptions within branches of government and communities regarding risk-preparedness through the proposed adoption of a 'No regrets principle' to investing risk preparedness and promoting evidence-based knowledge and use of existing financial instruments to hedge against the risks and impacts of disasters. The increased presence of and better collaboration between relevant agencies, the provision of disaster-specific budget allocations

and costings, and improvements to the inter-operability and disaggregation of disaster-related data stand to further boost decision making and implementation of disaster risk management efforts.

### 4.1.5 Panel discussions

The plenary session ended with panel discussion and open-floor question and answer session, aimed at eliciting the responses of the panel, consisting of Lynette Mwangi, Chief Executive Officer of the Media Owners Association; Dr Alex Awiti, founding director of the Aga Khan University East African Institute; and Prof. Bitange Ndemo, former Permanent Secretary at the Ministry of Information, Communication and Technology in Kenya and currently chair of the University of Nairobi Business School.

Ms Mwangi lauded the presenters for the informative sessions and reiterated the seeming failure of disaster management agencies to adequately use the abundant opportunities to boost preparedness and responsiveness found in existing technologies. Likewise, she stressed the need to boost the operationalization of existing national policies and international commitments to improved disaster risk management. Stressing inadequacies in budgetary planning, she further noted that perhaps half of the funding spent on dealing with the effects of disasters in Kenya could be better channelled towards preventive measures. In her closing remarks, she posed her own question as to the extent to which the national government of Kenya has refrained from adopting stock intervention templates and begun to truly learn from past disasters and the prospective benefits of co-opting communities to co-create disaster-relevant policies and laws.

In his remarks, Dr Awiti raised the paradox that Kenya had in fact checked most of the right boxes such as providing access to relevant technologies. However, Kenya's capacity to acquire 'early warnings had not translated into early actions'. He lamented the weak disaster response infrastructure, inadequate institutional capacity to handle disasters, poor coordination among agencies towards the goal of saving lives, and the lack of clarity regarding jurisdictions for action owing to devolution, resulting in under-utilization of disaster management resources. He recommended continued emphasis on accelerating response times, boosting human capital, and mobilizing adequate financial resources to save lives and property.

Concurring with much of the preceding comments, Prof. Ndemo highlighted the role of cultural deficiencies in impeding disaster risk management. He echoed the view that Kenya has the capacity to predict disasters using IT capabilities and open data access, but is encumbered by a culture of weak performance,

general pessimism and institutional silos which needed to be broken through. He advocated for adoption of high-impact, low-cost solutions to prevent disasters. Such solutions included promoting the storage of excessive grass (silage) as a result of flooding for use as animal feed during periods of drought. There is need to unclog drains within inner-cities to avoid unnecessary flooding. Destruction of forests facilitates floods and landslides.

The plenary session concluded with open-floor question and answer session during which the chair of the plenary session inquired as to what ought to be done to facilitate compliance with early warning signals. Dr Awiti responded by emphasizing the necessity of good leadership and accountability, and the need to stop impunity and ensure that standards are not flouted and plans such as Kenya's National Spatial Plan are adhered to.

Responding to a related question regarding the potential and designated purposes of Kenya's land, Ms Mwangi indicated that lack of public awareness posed a challenge in ceasing the unlawful sub-division and arbitrary repossessing of land. Prof. Ndemo responded in the affirmative to a question regarding the availability of disaster-related technologies and applications tailored to the needs of women and persons with disabilities, for which he attested to having personally seen such applications and to the governments continued efforts to ensure the availability of corresponding audio-based resources at the National Library to cater to the optically impaired. He added that low levels of awareness among disaster management agencies may have contributed to minimal uptake in the use of such technologies and applications.

## 4.2 Coordination of Occurrences of Drought and Floods in the Region

The second plenary session of the final day featured four presentations and several related break-away group discussions centered around the theme 'Coordination of Droughts and Flood Responses in the Region'.

### 4.2.1 Showcasing from the organizations involved in droughts and floods episodes' - Kenya Red Cross Society

Ms Eva Wanjiku made the presentation showcasing the work of organizations engaged in droughts and floods episodes, with a particular emphasis on the work of her organization, the Kenya Red Cross Society. She began by briefly outlining activities which the Kenya Red Cross Society has undertaken in the past to support disaster risk management efforts. These activities include the provision

of security; psychosocial support services to affected persons; rehabilitation of damaged or dysfunctional water points; construction of boreholes and water point desiltation; supporting the restoration of degraded livelihoods through cash and in-kind transfers; and partnering with the Kenya Seed Company to distribute seeds, which in one case saw one community obtain a bumper harvest ahead of an anticipated drought spell.

The Kenya Red Cross Society also provides mobile money cash transfers in partnership with Safaricom. Alongside these efforts, the Kenya Red Cross Society is actively engaged in food distribution, animal retrieval, assessing the destruction of shelters; providing temporary shelters; deploying medical outreach teams; provision of rescue services and transportation; and facilitating peace-building initiatives where resource constraints have resulted in clashes among communities, most recently in Baringo and Turkana. The poor conditions of some of the roads leading to the disaster-affected sites presents a challenge to the effective provision of disaster management support. Further, Ms Wanjiku also highlighted impediments to the use of mobile money cash transfers because of poor network coverage, low mobile penetration, or frozen or inactive M-Pesa money transfer lines.

In respect of past successes, she drew specific attention to the Kenya Red Cross Society's successful collaborations with national and county governments, non-governmental organizations, faith-based organizations, and local community leaders, the result of which has been improvements in the prospects of adequately responding to these collective challenges facing communities. In concluding the presentation, reference was made to key lessons that the Kenya Red Cross Society had learned over the course of its disaster response activities. Among these lessons was the benefit of holding multi-agency coordination meetings, which has ensured good relationships with other stakeholders; creation of a community complaints feedback system which has reduced complaints arising from disaster response activities; and ensuring timely disbursements of cash transfers, through which the Kenya Red Cross Society has managed to obtain the confidence of and foster good relationships with affected communities.

### 4.2.2 Challenges of coordination of capacity at county level - World Food Programme

Mr Bernard Nyatuga presented insights into the challenges of coordinating disaster risk management capacities at the county level through the lens of his experiences with the World Food Programme (WFP).

He began his presentation with a brief introduction to the WFP and its activities, and drew participants' attention to a critical shift in WFP's philosophy in recognition of the effect of disasters in disrupting livelihoods. As a consequence, its activities now extend beyond an exclusive focus on the provision of humanitarian assistance, to include the provision of assistance both in humanitarian and development terms.

Political devolution and rapid economic growth had spurred the implementation of numerous steps towards establishing and coordinating disaster risk management efforts, forcing humanitarian actors to assess how best to support national and sub-national institutions in ensuring sustainable livelihoods among communities. A second critical shift relates to the recognition of devolved governments as being the first line of responders in disasters, and with this has followed a de-emphasis by WFP on the provision of transfers, preferring greater involvement of the counties and national government in this regard. Instead, Mr Nyatuga indicated capacity development and strengthening of disaster risk management strategies as prioritized areas of collaboration between WFP and both levels of government, noting the shared functions between national and county governments in disaster risk management.

County representatives feel the need for capacity needs assessments, and are dissatisfied with the absence of a lead institution to coordinate emergency response issues, despite their acknowledgement that the NDMA was in existence and catered to restricted forms of disasters. Counties also feel the need to have their mandate expanded, citing the existence of disasters and hazards beyond the scope of organizations such as NDMA, and in recognition of the responsibilities of county governments in disaster management, as set forth in the Constitution of Kenya. Lack of role clarity between national and county level actors is manifested in struggle by many counties to mobilize resources and personnel to address needs of their affected populations. On a similar point, lack of clarity around the allocation of disaster risk management resources by both levels of government was cited as an impediment to forward planning for coordinating disaster risk management efforts, as was weak or discretionary approaches to information sharing, owing to the informality of disaster risk management partnerships.

The absence of Disaster Risk Management Units within most counties was another major challenge to coordinating capacities for disaster risk management in counties. Among counties that had established such units, it was noted that inadequate capacity and quantities of disaster risk management personnel presented a major challenge, made worse by challenges in finding and recruiting adequate numbers of competent staff. While counties have leeway to use emergency funds in response to disasters, many had not previously allocated funds towards strengthening the

capacities in disaster risk management, which resulted in sub-optimal spending of such emergency funds. The absence of monitoring and evaluation mechanisms was highlighted as detrimental to the coordination of disaster risk management capacities at the county level.

Reference was also made to several key interventions in response to the above challenges, which drew upon the collaborative efforts of WFP, NDMA, the county governments of Wajir, Marsabit, Samburu and Baringo, among other stakeholders. Among these were efforts to identify gains in the capacities of county personnel and systems through the testing of systems and procedures to understand existing infrastructure; development and review of disaster risk management policies, regulations, plans and strategies; simulation of comprehensive participation in emergency preparedness and recovery in the counties; provision of technical support for policy drafting in collaboration with other agencies; establishment of similar administrative structures across counties; assessment of accountability mechanisms; and the promotion of knowledge management to facilitate reflexive learning, knowledge sharing and public dissemination.

In concluding, he conveyed his appreciation of the steps taken towards establishing county capacities for coordinating disaster responses and preparedness, recognizing that full assimilation of these capacities would take longer than the three years of engagement between WFP and the county governments in this regard. He indicated that there was now a sense of institutional ownership of disaster risk management initiatives, which nevertheless would need to be safeguarded during electoral transitions. Despite ongoing inadequacies in planning and budgeting for capacity strengthening initiatives, the presentation stressed the promise of positive changes resulting from the recent approval of the National Disaster Risk Management Policy, and a Bill, which stands to create space for continued dialogue to clarify roles and responsibilities at both levels of government and identify opportunities for the financing of disaster risk management efforts. The presenter concluded by citing ongoing dialogue at the multi-national level regarding the development of a relief assistance policy to help coordinate actors at various levels of government and possibly elicit wider collaboration between state actors, non-state actors and the private sector.

### 4.2.3 Regional coordination efforts: Successes, challenges and way forward' - Intergovernmental Authority on Development

Prof. Farah Kassim represented the Intergovernmental Authority on Development (IGAD) and gave a presentation on the successes, challenges and way forward in regional coordination of disaster risk management efforts.

He began with brief remarks to contextualize pastoralist activities. He refuted romanticized notions of pastoralism common among anthropologists, criticisms levelled by economists as to inefficient resource management by pastoralist communities, and efforts to promote alternative sources of livelihood among pastoralists which, according to him, have left pastoralist communities worse off. Instead, he observed that pastoralist communities are already widely conceived as being one of the most resilient communities in the face of desertification.

On the case for interstate partnership, it was noted that natural disasters (like pastoralism) do not conform to political or administrative boundaries but to ecological ones which can run across countries, prompting the need for regional collaboration and coordination for effective disaster risk management. IGAD's membership, which constitutes several Heads of States from member countries, presents an opportunity for member countries to work together towards ending drought emergencies by building resilience and sustainability in pastoral areas. This can be achieved through harmonization of plans and strategies, sharing of information, joint actions, joint monitoring and evaluation, mobilization of collective resources, and accountability mechanisms.

The role of the IGAD Drought Disaster Resilience Sustainability Initiative (IDDRSI), which provides for the development of a common disaster risk management framework among member states was also undescored. Through IDDRSI, all the eight (8) IGAD member states are required to develop country programme papers that align to seven (7) priority investment areas and feed into a regional programme paper developed by the IGAD Secretariat.

Prof. Kassim described IGAD's governance structure as consisting of focal points and linked to focal ministries, two in each member state. He underscored the benefits of IGAD's convening power and the fact that as a platform, IGAD facilitates high-level participation in disaster risk management, including panel discussions featuring heads of member states on such panels, thus boosting accountability and policy significance. In 2017, there were three consecutive droughts that, taken together, were worse than the major drought in 2011, but nevertheless led to fewer losses in life and property. This could be attributed to the efforts of the 15-year IDDRSI. On the contrary, it was highlighted that persisting challenges to regional coordination involved the inadequacy of national focal points within IGAD member states, and little to no awareness of Kenya's critical role in championing IDDRSI, through Kenya's National Drought Management Authority in particular. Opportunities for progress lie in increasing the number of IGAD national focal points and addressing these levels of awareness in member states such as Kenya.

### 4.2.4 Data generation for disaster preparedness systems - Kenya National Bureau of Statistics

The fourth and final presentation of the plenary session was made by Mr Joash Kaara of the Kenya National Bureau of Statistics (KNBS). His presentation focused on the application of data generation for disaster preparedness systems.

He began by outlining the role of KNBS as the official data repository involved in the collection and dissemination of statistical information to facilitate planning and management in Kenya. Where KNBS lacks statistical information, it supports data users in developing appropriate infrastructure to facilitate relevant and methodologically sound data collection.

The importance of data related to disasters was underscored, hinged on both climate change and global warming that are progressively contributing to frequent and severe disasters with significant impacts on economic development. The various indicators produced by KNBS in respect of disaster management were outlined. Key domestic indicators concern the occurrence and impact of floods; droughts; disease outbreaks such as cholera; incidences of fire; landslides as recently witnessed in Murang'a and Suswa in Kenya; disruptions to transport systems which can have a large economic impact; and man-made disasters such as terrorism and the collapse of poorly-constructed buildings and dams.

Further, the presenter indicated that KNBS is equipped to provide the following indicators:

- Number of persons requiring food assistance owing to drought emergencies, as drawn from its proprietary National Household Budget Survey;
- Percentage of children under five years who are wasted due to drought and malnutrition;
- Time elapsed between the occurrence of and response to a disaster;
- Value of livestock lost during drought in relation to the number of animal deaths;
- Number of human deaths from violent conflict in ASAL counties, disaggregated by gender and age;
- Number of incidences of livestock theft;
- Number of road fatalities/accidents;
- Quantity of water available to households per day, during dry seasons;
- Improvements in long-term household food security;

- Percentage decrease in malnutrition incidences;
- Number of households receiving cash transfers;
- Number of households affected by droughts and floods;
- Occurrences of disasters by time, location and magnitude;
- Economic losses arising from disasters;
- Number of persons killed, injured, rendered homeless or affected by disasters; and
- Physical losses and damages arising from floods.

In addition to these domestic indicators, KNBS provides disaster risk management oriented to the UN Sustainable Development Goals (SDGs), such as:

- Number of deaths, missing or directly affected persons attributed to disasters per 100,000 persons within a population;
- Number of counties that have adopted and implemented national disaster risk strategies in line with the Sendai Framework for Disaster Risk Reduction;
- Proportion of county governments that adopt and implement local disaster risk reduction strategies in line with national risk reduction strategies; and
- Prevalence of moderate or severe food insecurity in populations, based on a food insecurity experience scale.

Mr Kaara concluded by indicating the importance of bringing both the users and producers of disaster-related data together as envisaged in the National Disaster Management Plan to boost the quality and application of disaster risk management data. He stressed the need for data collection to be grounded in sound methodologies, creation of a data sharing platform for ease of access by all stakeholders, and aspiration towards the provision of freely accessible real-time data regarding factors such as weather. Echoing sentiments from the first plenary session, he advocated for use of early warning systems and big data technologies which would serve to strengthen the identification and assessment of disaster risks based on historical data and attempts to anticipate the next drought or flooding season. Issuing a challenge to other research institutions, the presenter challenged KIPPRA to explore a potential correlation between poorer areas of residence and the frequency of floods and droughts in those vicinities.

### 4.2.5 Panel discussions

The second plenary session ended with discussion and open-floor question and answer session aimed at eliciting reactions to the presentations from Ms Jackie Ludibwi, representing the Kenya Broadcasting Corporation (KBC) and Mr Leonard Kimani, former Director of the National Economic and Social Council in Kenya.

Ms Ludibwi observed that a lot has taken place with respect to coordinating disaster risk management efforts in the region. However, many undertakings remained largely unknown to members of the public. She encouraged better coordination with members of the media to bridge the gap in public education and sensitization. In aid of this, she requested for capacity building of members of the mass media to help them understand, distill and convey disaster risk management information, which can often be complex. This capacity building could be achieved through invitation of members of the mass media to seminars and roundtable meetings, where disaster risk management reports can be broken down and their statistics explained. She concluded her comments by indicating that public awareness could be improved by use of strong and consistent messaging, building the capacity of journalists to make sense of statistical data and by agencies utilizing the 5-minute window for free public service announcements provided under Kenyan law.

Mr Kimani, on the other hand, lauded the efforts of WFP to strengthen disaster risk management capacities in counties and proposed that the mainstreaming of capacity building actions undertaken by WFP. He subsequently inquired as to the extent to which Kenya had adopted global best practices in disaster risk management, such as the cultivation of cactus farms in Israel. Responding to this query, Prof. Kassim highlighted the differences in economic development between Israel and Kenya's ASAL counties, which he indicated demands different variations of disaster risk management interventions. Moreover, Prof. Kassim explained that through IDDRSI, IGAD member states already had access to leading-edge practices in disaster risk management.

Responding to a question regarding the membership of IGAD, Prof. Kassim indicated that its membership includes all regional Heads of State except for Eritrea. He concluded his comments by advocating for a proactive approach to disaster risk management, in a manner analogous to response mechanisms by the disciplined forces.

The plenary session concluded with an open-floor question and comments session during which the moderator of the plenary session inquired as to the other agencies involved in disaster risk management efforts alongside the Kenya Red Cross Society. Ms Wanjiku responded by indicating that as an organization created by an Act of Parliament, the Kenya Red Cross, was required to hold collaborative

meetings with county and national governments, and NGOs, local communities and other institutions prior to providing emergency support. She stipulated that various organizations were involved in disaster risk management efforts, although this was characterized by weak coordination among the various agencies. In addition, she drew attention to the Kenya Red Cross Society's involvement in the County Steering Committees, and in ongoing collaborations to ascertain whether or not counties have allocated funds for disaster response and documented how they would respond to floods or droughts in their respective County Integrated Development Plans. She concluded her comments by highlighting the involvement of the Kenya Red Cross Society in developing capacity within communities by recruiting volunteers, some of whom are drawn from affected communities and subsequently proceed to train other trainers of volunteers in disaster risk management with the support of the Kenya Red Cross Society, and International Centre for Humanitarian Affairs (ICHA).

Several members of the floor raised questions as to the availability and accuracy of statistical data on the impact of disasters on Persons With Disabilities (PWDs), and the extent to which the KNBS has sought to partner with private sector in the provision and analysis of big data.

Responding to these queries, Mr Kaara indicated that the Kenya National Bureau of Statistics aims to bring together all stakeholders from government departments and research institutions to objectively assess the quality and usefulness of KNBS data. KNBS will have multilateral sector-specific committees to validate all KNBS data associated with the respective sectors, prior to dissemination of such data. Mr Kaara also hinted at the prospect of future engagements with providers of mass media and sector-specialists within the media fraternity to establish how best to package statistical information for public consumption, and to efforts to build industry capacity on international standards and best practices in statistical data collection.

Mr James Gatungu, a Director at KNBS, added to the discussion by indicating that KNBS has embarked on a strategy to digitalize its data and to address a broader culture of poor data handling and under-utilization of statistical information by government agencies, by hiring data scientists and obtaining Cabinet approval for a national strategy for statistical development, developed by the Kenya National Bureau of Statistics. In addition, Mr Gatungu explained that while certain levels of disaggregation is not feasible in all surveys, PWDs and associated member organizations were targeted in specific surveys, including comprehensively in the national census survey. He advocated for the much-needed support from other agencies in obtaining relevant data on persons with disabilities.

The final deliberations of the conference consisted of several presentations discussed in Breakaway Groups and subsequently summarized at plenary, as highlighted through the case studies below:

**Case Study 1: Agricultural drought monitoring with remote sensing data over the Greater Horn of Africa: A case of Somalia – Southeastern Kenya University**

In this breakaway group, Dr Joshua Ngaina, a lecturer at South Eastern Kenya University gave a presentation which sought to determine the temporal and spatial variables in agricultural drought patterns based on remote sensing information. He indicated that while many regions experience hazards and may be prone to floods and drought, fewer countries experience disasters and related epidemic and fatalities because of such hazards. The latter case is more common in the greater Horn of Africa region and is attributed to a culture of unresponsiveness towards hazards, resulting in their maturing into full-blown disasters.

With respect to droughts, Dr Ngaina highlighted four categories of this phenomenon. The first concerns drought occasioned by deficiencies in the amount, intensity and timing of rainfall, which indicates that a dry spell would likely continue into the next season. A second type concerns agricultural drought, which translates into crop failures. Hydrological drought manifests in low levels of ground and surface water, including the drying up of dams, although this takes several cycles to manifest and leads to the final form of drought. Socio-economic drought reflects the impact of rainfall deficiencies in driving energy and other prices upwards. However, Dr Ngaina underscored that drought is so onset a phenomenon and, in that regard, presents ample opportunity for sufficient planning against disastrous events.

Dr Ngaina proceeded to explain that Somalia is prone to these droughts, with crop failure in the South and threats to livestock in the North. Ground level monitoring of changing weather patterns is made difficult in Somalia by civil unrest, hence the value of remote sensing data in the absence of such ground-based information. His study of agricultural drought in Somalia based on remote sensing data revealed that remote sensing data is suitable for providing early warning in Somalia, especially given its sensitive political climate. Further, his findings showed that seasons are shifting within the region, raising pertinent questions as to whether these changes are being captured in current drought models and whether in places such as Kenya, such changes can influence decision regarding the choice of crops and periods in which to plant them. Finally, it emerged from the study that local expertise in the use of remote sensing data is sufficient to facilitate adequate drought monitoring across the region, and institutions such as NDMA in Kenya were encouraged to tap into local technological expertise in this regard. This in turn resulted in recommendations for the use of such information across the Horn of Africa to boost food security, promote multi-sectoral collaboration and coordinate stakeholders towards a similar aim.

**Case Study 2: Role of technology in disaster management, and Coordinating disaster management across counties**

The second breakaway group discussion consisted of two presentations. Dr Humphrey Njogu shared his study on the impact of droughts and floods on infrastructure such as roads, bridges and power lines and the resultant economic and humanitarian costs, amounting to millions of dollars lost and numerous lives lost annually because of extended rains or droughts. He indicated that Kenya was particularly vulnerable to such effects because most parts of the country comprise of ASALs. He further indicated that Kenya's infrastructure is particularly susceptible to the effects of floods and droughts, owing in part to inadequacies in planning and construction, and lack of alignment between how and when to build with climatic seasons.

Consequently, it is recommended that Kenya's infrastructure development plans and construction be based on technological data on the risks involved. In addition, Counties need to have a disaster budget and efforts be made to promote the adoption of renewable resources that are less prone to the effects of such disasters. Finally, it emerged that greater investment is needed in developing bottom-up knowledge in new methods of water collection, storage and water use, which would make use of flood rains, and in raising greater awareness among communities about the need to maintain and repair some of the infrastructure that suffers damage during such disasters.

Presenting on county-level coordination of disaster management efforts, Ms Jessica Kinoti cited the need for national and county government agencies, financial institutions and insurance companies to work together to mitigate the impact and effects of droughts. She highlighted the existence of various mechanisms for coordination of disaster management efforts in counties, an example of this being the County Steering Groups (CSGs) which are not legislated bodies and, as a result, are owned by the various stakeholders involved. The different community groups and disparate coordination mechanisms present a challenge to overall coordination of disaster management efforts at the county level, as organizations such as USAID have their own separate coordinating platform which their own agencies respond to. She therefore recommended that a single platforms be created to facilitate collation of all information on disaster responses and for research institutes and other institutions to strengthen their contributions to the county disaster risk management.

**Case Study 3: Strengthening disaster management: A case study of Kenya - National Drought Management Authority**

The presentation discussed the state of affairs in disaster preparedness and management in Kenya, with reference to key existing challenges; key gaps in existing research regarding disaster management and preparedness; and highlighted the best ways for filling these gaps in disaster management and preparation.

The presentation highlighted disaster preparedness and management measures to undertake precautionary and prudent steps to mitigate the effects of disasters. Further, it was indicated that drought-related losses account for nearly 8 per cent of Kenya's GDP. The presentation also indicated a shift in disaster management philosophy to consider the three phases of

disaster management and preparedness, namely – the pre-disaster, during the disaster and after the disaster. Choosing the right disaster management and preparedness approach depends on the nature of the disaster that is anticipated or is occurring. There is no 'one size fits all' disaster preparedness and management approach. It is essential for disaster managers to obtain adequate resources for intervention and make these resources available at the relevant moment to meet the needs of emergency situations.

The study was predicated on a conceptual framework which considered disaster management as a dependent variable; three (3) intervening variables which included policies, team players and the legal framework; and the impact of the preparedness, mitigation, resilience and recovery as independent variables affecting disaster management. Regarding the policies and legislations as an intervening variable, Kenya had adopted international and regional conventions, and national and county legislations and policies. Research institutions and other organizations such as the Kenya Meteorological Department and the European Union have been vital in this process of legislative and policy design. However, challenges persist in the laws and policies linked to disaster management and preparedness because they are not developed with reference to each other.

Secondly, vital players in disaster management and preparedness lack adequate linkages to one another, whereas the integration and support for such institutions (i.e. research institutions) is key to improving both the policy and capacity.

Thirdly, on the role of legal frameworks as an intervening variable, it was highlighted that the policies and laws place inordinate emphasis on national rather than county level provisions and mechanisms. The need to integrate climate change policies into legal and policy provisions on disaster management and preparedness was therefore noted.

Climate change effects have escalated the prominence and necessity of disaster management and preparedness. It was articulated that climate change is here to stay, and is not something that can be eliminated and, consequently, must be met with adequate and sustained efforts in disaster preparedness and management. Further opportunities to strengthen disaster management in Kenya include promotion of capacity building and an awareness culture on disaster preparedness. This should be coupled with opportunities to improve early warning systems, strengthening institutions and legal frameworks, and promoting linkages between agencies involved in disaster preparedness and management.

The following emerged as comments and questions following the presentations:

- There is need for capacity building at the county level on disaster impact assessment to facilitate improved county budgetary allocations related to disaster management. This reflected concerns from the Tana River County representative that most counties had previously lacked budgetary allocations owing to lack of knowledge regarding climate change and disaster management. Subsequently, KIPPRA was challenged to write a paper assessing the impact of disasters – including the economic, sociological and psychological impact of

disasters - to inform county disaster management budgetary allocations. One example given was to quantify the true costs (economic and psychological) to learning outcomes of relocating school children affected by floods and drought, or of restoring disaster affected schools.

- There is a need to learn from best practices and disaster experiences. Lessons on disaster management need to be drawn from the recent past, if not ongoing, floods and droughts on the true impact of these disasters. Local case studies are needed, such as the Nyeri Irrigation Scheme (Kifiringo) which has seen a community increase its resilience, overcome food insecurity, and improve lives and livelihoods.
- There is need to ensure inter-county coordination is respect of mitigating the effects of disasters. While disasters may occur in one county, impacts are often diffused into other counties through migration or other coping mechanisms. There is therefore need for counties to work together in disaster planning and provide resources to manage disasters. County governments have started to enact legislation related to climate change and setting aside at least 2 per cent of their budgets for the management of disasters, so that except for large scale disasters, counties may have the capacity to provide their own response to disasters. Some counties such as Kilifi have allocated 12 per cent of their budgets to disaster preparedness. Other such counties include Kajiado, Taita Taveta, Baringo, and West Pokot.
- Implementation of the Core Humanitarian Standards (CHS) principles was cited as a vital strategy for building capacity at the community level. This concerns the use of community-led drought management, starting at the village level and building all the way up from the wards to the policy-making level. One case study involved comprehensive training of all representatives at the community level. With the result of creating and improving resilience cycles and coping mechanisms, enhancing accountability, providing a relevant complaints mechanism with respect to the management of disasters, and increased engagement with the media. By improving community mobilization, communities are also able to better participate in CIPDs, which have picked their disaster management concerns and suggestions.
- Demographic considerations need to be mainstreamed in respect of disaster management, as unmanaged population growth – related to fertility, mortality and migration rates – leads to the encroachment into habitats that are not meant to house large populations. The demand placed on ecosystems such as natural forests leads to destruction of such ecosystems and subsequently the disasters.

- Management Development Institutes (MDIs) need to play a bigger role in disaster management and climate change discussion. A representative from the Kenya School of Government (KSG) indicated that the School has a network of managers, which disaster managers can leverage to raise the profile and awareness. In addition, they had held symposia on the blue economy. She indicated that there is a real thirst for information and sharing on climate change and disaster management issues. Related to the role of MDIs was the need to develop and share more case studies, as there are a lot of opportunities for peer-2-peer learning. In embracing peer-2-peer learning opportunities, stakeholders should avoid the need to reinvent the wheel and learn from successes such as the Kifiringo irrigation scheme in Nyeri County. The representative from KSG further noted that while the media tends to focus on what is not going right in disaster management, KSG had worked on six (6) case studies, with the Climate Change Directorate showcasing what had gone right, especially in technology transfers.
- Concerns were expressed that stakeholders are not working in an integrated manner and that capacity building programmes are not based on community needs assessments, but rather driven by experts. This emphasis on community needs would render such capacity building programmes more sustainable and enhance the resilience of the communities they target.
- Highlighted as one of the weakest links in disaster management and climate change efforts was the failure of disaster management and climate change stakeholders to effectively disseminate their findings. This is because these conversations tend to be very technical and need to be repackaged or simplified during training to enable effective communication and capacity building. Far from understanding the technical elements of climate change and disaster management, there are still many who do not know the difference between concepts such as climate and weather. Clear packaging of disaster management and climate change issues would also enhance transparency and accountability. This led to proposals for more time to be spent offering basic capacity building opportunities at community level in areas such as proposal writing and funding access, as there are adequate funds for climate-related community training.
- In closing, Mr Paul Kimeu, Director of the National Drought Management Authority, challenged the audience that the work of disaster management cannot, for the most part, be done in Nairobi, but in the communities where the disasters occur. He referred to Community Managed Disaster Risk Reduction as an approach they embraced.

# CHAPTER 5: CONCLUSIONS AND ACTION AREAS

## 5.1 Conclusion

The conference on ***Building Resilience to Mitigate the Impact of Droughts and Floods*** took place from 5th to 7th of June 2018 at the Hilton Hotel, Nairobi. It coincided with the UN World Environment Day on 5th June 2018. The conference came at a time when Kenya was undergoing serious episodes of floods, coming just after prolonged drought spells that started in 2016.

Kenya's geography makes it highly vulnerable to climate-induced hazards, especially droughts and floods. This is because over 80 per cent of the country is ASALs. Some parts of Kenya experience double hazards of droughts and floods in quick succession.

All indications are that droughts and floods will increase due to climate change. Various projections presented in the conference show that the occurrence of droughts and floods will be more frequent and severe and will complicate the realization of the Vision 2030 targets, the "Big Four" agenda, and the Sustainable Development Goals.

At global level, Kenya has adopted the Sendai Framework for Disaster Risk Reduction 2015-2030 which was adopted at the 3rd UN World Conference on Disaster Risk Reduction. The four (4) priority areas are: Understanding disaster risk; Strengthening disaster risk governance to manage disaster risk; Investing in disaster risk reduction for resilience; and Enhancing disaster preparedness for effective response and to "Build Back Better" in recovery, rehabilitation and reconstruction.

Major droughts in Kenya were recorded in 1975, 1983, 1999-2011, and 2016-2017. Flood events related to the El Nino phenomenon were experienced in 1997/98 and 2003 and, in 2018, serious floods have affected various parts of the country.

The negative impacts of droughts and floods include disruptions of production flows, which results in production losses, increased operational costs, low income, unemployment, loss of lives, among others. An estimated 3 to 4 million Kenyan's are affected annually by disasters that disrupt livelihoods. More than 70 per cent of natural disasters that occur in Kenya are because of extreme climatic events that include droughts and floods.

Between 2008 and 2011, the total drought loss and damage amounted to Ksh 968.6 billion and resulted to reduction of Gross Domestic Product (GDP) growth rate from an average of 6.5 per cent in 2006/2007 to an average of 3.8 per cent between 2008 and 2012. On average, the economic cost of droughts and floods alone is estimated to create a long term fiscal liability equivalent to about 2.4 per cent of GDP annually.

The government, through the Ministry of Interior and Coordination of National Government, has developed the National Disaster Risk Management (DRM) Policy 2017 which has been approved by the Cabinet. This will serve as the over-arching framework on disaster risk management for the country. The aim of the DRM policy is to build a safe and disaster-resilient nation through establishment of a robust DRM system that contributes to and protects the achievement of Kenya's national development. The DRM seeks to substantially reduce natural and human induced disaster risks and associated losses in social, economic and environmental assets at national and county levels through the establishment of an integrated multi-hazards DRM approach.

The government established the National Drought Management Authority (NDMA) in 2011 to coordinate all matters relating to drought management, including implementation of policies and programmes. Recently, the government has established the National Drought Emergency Fund (NDEF) with an allocation of Ksh 2 billion from the Exchequer in 2018/2019 budget. To operationalize the NDEF, the National Treasury and Planning has developed the National Drought Emergency Fund Regulations 2018 that were recently approved by the Cabinet. Resources to the NDEF will be allocated to various drought risk management components of resilience, preparedness, response and recovery.

## 5.2 Action Areas

The conference deliberations culminated into the following 13 Action Areas as policy priorities.

### 1. Scaling up the Early Warning System

The impacts of droughts and floods can be greatly avoided and or minimized if their occurrence were properly monitored, assessed and mitigated. Strengthening the current early warning system (EWS) is therefore a priority in planning for, responding to and recovery from the adverse impacts of weather-related hazards. The EWS network could be expanded to cover the country's diverse agro-climatic zones. One way of scaling up EWS is through use of remote sensing technologies and mobile phone applications.

### 2. Leveraging on Technology

Implementation of various pilot projects in the country has demonstrated that technology can improve the resilience of affected communities, particularly those prone to droughts and floods. Despite their positive outcomes, these technologies have rarely progressed beyond pilot stage. Building the country's resilience will require deployment of appropriate technologies across the sectors, including adoption of climate smart agriculture technologies. Opportunities also exist for integrating satellite-based applications to support disaster reduction measures. This will require investments in research and development to enable identification of appropriate technologies. Where applicable, there is need to blend modern and traditional technologies to enhance their relevance and increase uptake.

### 3. Institutional Strengthening and Coordination

Many institutions including non-state institutions and development partners are involved in disaster risk reduction, although there are weaknesses in the coordination mechanisms. Gaps also exist at county government level where the disaster management function assigned under Schedule IV of the Constitution has not been fully operationalized. This calls for institutional frameworks to handle climate disasters at the local level. Given the intertwined nature of droughts and floods, the mandates of the institutions should cover both types of disasters.

### 4. Adoption of Comprehensive Approaches to Disaster Risk Management

The frequency and severity of disasters resulting from natural hazards have been increasing. The complexity of problems posed by natural hazards such a droughts and floods cannot be addressed by single-sector development planning. Thus, Kenya and the region should respond with multi-sectoral approaches and move quickly towards mainstreaming the management of risks from natural hazards into all aspects of development planning and in all sectors of the economy.

The recently adopted Sendai Framework for Disaster Risk Reduction 2015–2030 addresses knowledge-related issues and provides the opportunity to highlight the critical role of knowledge in disaster risk reduction.

Because the risks from natural hazards can never be eliminated, Kenya and the region should ensure a balanced approach that incorporates structural measures, and community-based prevention measures, emergency preparation, insurance, and other non-structural measures such as education and training or land use regulation.

### 5. Design Programmes that Promote Gender Empowerment in Building Resilience

Women in poor households and rural communities are largely committed to family chores such as cooking, food and nutritional needs of the households and care for children and the elderly. Incidences of droughts and floods worsen the burden for women because of challenges in accessing food, sanitation and health services, especially when households move away from health facilities and other social amenities. The problem is more complex among pastoral communities that migrate with livestock in search for water and pasture, leaving women to take more male responsibilities. Overcoming these challenges entails: Equitable access to economic opportunities such as access to education, entrepreneurial support and land ownership; Equitable development that eases access to water and sanitation, health and other social amenities; Cultural change in mindset on gender responsibilities; and adoption of rain water harvesting technologies to boost access to clean water, kitchen gardening and reduce time spent searching for water.

### 6. Mainstreaming Interventions for Vulnerable Groups in Disaster Management

Special interest groups including women and persons with disabilities (PWDs) are disproportionately affected by droughts and floods. It is therefore important to understand the vulnerable nature of these groups to disasters and integrate their concerns into disaster management at all levels.

There also concerns that statistics on PWDs for Kenya is low compared to regional countries, which may not be the accurate picture. This has consequences for resource allocations to support the group. Collecting comprehensive information on PWDs is therefore imperative.

### 7. Enhancing Financing Mechanisms

Adequate, predictable and timely financial resources are key in building resilience and adaptation in the medium and long term. Robust financing is required to deepen technology, build human capital and support extension services. At national level, the National government has established a Contingencies Fund, National Drought Emergency Fund, and Climate Change Fund while some counties have created Climate Change Funds to address disasters. In view of the increasing frequency and severity of disasters, there is need to scale up the capitalization of these funds while at the same time improving coordination.

Deepening of financial instruments including insurance and credit will also be key in building robust coping mechanisms at household and firm level against impacts of droughts and floods.

Dynamics of droughts and floods constrain the supply of financial products, low awareness, affordability and financial literacy imposing demand constraints.

Given the high-risk nature of weather-related insurance and credit, which is at infancy stage, insurance and credit companies need support from government and development partners to increase participation in disaster risk financing. This will also enable application of satellite-based technology which is critical in the design of insurance and credit products.

While the Capital Markets Authority (CMA) has been promoting financial literacy on capital markets, among other initiatives, there is need for greater collaboration among regulatory agencies, industry associations, and developers of financial products to increase awareness and financial literacy. Such initiatives can therefore leverage on existing frameworks such as the Capital Markets Master Plan which aims to promote financial literacy.

### 8. Strengthen Research and Development

Building resilience to droughts and floods at household and firm level requires implementation of coping, adaptation and mitigation measures informed through research. However, disaster-related research in the country is low. Where research has been conducted, it often does not inform research and programme interventions. Investments in disaster risk reduction research will be key while at the same time strengthening the link between research, policy and industry.

### 9. Data, Information and Knowledge Sharing

Disaster risk reduction policies and practices require data, information and knowledge for informed decision making and coordinated action. Although knowledge production and implementation processes are critical for disaster risk reduction, these issues are seldom systematically addressed in depth in disaster interventions. While efforts and improvements have been made about data collection, only limited resources are committed to improving knowledge identification, creation, processing, storage, sharing and application, thus hindering effective preparedness, response and recovery efforts.

The Kenya Meteorological Department could increase the network of weather stations to generate localized data across the various agro-climatic zones that will serve the needs of local communities. Kenya also needs a framework for data and knowledge sharing across the various players.

### 10. Promoting Sustainable Environmental Management

Environmental resources play a critical role in adaptation and mitigation of climate-related disasters through flood control and carbon sequestration. Rapid degradation of these resources, particularly forests and wetlands across various parts of the country, expose communities to disasters. Efforts to reclaim lost forests and wetlands should be expedited alongside programmes to increase the country's tree cover to enable them to perform their flood and drought mitigation functions.

Geothermal, solar and wind power usage could be scaled up to increase their overall share in the country's energy mix and help diversify the sources of energy. To manage floods, more dams could be constructed downstream especially in the Seven Forks dams ecological zone where spillage of the dams has been associated with flooding.

There is opportunity to reposition the fodder value chain by strengthening investments in fodder and production of fodder seeds for large-scale pasture fodder production at the national and county levels, especially in areas abundant with idle land.

### 11. Land Use and Spatial Planning

Developing and enforcing spatial plans in rural and urban areas is important in disaster risk management. Economic and urban development choices which are less vulnerable to floods and droughts should be encouraged. In urban areas, especially, good physical and environmental planning is important to mitigate floods. In Nairobi, most land surfaces are carpeted with concrete, which does not allow water to percolate to the ground and, because of poor drainage, floods are common. Policies need to be put in place to ensure every house, based on its surface area, constructs a storage tank to collect water to prevent loss of water which can result to flooding.

### 12. Investment in Infrastructure and Human Capital Development

Investment in infrastructure and human capital development is key in developing the capacity for disaster preparedness, response and recovery. Efforts need to be scaled up to revisit the design and building codes to ensure they are climate-proofed and that they can withstand extreme weather conditions, including disaster risk management in professional training to ensure that they are integrated in all aspects of economic planning.

To reduce the impacts of droughts, it is necessary for the national and county governments to improve infrastructure development (transport, storage and ICT) by upgrading the existing ones and expanding to areas with low coverage

to allow for timely distribution of food from excess surplus areas to scarce areas and enhance access to markets. Quality communication networks are also key to supporting social support programmes such as cash transfers by the government and development partners.

In addition, housing can act as a buffer to droughts-floods disaster cycle in the ASALs. There is need for community involvement in cost-effective planning for housing development especially in the ASALs. Focused attention is needed to integrate development of housing schemes as a resilience measure in mitigating the impacts of droughts and floods.

### 13. Use Incentives to Boost Trade and Investment

Tariff and Non-tariff Barriers (NTBs) restrict efficient movement of products in the region, hindering coping measures through trade. The EAC countries, Kenya included, are net importers of essential products such as food that are subject to extreme price fluctuations due to climate-related shocks. The implications are macroeconomic imbalances, high costs of production to firms and adverse household livelihoods. Incentive-based approach to private sector can serve to boost investments that support production of essential products domestically. Investments that support climate change adaptation through climate-friendly consumption and production decisions can also be promoted through fiscal and trade incentives. Realization of these goals requires:

- Continued regional efforts to eliminate NTBs and lower common external tariffs; and
- Use of tax incentives to promote investments in industries that produce products that are eco-friendly and build superior household coping mechanisms.

# ANNEX

## CONFERENCE DETAILED PROGRAMME

| TIME | | DAY 1: 5TH JUNE 2018: OVERVIEW OF DEVELOPMENTS AND EMERGING ISSUES RELATED TO DROUGHTS AND FLOODS IN THE REGION |
|---|---|---|
| 7.00- 8.45 | | KIPPRA DOCUMENTARY<br>FORMER BOARD CHAIR'S DOCUMENTARY<br>SLIDE SHOW -SPONSORS/PARTNERS |
| | | Arrival and Registration;<br>Facilitators: KIPPRA |
| 8.45 | | NHIF CHOIR Performance (KIPPRA AND CONFERENCE RELATED SONGS)<br>PRAYERS - CHRISTIAN AND ISLAM<br>NATIONAL AND EAST AFRICA ANTHEMS (NHIF CHOIR)<br>PROJECT PROGRAMME OF THE DAY<br>MC - MICHAEL OYIER<br>OPENING REMARKS: WORLD ENVIRONMENT DAY - MUST DROUGHTS AND FLOODS END UP AS EMERGENCIES? |
| 9.00 | P1.1_1 | Conference Overview: Droughts and floods: How do they become emergencies?<br>Dr Rose Ngugi, Executive Director, KIPPRA<br>Review of the region's achievements, challenges and lessons on building resilience against drought and floods<br>Paul Kimeu, Drought Resilience Manager, National Drought Management Authority (NDMA)<br>What we have achieved with ending emergencies of drought and floods<br>Veronica Okoth, Director, Economic Pillar, Vision 2030 Delivery Secretariat<br>The changing weather patterns: What we need to know<br>Peter Ambenje, Director, Kenya Meteorological Department<br>PLENARY QUESTIONS |
| 10.30 | | NATIONAL TREE PLANTING - MAKUENI EVENT VIDEO IN CELEBRATION OF WORLD ENVIRONMENT DAY |
| | | PLENARY SESSION 1.1 - ECONOMIC IMPACT OF DROUGHTS AND FLOODS<br>Chair: Vimal Shah, KEPSA<br>Rapporteurs: KIPPRA |
| 11.00 | P1.1_2 | Key note address on the macroeconomic costs of droughts and floods: Kenya experience (20 minutes)<br>PS, State Department of Planning |
| | | Implications of drought on key macroeconomic variables in Kenya (20 minutes)<br>Dr Naomi Mathenge, Policy Analyst, KIPPRA<br>Implications of drought and floods on cost of doing business (20 minutes)<br><br>Job Wanjohi, Head of Policy, Research and Advocacy, Kenya Association of Manufacturers<br><br>Panellists- ZIPAR, KENGEN, IEA, AFC, Vision 2030, Dr Sambili (40 minutes)<br><br>PLENARY QUESTIONS |
| 13:00 | | LUNCH BREAK |
| | | Pool side Performance- Bendi Huru and Willie Oeba<br>KIPPRA Conference NTV longer version<br>Sponsors and Partners |

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| | | PLENARY SESSION 1.2 – SOCIAL IMPACT OF DROUGHTS AND FLOODS<br>Chair: Prof. Nelson Wawire, Dean and Associate Professor of Economics, Kenyatta University<br>Rapporteurs: KIPPRA |
| 14:00 | P1.2_1 | Showcasing effects of droughts and floods on social lives: Experiences from Mtito Andei Primary School and Kano Plains (20 minutes)<br>Ms Winfred Sila – Headteacher, Mtito Andei Primary School<br>Jane Anyango Andika- Kano Plains<br>Gender and economic livelihoods (20 minutes)<br>Dr Michele Leone, Senior Programme Specialist, IDRC<br>Effects of droughts and floods on the well-being of children, the elderly and vulnerable groups (20 minutes)<br>Patrick Lavandhomme, Chief of Field Operations and Emergency, UNICEF<br>Christian Aid<br>Panellists: AMREF, KWFT, Kajiado County, NCPWD; Bill and Melinda Gates Foundation, Ministry of Education (40 minutes)<br>Q&A (20 minutes)<br><br>PROJECTION OF BAG LOCATION ON LARGE SCREENS<br>PHOTO GALLERY OF DAY'S PHOTOS<br>SCREEN SHOTS OF DAY'S TWEETS<br>INSTRUMENTAL BACKGROUND MUSIC |
| 15:30 | | REFRESHMENT BREAK & BREAK-AWAY GROUP DISCUSSIONS (3-4 Presenters/Panellists and 2 Discussants per BAG) |
| | | BRANDED BAGS |
| 15.30-16.45 | | BAG 1.1 (Group 1A)– Why do droughts and floods scale up to emergencies?<br>Presenter: Past and projected variability in rainfall and temperature over East Africa (Victor Ongoma, SEKU)<br>Chair: NDMA<br>Rapporteurs: KIPPRA<br>BAG 1.2 ((Group 1B) – Economic costs of drought and floods<br>Presenter: Droughts and resource competition: A catalyst for conflicts? (Joshua Laichena, KIPPRA)<br>Chair: KAM<br>Rapporteurs: KIPPRA<br>BAG 1.3 (Group 1C) – Social costs of droughts and floods?<br>Presenter: Housing scheme for residents: The centre nerve of disaster preparedness in the ASALs, Kenya (Dr Ben Musonye Akala, Maseno University)<br>Chair: Dr Linda Ochola<br>BAG 1.4 (Group 1D) – Gender issues with drought and floods<br>Rapporteurs: KIPPRA<br>Presenter: Effects of droughts and floods on coping mechanisms on women and men in Kenya (Paul Odhiambo, KIPPRA)<br>Chair: NGEC/IDRC<br>Rapporteurs: KIPPRA<br>NHIF CHOIR PERFORMANCE |
| | | PLENARY SESSION 1.4 – GROUP REPORTS AND DAY 1 RESOLUTIONS<br><br>Chair: Ministry of Environment and Forestry<br>Rapporteurs: KIPPRA |
| 17:00 | RB1_1 | Group 1A |
| | RB1_2 | Group 1B |
| | RB1_3 | Group 1C |
| | RB1_4 | Group 1D |
| | | BACKGOUND MUSIC |
| 18:00 | | Conference Cocktail |

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| DAY 2: 6TH JUNE 2018<br>8.00- 8.45 | | KIPPRA DOCUMENTARY/ABOUT KIPPRA<br>NTV EDITED FOOTAGE<br>CLIMATE CHANGE VIDEO (YOUTUBE) |
| 8.50 | | PRAYERS<br><br>CLIMATE CHANGE: AGRICULTURAL SYSTEMS, TRADE AND COPING MECHANSISMS AT FIRM AND HOUSEHOLD LEVELS<br><br>RECAP OF DAY ONE: Resolutions and Emerging Issues |
| | | Facilitator: KIPPRA |
| | | PLENARY SESSION 2.1 –DROUGHTS AND FLOODS: IMPLICATIONS ON AGRICULTURE AND TRADE |
| | | Chair: AFA<br><br>Rapporteurs: KIPPRA |
| 9.00 | P2.1_6 | Impacts of drought and floods on agricultural systems and food security: Emerging issues and interventions (focus on EAC region)<br>Dr Fatima Denton, Director ACPC (Special Initiatives Division)<br>A synthesis of the impacts of climate change on agricultural production systems in the East African Community region<br>Dr Joshua Ngaina, Southern Eastern Kenya University<br>Impact of climate change and agricultural policy on household welfare in the East Africa Community<br>Dr Richard Mulwa, University of Nairobi<br>Climate change, agricultural production, trade, food security in the East African Community<br>Dr Christopher Onyango KIPPRA<br>Panellists: TEGEMEO, ILRI-Karugia, Ministry of Agriculture/African Agricultural Technology Foundation KTDA, KARLO, AFC, Muthamia (40 minutes) |
| 11:00-12.15 | | INTERLUDE AND REFRESHMENT BREAK: TOUR OF EXHIBITION BY CABINENT SECRETARY AND CHIEF GUEST; ENTERTAINMENT |
| | | SPECIAL SESSION 1 – OFFICIAL OPENING OF THE CONFERENCE<br><br>Chair: KIPPRA/NDMA<br><br>Master of Ceremony: KIPPRA<br><br>Rapporteurs: KIPPRA |
| 11.00 | SS1_1 | Recap of conference agenda |
| | | Kenya Institute for Public Policy Research and Analysis (KIPPRA)<br><br>VIDEO ON THE EXPERIENCES WITH THE DROUGHT AND FLOODS (5 MINUTES)<br>NHIF Choir and Poem |
| | SS1_2 | Opening Statement<br><br>State Department for Planning<br>Ministry of Environment and Forestry<br><br>Henry Rotich (EGH), Cabinet Secretary, National Treasury and Planning |

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| | SS1_3 | The Cabinet Secretary's Speech and Invitation of the Chief Guest |
| | SS1_4 | The Chief Guest's Speech and Official Opening<br>Keriako Tobiko, Cabinet Secretary, Ministry of Environment and Forestry |
| | | PLENARY SESSION 2.2 – COPING MECHANISMS<br>Chair: Prof. Agnes Mwang'ombe<br>Rapporteurs: KIPPRA |
| 12.15 | P2.2_10 | Showcasing initiatives and interventions (40 minutes) |
| - | | Supporting counties to mainstream climate change in planning and implementation (ADA)<br>Building flood and drought resilience in Africa (Airbus Defence and Space)<br>Adaptation and climate change in ASALs (Governor, Kajiado County)<br>Instruments to support the households and firms cope with drought and floods: Traditional and modern (20 minutes) |
| - | | Reinventing pastoralism for enhanced resilience and economic growth (20 minutes)<br>Dr Stephen Muriithi, University of Nairobi<br>Panellists: KNCCI, KTDA, REPOA, FAO, County Governor - Marsabit (40 minutes) |
| 1.00PM | | LUNCH BREAK |
| | | PLENARY SESSION 2.3 – ADAPTATION AND MITIGATION<br>Chair: Prof. Wainaina<br>Rapporteurs: KIPPRA |
| 14:00 | P2.3_14 | Showcasing initiatives and interventions (20 mins)<br>Equity Bank<br>An index-based livestock insurance<br>ILRI<br>Climate risk financing (20 minutes)<br>Prof. Christine Oughton, SOAS, University of London<br>Financial products in scaling up adaptation (20 minutes)<br>Takaful Insurance<br>Panellists: KBA, World Vision, USAID, IRA, British Council, CIC (40 minutes) |
| | | BAG 2.1 (Group 2A) – Coping mechanisms: What works for firms<br>Chair: Kenya Institute of Management<br>Presenter: Responding to disasters including droughts and floods (Torchlight)<br>Rapporteurs: KIPPRA<br>BAG 2.2 (Group 2B) – Coping mechanisms; what works for households<br>Presenter: Coping mechanisms for households and firms to mitigate the effects of droughts and floods (Adan Shibia)<br>Presenter: Assessing climate variability adaptation and coping strategies among rural households in Kenya (Karatina University)<br>Chair: NDMA<br>Rapporteurs: KIPPRA<br>BAG 2.3 (Group 2C) – Adaptation financing<br>Presenter: Role of social protection to mitigate the effects of droughts and floods (Dr Nancy Nafula - KIPPRA)<br>Chair: KUSSCO<br>Rapporteurs: KIPPRA<br>BAG 2.4 Group 2D) – Adaptation through agricultural systems<br>Presenter: Spatial-temporal maize productivity and stability response to soil-water use-efficiency strategies under high rainfall variability agroecosystems (Oscar Kisaka)<br>Chair: Dr Jonathan Nzuma, University of Nairobi<br>Rapporteurs: KIPPRA |
| | | PLENARY SESSION 2.5 – GROUP REPORTS AND DAY 2 RESOLUTIONS<br>Chair: National Treasury<br>Rapporteurs: KIPPRA |

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| 17:00 | RB2_4 | Group 2A |
| | RB2_5 | Group 2B |
| | RB2_6 | Group 2C |
| 18:00 | | Fail Fair (Informal conversations on what worked, what hasn't worked and the solutions) |
| | DAY 3: 7TH JUNE 2018 | DISASTER RISK MANAGEMENT: COORDINATION AND INSTITUTIONAL FRAMEWORK FOR DISASTER RISK MANAGMENT<br>RECAP OF DAY TWO: Resolutions and emerging Issues<br>Facilitator: KIPPRA<br>PLENARY SESSION 3.1 – DISASTER RISK MANAGEMENT FRAMEWORK IN THE REGION<br>Chair: Karatina University<br>Rapporteurs: KIPPRA |
| 08:30 | P3.2_14 | Emergency telecommunication (20 minutes) CA<br>The role of technology in disaster management (20 minutes) IHUB<br>Managing Disaster Risk Management in the Region: Emerging Issues and Challenges (20 minutes) NEPAD<br>Mainstreaming Disaster Risk Management in national development goals (20 minutes) Karen Rono<br>Panellists: Makueni County, NTV, Aga Khan University (Alex Awiti), Dr Bitange Ndemo (40 minutes) |
| 10:30 | | REFRESHMENT BREAK |
| | | PLENARY SESSION 3.2 – COORDINATION OF DROUGHTS AND FLOODS IN THE REGION<br>Chair: Riara University<br>Rapporteurs: KIPPRA |
| 11:00 | P3.3_17 | Showcasing from the organisations involved in drought and floods episodes (20 minutes) Kenya Red Cross Society<br>Challenges of coordination capacity at county level (20 minutes) IGRTC<br>Regional coordination efforts: Successes, challenges and way forward (20 minutes) IGAD<br>Data generation for disaster preparedness systems - KNBS<br>Panellists: EAC, KIPPRA, KBC, NEPAD, AFC, GIZ (40 minutes) |
| 13:00 | | LUNCH |
| 2:000 | | BREAK AWAY GROUP DISCUSSIONS |
| | | BAG 3.1 (Group 3A) – Disaster preparedness systems<br>Presenter: Agricultural drought monitoring with remote sensing data over the Greater Horn of Africa: A case of Somalia (Ngaina J.N., SEKU)<br>Chair: KNBS<br>Rapporteurs: KIPPRA<br>BAG 3.2 (Group 3B) – Building sustainable capacity for disaster management in the region<br>Presenter: Strengthening disaster management: A case study in Kenya (Nelson Mutanda and Victor Orindi)<br>Chair: NDMA partners<br>Rapporteurs: KIPPRA<br>BAG 3.3 (Group 3C) – Role of technology<br>Presenter: Effects of droughts and floods on infrastructure (Humphrey Njogu-KIPPRA)<br>Chair: IHUB<br>Rapporteurs: KIPPRA<br>BAG 3.4 (Group 3D) – Coordinating disaster management across counties<br>Presenter: The role of governance and coordination in mitigation against the effects of droughts and floods (Jessica Kinoti)<br>Chair: ATPS<br>Rapporteurs: KIPPRA |

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| 15:00 | | PLENARY SESSION 3.3 – GROUP REPORTS AND DAY 3 RESOLUTIONS<br>Chair: KIPPRA |
| | RB1_1 | Group 3A |
| | RB1_2 | Group 3B |
| | RB1_3 | Group 3C |
| 16:00 | | SPECIAL SESSION 2 – WRAP UP AND WAY FORWARD<br>Chair: Henry Rotich (EGH), Cabinet Secretary, National Treasury and Ministry of Planning<br>Rapporteurs: KIPPRA |
| 16:30-17:00 | SS2_5 | Discussions and conference resolutions - Presentation of Conference Communique<br>Kenya Institute for Public Policy Research and Analysis |
| | SS2_6 | Vote of Thanks and Invitation of the Chief Guest<br>KIPPRA/NDMA |
| | SS2_7 | The Chief Guest's Speech and Official Closing<br>National Treasury and Planning |

# PRESENTERS' PROFILES
# DAY ONE

Dr. Julius Muia (EBS)

Dr Julius Muia (EBS)is the Principal secretary, The National treasury & Ministry of Planning. Before this appointment, he was the Director General of the Vision 2030 Delivery Secretariat which operates under the Office of the President. Prior to this, the Secretary, National Economic and Social Council, Office of the President. Masters Degree and PhD in Finance from the University of Nairobi's School of Business. He is also a Certified Public Accountant (CPA-K)

Mr. Sahil S.R Shah

Sahil S.R Shah is a public policy and strategy adviser with a working expertise around the areas of private sector development, market intelligence, institutional reform and political economy. He is currently the Project Lead of the Kenya Business Guide think-tank and a Trade & Policy Consultant to the KNCCI previously holding research and consulting positions at Strathmore Business School. Mr. Shah has been deployed as an external technical advisor to multiple Government agencies and institutions and has wide consulting experience across both the public and private sectors in East Africa. Mr. Shah further sits as a Board Advisor to the UTI Business Park and the Dawa Group. He holds a BA in History (with First Class Honours) from the University of Bristol and a Masters in Public Policy and Management from Strathmore Business School.

Dr. Naomi Mathenge

Experienced Policy Analyst with a demonstrated history of working in the research industry. Skilled in CGE modelling, Stata, Econometrics, Macroeconomics, Economic Development, and Policy Analysis. Strong community and social services professional with a Doctor of Philosophy (PhD) in Economics from University of Cape Town.

Mr. Job Wanjohi

Job Wanjohi Muriithi is the Head of Policy Research and Advocacy, one of Kenya's leading business associations with over 800 members. The Unit provides the overall direction in the policy and advocacy work of the Association. KAM is a representative organization for manufacturing value-add industries in Kenya established in 1959. Who's mission is to promote competitive and sustainable local manufacturing

Before joining KAM, Job worked at the Presidency of Kenyan Government in Economic and Public Policy Research & Advocacy section for close to a decade which saw him rise in several positions. He participated in various public policy review in various fields including fiscal, trade, industrial policies including review of regional and international policy frameworks.

He previously worked as a Senior Bilingual Project Assistant at World Agroforestry Center and The French Agricultural Research Centre for International Development (CIRAD).

Mrs. Winfred Sila

Headteacher
Mtito Andei primary
school

Headteacher Mtito Andei primary school with a passion for conservation and empowering the youth through education and skills.

Ms. Jane Anyango Adika

Jane Anyango Adika, popularly known for her 'serikali saidia' (help government help!) cry when floods swept away all she had in in Kano in 2012. As a result, she has been appointment by the Kisumu County as the flood preparedness ambassador for a campaign on flood mitigation in order to reduce the expected effects of El Nino rains. She has also recently landed a deal with telecommunication company Safaricom

2018

Doc. Nelson Wawire

School of Economics,
Kenyatta University
Dean and Associate
Professor of Economics

An Associate Professor of Economics specializing in Public Sector Economics, Macroeconomics, Project Appraisal, Planning and Evaluation and Women Economic Empowerment. With over 23 years' experience in teaching, researching and consulting at the university level. A reviewer for various International Journals. A resource person at the African Economic Research Consortium Joint Facility for Electives. I have carried out research and published articles, books and book chapters on a wide range of topics and themes including but not limited to fiscal Policy, taxation, monetary policy, health economics and project evaluation.

Dr. MICHELE LEONE

INTERNATIONAL
DEVELOPMENT
RESEARCH CENTRE
(IDRC)
SENIOR PROGRAM
SPECIALIST

Dr. Leone got a PhD in physics of complex systems from the UNESCO ICTP and the International School for Advanced Studies of Trieste, Italy. He has worked as research scientist applying complex systems theory and tools to real world development problems in computer sciences, biology and economics. He left Europe in 2005 to then work as senior lecturer, consultant and project manager in Malawi, Kenya, Mozambique, Burundi, Cuba and Madagascar. He joined IDRC in 2010, where he is Senior Program Specialist for Climate Change. He is based in the IDRC regional office for sub-Saharan Africa located in Nairobi, Kenya. He works on program management, evidence-based decision making, and complex decision making under uncertainty. More recently, his interests have converged towards the linkages between ecosystems and environmental change and human decision making at the basis of mobility and migration.

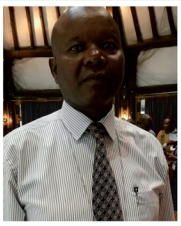
Mr. Patrick Lavand'homme

UNICEF Kenya
Chief Field Operations and Emergency

Over 20 years' experience in development , humanitarian and emergency preparedness and response programmes for INGO, and UN agencies, including UNOCHA and UNICEF. Currently working for UNICEF Kenya as Chief of field operation and emergency.

Mr. Joseph Atela
Disabled Empowerment Society of Kenya
Executive Director

Joseph Atela has over seven years of experience in Disability Rights Advocacy and Research. Currently Atela is the Executive Director at Disabled Empowerment Society of Kenya where he focuses on programs that empower PWDs in the slums. He is also YALI fellow. Mr. Atela has educational background in Management and Law. His hobby is traveling.



Mr. Daniel Kurao

Amref Health Africa in Kenya Programme Director; Water, Sanitation and Hygiene (WASH)

Mr. KURAO is a Public Health Specialist with over 25 years' experience in Health development and programming. He is currently the Acting Water, Sanitation and Hygiene (WASH) & Neglected Tropical Diseases Programme Director at Amref Health Africa in Kenya. He has worked for Amref Health Africa in Kenya for over 10 years providing support and leadership in the design and implementation of WASH programs. He has managed complex socio-technical development programmes and projects in water, environmental sanitation and hygiene mainly targeting marginal communities including; pastoralists and low-income urban communities in Kenya. His experience cuts across technology, management, institutional development and multi-sector partnership building for sustainable WASH Programming.

# PRESENTERS' PROFILES
# DAY TWO

Dr Joshua Ngaina

Southern Eastern
Kenya University

Dr. Ngaina is an applied meteorologist with interest in the field of the physical climate system and climate processes. His current research are specifically directed to providing scientifically founded quantitative answers to the basis for predictions of regional climatic variations and of changes in the frequency and severity of extreme events and its impacts on key socioeconomic sectors such as agriculture, energy and forestry. His special interest lies in the areas of climate change modeling and simulations, climate scenario development and projections, disaster risk reduction, natural resource management and food security

Dr Miltone Ayieko
Executive Director, Tegemeo
Institute of Agricultural Policy and
Development,
Egerton University

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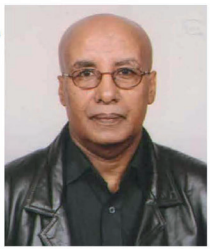
Dr Miltone Ayieko holds a doctorate degree in Agricultural, Food and Resource Economics from Michigan State University, USA, with specialization in agricultural markets, policy analysis and international development. Miltone has been involved in agricultural policy research and advocacy, focusing on rural livelihoods, market development, technology adoption, seed systems and agricultural value chain analysis. He was the immediate past Regional Coordinator of the Integrated Seed Sector Development in Africa (ISSD Africa), and a Senior Research Fellow at Tegemeo Institute. He has a wide experience in monitoring and evaluation, household surveys and panel data analysis. He has served in various ministerial task forces and committees.



Dr Haile Kibret
Research Director
The Horn Economic and
Social Policy Institute
(HESPI)

Dr. Haile Kibret is a senior research fellow and current director of research at HESPI. He has an extensive teaching and research experience. Before joining HESPI, he taught at various universities and worked as a senior research fellow for research institutions, including the Botswana Institute for Development Policy Analysis (BIDPA), and the Ethiopian Economic Policy Research Institute (EEPRI). His Areas of research and teaching interest are macroeconomics and international economics.

Dr Joseph Karuga Coordinator of the Regional Strategic Analysis and Knowledge Support System (ReSAKSS) for Eastern and Central Africa at the International Livestock Research Institute in Nairobi, Kenya

Dr Karuga holds a Ph.D. in Agricultural Economics from the University of Alberta, Canada. ReSAKSS is an information and knowledge management initiative with the objective of providing data, information and knowledge to stakeholders to improve the formulation, implementation, and monitoring and evaluation of agricultural and rural development strategies in Africa. Regional nodes have been established to provide such support to Regional Economic Communities and their member states. ReSAKSS-ECA supports COMESA, EAC and IGAD.
Prior to joining ILRI, Dr Karugia served as the Research Manager at the African Economic Research Consortium (AERC). He has been a faculty member at the University of Nairobi for more than twenty years

Prof Agnes Wakesho Mwang'ombe (EBS)

Prof Agnes Wakesho Mwang'ombe (EBS) is the former Principal of the College of Agriculture and Veterinary Sciences (CAVS), University of Nairobi. She is a Professor of Plant Pathology with a PhD degree in Plant Pathology.
She is a board member of Vision 2030 Delivery Board, KEFRI Board, Consortium Board for Consultative Group of International Agricultural Research (CB-CGIAR) headquartered in Montpellier, France. She has previously served as Chairperson, Kenya Institute for Public Policy Research and Analysis (KIPPRA); First chairperson, Kenya Professional of Women in Agriculture and Environment Association (KEPAWAE); CGIAR Gender Diversity Program based in ICRAF: Advisory Committee Member and Mentor of young women in Agricultural Sciences through a Fellowship Program to Strengthen the Careers of African Women Scientists in Agricultural and Environmental Sciences. She served as the President of African Crop Science Society

Victor Orindi
Ada Consortium Coordinator

Victor A. Orindi works as the Coordinator of Adaptation Consortium. The consortium supports counties to mainstream climate change in planning and budgeting as well as access climate finance. He has researched and published widely on mainstreaming climate change in planning, monitoring and evaluation of climate adaptation, and climate finance.
A holder of a Masters and Bachelor degrees in Environmental Science from Kenyatta University, Orindi previously worked as a Climate Change Advisor with the then Ministry of State for Development of Northern Kenya & Other Arid Lands; Research Officer with the International Development Research Centre (IDRC), Research Fellow with the African Centre for Technology Studies (ACTS) and Lecturer in the School of Environmental Studies, Kenyatta University.

Fabio Domenico Vescovi
Earth Observation Consultant in Airbus DS

He specialized in space applications for agriculture, water management, land mapping and precision farming. Special focus on African environments, where he carried out surveys and tutorial activities for local students.

Fabio developed his career in public research institutions and private companies spending some years in Italy, Germany and, currently, UK. He developed commercial EO-based services for the hydropower companies in Europe (2004-08). Currently working as senior consultant, his typical topics are the EO data applications for land use/cover change, water management in arid lands and precision farming in Ghana, Burkina Faso, Ethiopia and Kenya.

He promotes tutorial activities and lectures for the Geography Dept. of Nairobi University and develops satellite-based services for the African insurances (drought monitoring, flood mapping, prevention and risk transfer).

Dr Stephen Mureithi
University of Nairobi

Stephen Mureithi is a Rangeland ecologist and Soil scientist. His research focuses on the direct effects of disturbance on dryland ecosystems, and restoration of degraded lands and its impact on land, livestock, wildlife and pastoral livelihoods. He has particular interests in land, soil and water management; restoration of degraded arid environments; watershed and water resources management. Stephen is currently serving as a Researcher and Lecturer at the University of Nairobi's Department of Land Resource Management and Agricultural Technology (LARMAT), where has helped establish the Hydrology and Watershed Research Laboratory, which he heads as the Lead Scientist. He is also an Associate Researcher, at the University of Nairobi's African Drylands Institute for Sustainability (ADIS), a Senior Scientist in Triple L Research Initiative, and a Post-Doc Fellow at the International Livestock Research Institute (ILRI) under the AgriFoSe2030 Programme.

Dr Jonathan Nzuma
University of Nairobi

2018

Dr. Nzuma holds a PhD in Agricultural Economics and Business from the University of Guelph Canada. He is a Lecturer at the Department of Agricultural Economics, University of Nairobi, where he specializes in Agricultural Policy, International Trade, Microeconomics, Production Economics, Commodity Markets, International Development, Feasibility Assessments and Research Methods. He has extensive socioeconomic research experience within the Sub-Saharan Africa and has consulted widely with the FAO, WFP, IGAD, ILRI, IFPRI, FANRPAN, EAGC, EAFF, CGD, KIPPRA and IPAR on inter alia Agricultural Policy, International Trade Policy, Commodity Markets, Project Monitoring and Evaluation, Economic Evaluations and Econometric Analysis.

Mr. Shaun Davis the Project Manger, Torchlight group. This project is looking to help the country respond to disasters including droughts, floods and famine.

Mr Adan Shibia Policy Analyst at Kenya Institute for Public Policy Research and Analysis (KIPPRA)

Mr Peter Musyimi Lecturer Karatina University

Dr Eldah Onsumu is a Principal Policy Analyst and Head of Social Sector Department

Dr Oscar Kisaka Department of Agroforestry and Rural Development, School of Natural and Environment Resource Management

Mr David Muturi Chief Executive Officer (CEO) Kenya Institute of Management

Mr George Ototo, Managing Director, Kenya Union of Savings & Credit Co-operatives Ltd (KUSSCO)

# PRESENTERS' PROFILES
# DAY THREE

Prof Linus Muthuri Gitonga

Prof. Linus Muthuri Gitonga is and Entomology professor with a specialty in insect pests management in agricultural systems. He is currently the Deputy Vice Chancellor of Karatina University in charge of Planning, Finance and Administration (2013 to 2018), and now re-appointed to a second 5-year term (2018-2023). He served as Deputy Principal of Karatina University College, before held several senior Administrative positions in Jomo Kenyatta University of Agriculture and Technology (JKUAT), and its Constituent Colleges, viz Taita Taveta Campus (now Taita Taveta University) and Meru University College of Science and Technology (now Meru University of Science and Technology). He has published widely, organized, facilitated and presented papers in national and international conferences and is a board member of Kenya National Innovations Agency (KENIA).

**Crisphine Juma Ogongo**
**Communications Authority of Kenya**

ANNUAL REGIONAL CONFERENCE 2018

Crisphine Juma Ogongo
Holds a Bsc. In Electrical and Electronic Engineering
Master in Business aAdministration and An ongoing Master in ICT policy and Regulation.
Has worked in the communications sector for over 15 years and currently is the Manager in charge of telecommunication licensing at Communications Authority of Kenya


Mr. Lincoln Njogu
iHub Limited
Technology Officer

2018

Lincoln Njogu is an I.T specialist with over 7 years of experience working directly with computer technology in the IT field focusing on services such as I.T. Support/ Training, System administration and Web Development. He has a passion for providing Business & I.T solutions to businesses/ startups and small businesses that look to leverage from web technology/ services.

He has been working working with iHub Limited for the last 5 years as a technologist.During this time he has run over 10 startup competitions, 4 accelerators, over 50 tech-forums. His day to day work involves technical facilitation of iHub entrepreneurial programs, facilitating technology related forums/ discussions and managing the iHub tech infrastructure.

Daniel Osiemo OGW
Ag. Chief Executive Officer NEPAD/APRM Kenya Secretariat

Daniel holds a Master of Science in Economics and Management; Master of Public Administration; Bachelor of Arts (Economics) and a Post Graduate Certificate in Project Management, Monitoring and Evaluation. Prior to joining the Secretariat, he was the Chief Economist in the Ministry of Forestry and before that, he worked as the Programme Manager, Agricultural Sector Programme Support (ASPS), Ministry of Agriculture. Upon joining the Secretariat, Daniel played a key role in the elevation of the Lamu Port South Sudan Ethiopia Transport Project (LAPPSET) to the Presidential Infrastructure Championship Initiative (PICI) under the African Union. In addition, Daniel played a critical role in lobbying for Kenya to host the Second High Level Meeting on Global Partnership for Effective Development Cooperation and was appointed to his current position in November 2015.

Karen Rono

Development Initiatives (DI) Africa

Karen has more than seven years in international development. These have been in the fields of official financial investments: with a focus on domestic spending and foreign aid analysis, political economy in the humanitarian space, poverty research, promoting open data and the use of evidence by government decision makers.
Currently the Regional Technical Lead at Development Initiatives (DI) Africa Hub-based in Nairobi. Has the overall management and technical responsibility for the delivery of high quality analytical work for DI Africa Hub. Our analysis is primarily around measuring people's progress out of poverty, financial investments to end poverty and the politics behind resource allocations and how best these investments should work

Ms. Lynette Mwangi
Chief Executive Office, Media Owners Association

Lynette is the Chief Executive Officer of the Media Owners Association. She is an Advocate of the High Court who also dabbles in Strategic Management. She has built her career working in both the public and private sector, having previously worked for the Standard Group, the Judiciary and the National Council for Law Reporting. She sits in the Kenya Leadership & Integrity Forum and has served in the Law Society of Kenya, Law Reform, Devolution and Constitutional Implementation Committee.
Lynette pursued her Masters in Business Administration (Strategic Management) at the University of Nairobi. She has been to the Kenya School of Law for the Advocates Training Program and has a Bachelor of Laws Studies from University of Nairobi.

Dr Alex O. Awiti, PhD
Director, East Africa Institute, Aga Khan University

Alex O. Awiti, PhD is the Founding Director of the East Africa Institute (EAI) of Aga Khan University. The EAI is a regional platform for policy research, performance and public engagement, which focuses on the consequential drivers of socio-economic, environmental and institutional change. The EAI is currently focusing on youth, urbanization, economic growth, food systems and the extractive resources.

Awiti is also an Adjunct Professor of University of the Fraser Valley in Vancouver, Canada and an Adjunct Lecturer at Griffith University in Melbourne Australia.

Awiti began his research, academic and policy career 19 years ago at the World Agroforestry Centre (ICRAF) in Nairobi. Awiti and colleagues pioneered novel approaches for rapid diagnosis of land health. As the head of GIS/Remote Sensing, he set up the Decision Support laboratory at ICRAF, would a focus on spatial

Prof. Bitange Ndemo, CBS
University of Nairobi

Associate Professor University of Nairobi
Technocrat
Advisor to the Better than Cash Alliance
Panelist at ICANN
Editor http://www.digitalkenyabook.com
Prof Ndemo was in between 2005 to 2013 a Principal Secretary in Ministry of Information and Communication
He holds a PhD in Industrial Economics from University of Sheffield, UK

Dr Gerald Majany
Riara University

He holds a Ph.D. in peace and conflict studies from Masinde Muliro University of Science and Technology, 2017. He studied and graduated from Punjab University, India with BA (Sociology) and LLB. He holds a Master's degree in conflict resolution and peace building from Kampala International University. He has experienced in peace, security and conflict management

**Ms. Eva Wanjiku**
Kenya Red Cross Society

Eva Wanjiku is the Environment and Climate Change Adaptation Officer at the Disaster Risk Management department, Kenya Red Cross Society. She is involved in initiating and coordinating environment initiatives within the Kenya Red Cross Society under the Sustainable Environment Restoration Programme, an initiative formed in 2014 by the Ministry of Environment, Water and Natural Resources, International Federation of the Red Cross and the Red Crescent Societies and Kenya Red Cross Society. Passionate about the environment, she is an enthusiastic graduate with a good knowledge of Environmental Planning and Management from Kenyatta University and Geography and Environmental Management from University of Ilorin. She holds a Certificate in GIS and Remote Sensing from esri Eastern Africa.
She is a licensed associate expert with excellent exposure to writing Environmental Impact Assessment and Environmental Audit reports.

Mr. Bernard Nyatuga
World Food Programme -Kenya

My Nyatuga is the Programme Policy Officer for Coordinating Capacity Strengthening initiatives with the Government. He serves as activity manager for the undertaking focusing on Strengthening national and county institutions' capacity and systems for assisting food-insecure and nutritionally vulnerable population. He is responsible for programmes that promote mapping and understanding capacity gaps and assets of county and national institutions that are responsible for DRR.

Prior to his current position, Bernard worked for 10 years with WFP in various capacities within the humanitarian field both at the national and subnational levels coordinating emergency relief interventions including supporting activities transitioning beneficiaries to recovery and resilience building.
Bernard holds a Bachelor of Science in Agricultural Engineering from University of Nairobi, and undertaken courses in Disaster Risk Management and Emergency Food Security Assessment.

Prof. Farah Kassim
The Intergovernmental Authority on Development (IGAD)

Kassim Omar Farah, is a trained Range Scientist and Natural Resource Management Expert is specialized in the areas of Range ecology, Management of Rangelands for Grazing, Resource utilization Patterns among Pastoral nomads of IGAD region, Dryland Securities and livelihoods, eco-sociological analysis of Range conditions and trends and community based drought resilience to both intrinsic and extrinsic perturbations.
The last seven (7) years was notable in his career with "hands on" activities through the formulation of evidence-based policy that informed design of development Interventions and Programming for building drought resilience of pastoral communities in the Asals' of the *IGAD* region.
At the National level, he has worked extensively in Northern Kenya and other arid areas and was involved in development of key National Policies

Mr Josiah Kaara
Kenya National Bureau of Statistics

A statistician from the Kenya National Bureau of Statistics. Deal with statistics from the Weather, Food Security, Food Monitoring and Nutrition. This also includes analysing data for retail market prices from all the 47 counties on specific food commodities e.g. maize, beans, potatoes, sorghum, millet, cabbages, bananas and they are published in the Annual Economics Survey, Monthly Leading Economic Indicators

Leonard Kimani
Economic& Public Policy Advisor/Consultant at Analytics and Strategies LTD(Anastra)

Leonard holds the MSc degree in Project Planning & National Development of the University of Bradford (UK). He also holds the MSc degree in Computer Science of the University of Science & Technology, Bulawayo – Zimbabwe and is a PhD Candidate with Open University of Tanzania. He has done the Public Policy Course at Strathmore University, Kenya. He obtained the Bachelor of Statistics (Hons) degree of Makerere University, Uganda and is a member of Institute of Statisticians and IEEE. Leonard held various key positions in the Government of Kenya as an Economist Statistician rising to the position of Chief Economist/Statistician Office of the President . He also served as Acting Secretary & Director in the National Economic and Social Council.
Leonard was appointed National Consultant, EAC Vision 2050(Kenya Case),Economic and Policy Advisor with Laptrust Fund.

Daniel Osiemo OGW
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Shadrack Mutavi
GDC/GIZ

German Development Cooperation in Kenya
For more than 55 years, the German Development Cooperation (GDC) has contributed extensive expertise and investments to improve services and address human needs. In the process, GDC has built a strong network and partnership with Kenya and is, today, a key supporter of the country's sustainable development agenda and the implementation of Vision 2030.
The Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH has been working in Kenya on behalf of the German Federal Ministry for Economic Cooperation and

Jackline Lidubwi
Kenya Broadcasting Corporation

Jackline Lidubwi is a Senior Producer at Kenya Broadcasting Corporation (KBC) and heads the Y254 television station. She holds a Master's Degree in Communication from the University of Nairobi, a Bachelors degree in Mass communication from St. Paul's University and a Diploma in Television Production from Kenya Institute of Mass Communication. She is an award-winning producer whose focus is on human interest stories aimed at empowering the marginalized. Her awards include, the 2013 KEMEP Award for Best Television Producer, and the 2014 Media Activist Award by the Annual Disability Rights and Advocacy Awards (ADARA)

Mr Josiah Kaara
Kenya National Bureau of Statistics

A statistician from the Kenya National Bureau of Statistics. Deal with statistics from the Weather, Food Security, Food Monitoring and Nutrition. This also includes analysing data for retail market prices from all the 47 counties on specific food commodities e.g. maize, beans, potatoes, sorghum, millet, cabbages, bananas and they are published in the Annual Economics Survey, Monthly Leading Economic Indicators

Dr Joshua Ngaina

Southern Eastern Kenya University

Dr. Ngaina is an applied meteorologist with interest in the field of the physical climate system and climate processes. His current research are specifically directed to providing scientifically founded quantitative answers to the basis for predictions of regional climatic variations and of changes in the frequency and severity of extreme events and its impacts on key socioeconomic sectors such as agriculture, energy and forestry. His special interest lies in the areas of climate change modeling and simulations, climate scenario development and projections, disaster risk reduction, natural resource management and food security

Paul Kimeu
National Drought Management Authority (NDMA)

Paul Kimeu is the Drought Resilience Manager/National C-FFA Coordinator at National Drought Management Authority (NDMA). He currently coordinating both government and non governmental organization with communities I building resilience against negative impacts of disasters especially drought through preparedness capacity building and support to the Kenya Strategy on Ending Drought Emergencies by 2022. He is also involved in development of drought resilience building initiatives, programme development and implementation, capacity building, partnerships, monitoring and evaluation, coordination of DRR programming . His Bachelor of Science was in Agricultural Engineering and Masters in Business Administration

Kevin Ochieng
National Drought Management Authority (NDMA)

Kevin Ochieng is an Analyst at National Drought Management Authority (NDMA)
And the presenter of the study " Strengthening Disaster Management: A case study in Kenya" (Nelson Mutanda , Victor Orindi, and Kevin Ochieng )


Mr. Lincoln Njogu
iHub Limited
Technology Officer

Lincoln Njogu is an I.T specialist with over 7 years of experience working directly with computer technology in the IT field focusing on services such as I.T. Support/ Training, System administration and Web Development. He has a passion for providing Business & I.T solutions to businesses/ startups and small businesses that look to leverage from web technology/ services.

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Dr Humphrey Njogu
Kenya Institute for Public Policy Research and Analysis (KIPPRA)

Humphrey Njogu received his Ph.D and M.Sc in Computer Science from Hunan University, China. He received his B.Sc. degree in IT from Moi University, Kenya. He holds several IT professional certifications in Cisco, Oracle, Comptia, Linux, Microsoft, CISSP among other IT certification vendors.

His research interests include most aspects of IT security, with an emphasis on network security; intrusion detection and prevention; vulnerability management; cloud computing security; social media security. Other areas include green computing and data mining. He has a vast experience in implementing several IT security projects.

He is currently a Policy Analyst in the Infrastructure and Economic Services Division in KIPPRA

Jesca Kinoti
Kenyatta University

Jesca Kinoti is currently undertaking a PhD in Sociology in Kenyatta University. She holds a Masters Degree in sociology (Rural and Community Development) and Bachelor's degree in Social Work both from the University of Nairobi.

She has wide experience in community development work through project planning, capacity building, monitoring and evaluation and social research work having worked for 13 years with different donor funded (Center for Disease Control, USAID) development projects, public sector (6 years as a Development Officer at Kenyatta University) teaching part-time for Karatina University (Department of Social Sciences) and participated in various community development evaluation exercises

# PAPERS RECEIVED FOR THE CONFERENCE

***Housing Scheme for Residents: The Centre Nerve of Disaster Preparedness in the ASALs, Kenya***

***Authors***

Dr Ben Musonye Akala, Lecturer, Department of Environmental Science, School of Environment and Earth Science, Maseno University, Kisumu

Keith Rono, Assistant Lecturer, Department of Environmental Studies, School of Natural Resources and Environment, University of Kabianga, Kericho

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Cell phone: +254722686061/+254732223619

***Assessing Climate Variability Adaptation and Coping Strategies Among Rural Households in Kenya***

***Authors***

Peter Kinyae Musyimi, Department of Humanities, Karatina University

Gilbert M. Nduru, Department of Environmental Studies, Karatina University

Julius M. Huho, Department of Arts and Social Sciences, Garissa University

Francis E. Opiyo, Regional Bureau for East and Central Africa, United Nations -World Food Programme (WFP), Nairobi, Kenya

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**Spatial-Temporal Maize Productivity and Stability Response to Soil-Water Use-Efficiency Strategies Under High Rainfall Variability Agroecosystems**

***Authors***

Oscar Kisaka M., Department of Agroforestry and Rural Development,

School of Natural and Environmental Resource Management, University of Kabianga,Kericho

F.K. Ngetich, Department of Land and Water Resource Management, Embu University College, Embu

M. Mucheru-Muna, Department of Environmental Science, Kenyatta University, Nairobi

J. Mugwe, Department of Agricultural Resource Management, Kenyatta University, Nairobi

D. Mugendi, TSBF-CIAT, Tropical Soil Biology and Fertility Institute of CIAT, Nairobi

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Email: oscarndinyo@yahoo.com or soscarneyo@gmail.com

***Climate Change: Land use and Water Management Practices by Smallholder Farmers in Uganda***

***Author***

Mwangu Alex Ronald, Kabale University, Uganda

***Contacts***

Email: amwangu@gmail.com, amwangu@kab.ac.ug

***Using Regional Integrations in Sub-Saharan Africa as a Platform to Formulate Environmental Policies***

Author

Fridah Lotuiya

***Past and Projected Variability in Rainfall and Temperature over East Africa***

***Authors***

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Befikadu Esayas, Center for Environment and Development, Addis Ababa University, Addis Ababa

***Contacts***

Email: victor.ongoma@gmail.com

***Strengthening Disaster Management in Kenya***

***Authors***

Victor A. Orindi, vorindi@adaconsortium.org

***Agricultural Drought Monitoring with Remote Sensing Data over the Greater Horn of Africa: A Case of Somalia***

Ngaina J.N., Department of Meteorology, South Eastern Kenya University, Kitui

Kipkoech, B.M., Department of Meteorology, South Eastern Kenya University, Kitui

Koton A.K., Food Security and Nutrition Analysis Unit – Somalia, Nairobi

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**POLICY BRIEFS**

1. Nyangena, John (2018), Drought and Flood Vulnerability in Kenya: What Needs to be Done?. KIPPRA Policy Brief No. 11-2017-2018, Nairobi: Kenya Institute for Public Policy Research and Analysis.
2. Shibia, Adan (2018), Building Household Coping Mechanisms with the Effects of Droughts and Floods Using Financial Instruments. KIPPRA Policy Brief No. 12-2017-2018, Nairobi: Kenya Institute for Public Policy Research and Analysis.
3. Mathenge, Naomi M. (2018), The Impact of Drought on Key Macroeconomic Variables. KIPPRA Policy Brief No. 13-2017-2018, Nairobi: Kenya Institute for Public Policy Research and Analysis.

# PARTICIPATING INSTITUTIONS

1. Action Aid
2. Adaptation (Ada) Consortium
3. African Capacity Building Foundation
4. Agricultural Finance Corporation
5. Agriculture and Food Authority
6. Airbus DS
7. AMREF Health Africa in Kenya
8. Analytics and Strategies Ltd (Anastra)
9. Brae Holdings
10. Bunge la Wazalendo
11. Caritas Africa
12. Central Bank of Kenya
13. Centre for Minority Rights Development
14. Christian Aid
15. CIC Insurance Group
16. Communications Authority of Kenya
17. County Government of Garissa
18. County Government of Kajiado
19. County Government of Kilifi
20. County Government of Nyeri
21. County Government of Tana River
22. Department for International Development
23. Development Initiatives (DI) Africa
24. DIESK
25. Disabled Empowerment Society of Kenya
26. Disaster Management Unit
27. East African Institute of Agha Khan University
28. Embassy of Algeria
29. Embassy of Japan
30. Embu University College
31. Equity Bank
32. Food and Agriculture Organization
33. Garissa University
34. German Development Corporation in Kenya (GIZ/GDC)
35. GISK
36. Green Point Sustainable Solutions
37. Horn Economic and Social Policy Institute
38. IDRC
39. iHub Limited
40. Institute of Economic Affairs, Kenya
41. Intergovernmental Authority on Development (IGAD)
42. International Livestock Research Institute
43. Karatina University
44. Kenya Agricultural and Livestock Research Organization

45. Kenya Association of Manufacturers
46. Kenya Broadcasting Corporation
47. Kenya Business Guide
48. Kenya Dairy Board
49. Kenya Electicity Generating Company
50. Kenya Institute for Public Policy Research and Analysis
51. Kenya Institute of Management
52. Kenya Institute of Special Education
53. Kenya Meteorological Department
54. Kenya National Bureau of Statistics
55. Kenya News Agency
56. Kenya Private Sector Alliance
57. Kenya Red Cross Society
58. Kenya Roads Board
59. Kenya School of Government
60. Kenya Tea Development Authority
61. Kenya Union of Savings and Credit Cooperatives
62. Kenya Water Partnership
63. Kenyatta University
64. Kiambu Institute of Science and Technology
65. Maseno University
66. Mavuno Church
67. Media Owners Association
68. Ministry of Agriculture, Livestock, Fisheries and Irrigation
69. Ministry of Energy
70. Ministry of Finance
71. Ministry of Health
72. Ministry of Water and Irrigation
73. Mozambique High Commission
74. Mtito Andei Primary School
75. Nation Media Group
76. National Assembly
77. National Council for Persons with Disabilities
78. National Drought Management Authority
79. National Environmental Management Authority
80. National Gender and Equality Commission
81. National Museums of Kenya
82. National Police Service
83. National Social Security Fund
84. National Treasury and Planning
85. Nature Kenya
86. New Partnership for Africa's Development (NEPAD)/African Peer Review Mechanism (APRM) Secretariat
87. Nigeria High Commission
88. NOMA
89. Pan African Climate Justice Alliance
90. Pwani FM

91. Radio Africa Group
92. Riara University
93. Rokal Enterprises
94. Safaricom
95. Sakwall Investment
96. School of Oriental and African Studies, University of London
97. SIAK
98. Society of Crop, Agribusiness Advisors of Kenya
99. South Eastern Kenya University
100. St Pius University
101. Standard Media Group
102. State Department of Devolution
103. State Department of Gender Affairs
104. State Department of Social Protection
105. Strategic Agenda
106. Takaful Insurance of Africa
107. Tegemeo Institute
108. The Star Newspaper
109. Torchlight Group
110. United Nations Development Programme
111. United Nations Economic Commission for Africa
112. United Nations International Children's Emergency Fund (UNICEF)
113. United States Agency for International Development
114. University of Kabianga
115. University of Nairobi
116. University of Nairobi
117. World Food Programme

# INSTITUTIONS WITH PUBLIC EXHIBITIONS

1. Kenya Electiricyt Generating Company
2. Commercial Bank of Africa
3. Agricultural Finance Corporation
4. Agriculture and Food Authority
5. Kenya Institute for Public Policy Research and Analysis
6. CIC Insurance Group
7. Takaful Insurance of Africa
8. African Capacity Building Foundation

# SPONSORS

1. African Capacity Building Foundation
2. Agricultural Finance Corporation
3. Agriculture and Food Authority
4. CIC Insurance Group
5. Commercial Bank of Africa
6. European Union
7. Government of Kenya
8. iHub
9. Kenya Electricity Generating Company
10. Kenya Institute for Public Policy Research and Analysis
11. Kenya Private Sector Alliance
12. Kenya Red Cross Society
13. Nation Media Group
14. National Drought Management Authority
15. Takaful Insurance of Africa
16. The East African
17. Vision 2030 Secretariat

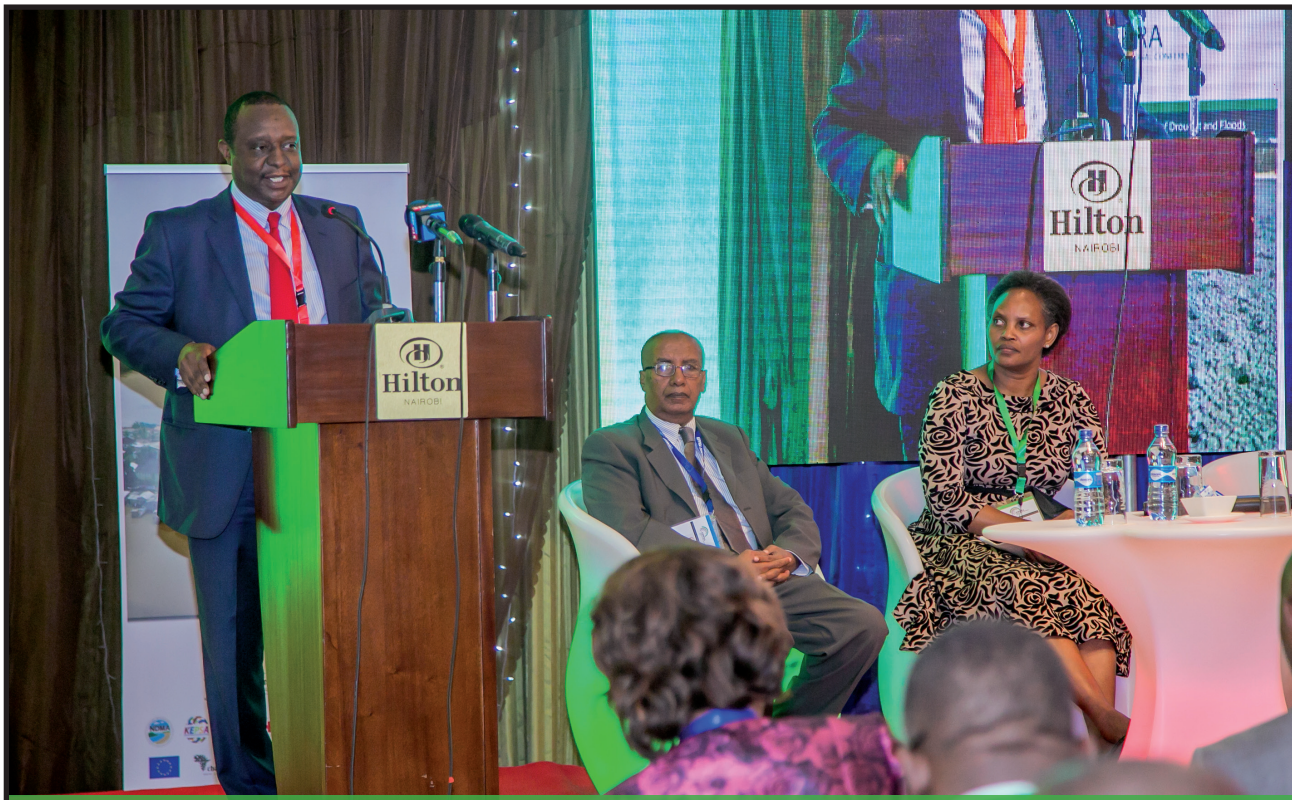
*Participants during a session on Day 2 of the KIPPRA Conference*


*NHIF Choir performing on Day 1 of the KIPPRA Conference*

*KIPPRA Executive Director, Dr Rose Ngugi welcomes the Principal Secretary State Department for Planning, Dr Julius Muia to the KIPPRA Conference*


*Dr Rose Ngugi, Mr Henry Rotich and Dr Julius Muia participate at the special session of the official opening of the KIPPRA Conference 2018*

*KIPPRA Executive Director, Dr Rose Ngugi welcomes the Treasury Cabinet Secretary, Mr Henry Rotich to the KIPPRA Conference*




*Treasury Cabinet Secretary, Mr Henry Rotich gives his speech at the official opening of the KIPPRA Conference*


*KIPPRA Executive Director, Dr Rose Ngugi*


*Dr Julius Muia participates at one of the sessions of the KIPPRA Conference 2018*


*KIPPRA Executive Director, Dr Rose Ngugi participates at a session*

*Michael Oyier, the chief moderator of the KIPPRA conference, speaks during one of the sessions*

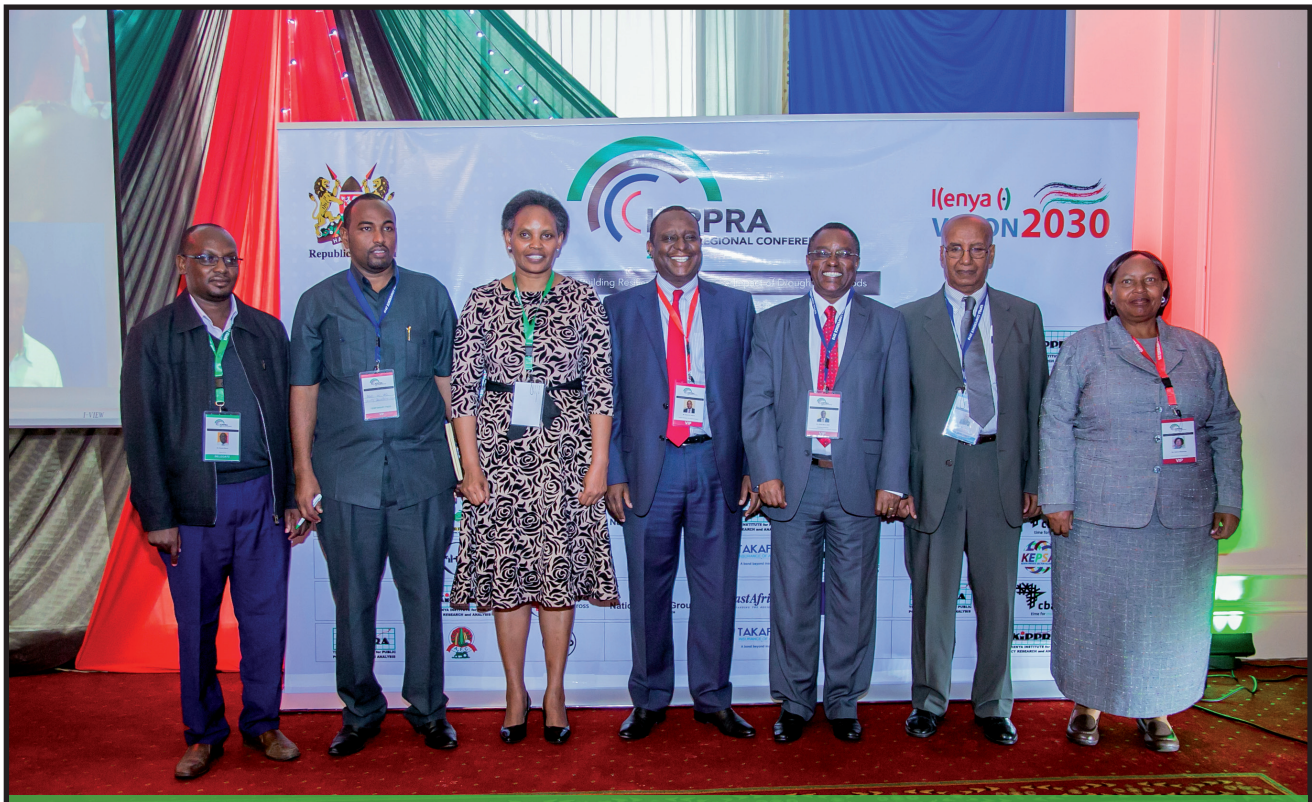

*Lynette Mwangi, CEO Media Owners Association, Dr Alex Awiti of Aga Khan University and Prof Bitange Ndemo participate at a panelist session at the KIPPRA Conference*


*Prof Agnes Mwang'ombe of University of Nairobi chairs a session on Day 2 of the KIPPRA conference*


*Mrs Millicent Omukanga of Agricultural Finance Corporation, chairs a session during the KIPPRA Conference*

*The Principal Secretary, State Department for Planning, Dr Julius Muia among other panelists at a session on Day 1 of the KIPPRA conference*

*Some of the KIPPRA staff who served as ushers at the conference*




*Treasury CS Mr Henry Rotich (centre), Planning PS Dr Julius Muia (right from centre), KIPPRA Executive Director Dr Rose Ngugi (left from centre) and other guests during the KIPPRA Conference*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