

**REPORT OF THE SIXTY THIRD GREATER HORN OF AFRICA CLIMATE OUTLOOK FORUM  
(GHACOF 63) FOR THE MARCH- MAY (MAM) 2023 RAINFALL SEASON  
20-22, FEBRUARY 2023**

**THEME: "EARLY WARNING FOR CRISIS MANAGEMENT"**



**Nairobi, Kenya**

## Table of Contents

<b>PREFACE .....</b>	<b>2</b>
<b>EXECUTIVE SUMMARY .....</b>	<b>4</b>
<b>1. SETTING THE STAGE AND OFFICIAL OPENING CEREMONY .....</b>	<b>4</b>
<b>1.1 INTRODUCTION .....</b>	<b>5</b>
<b>1.2 OBJECTIVE OF THE FORUM .....</b>	<b>6</b>
<b>1.3 PARTICIPANTS FOR THE FORUM .....</b>	<b>6</b>
<b>1.4 METHODOLOGY.....</b>	<b>7</b>
<b>2. CO-PRODUCTION SESSION: ENHANCING THE USABILITY OF ICPAC CLIMATE PRODUCTS .....</b>	<b>7</b>
<b>3.1 AGRICULTURE AND FOOD SECURITY .....</b>	<b>8</b>
<b>3.2 DISASTER RISK MANAGEMENT .....</b>	<b>9</b>
<b>3.3 WATER RESOURCES AND ENERGY.....</b>	<b>9</b>
<b>3.4 LIVESTOCK AND RANGELANDS.....</b>	<b>9</b>
<b>3.5 HEALTH AND NUTRITION .....</b>	<b>10</b>
<b>4. STATE OF THE CLIMATE: MARCH TO MAY 2023 SEASONAL FORECAST .....</b>	<b>11</b>
<b>5. SECTOR DISCUSSIONS: MARCH TO MAY 2023 SEASONAL ADVISORIES .....</b>	<b>11</b>
<b>5.1 AGRICULTURE AND FOOD SECURITY .....</b>	<b>11</b>
<b>5.2 DISASTER RISK MANAGEMENT .....</b>	<b>12</b>
<b>5.3 WATER RESOURCES AND ENERGY.....</b>	<b>13</b>
<b>5.4 LIVESTOCK AND RANGELANDS.....</b>	<b>13</b>
<b>5.5 HEALTH AND NUTRITION .....</b>	<b>14</b>
<b>5.6 MEDIA SECTOR.....</b>	<b>14</b>
<b>6. THE TRANSFORMATION OF GHACOF, 25 YEARS IN THE MAKING.....</b>	<b>15</b>
<b>7. IMPACT AND PROSPECT OF THE PROLONGED DROUGHT .....</b>	<b>16</b>
<b>ANNEXES .....</b>	<b>19</b>
<b>ANNEX I: STATEMENT FOR THE GHACOF63 .....</b>	<b>19</b>

## PREFACE

The sixty-third Greater Horn of Africa Climate Outlook Forum (GHACOF63) was organized virtually and in person on 20-22 February 2023. The main objectives of the forum were to provide feedback on the performance and impacts of the October

to December 2022 season, present a consolidated objective regional climate outlook for the MAM 2023 season, and then deliberate and provide implications of the MAM 2023 climate forecast to vital socioeconomic sectors in the region.

The forum brought together climate scientists, researchers, decision-makers, and users from vital socioeconomic sectors, governmental and non-governmental organizations, development partners, and civil society, among other stakeholders. GHACOF63 was preceded by sector-specific workshops that focused on the co-production and co-design of climate services, feedback on the use of the previous forecast and its impacts on the sectors, lessons learned, and co-design of forecast-based interventions and mitigation measures for the coming season. This was in addition to a week-long climate prediction development workshop (PRECOF) held from the 14th to the 18th of February 2023, to co-develop regional and national climate forecasts.

The forum was organized by IGAD Climate Prediction and Applications Centre (ICPAC) in collaboration with the National Meteorological and Hydrological Services (NMHSs) of ICPAC's participating member countries and was supported by partners. The forum was held within the framework of the IGAD regional strategy for mainstreaming climate information in vital socioeconomic sectors for disaster risk reduction and sustainable development under the theme: "Early warning for crisis management."

The three day-event attracted online and in-person participants, of whom 147 (40 female and 107 male) attended in person at the Movenpick hotel in Nairobi.

ICPAC will continue to organize GHACOFs as one of the most effective ways to strengthen the dialogue between producers, users, and all climate services value chain actors and proactively innovate and improve efforts to deliver better services to build resilience in the region.

***Guleid Artan (PhD)***

***ICPAC Director***

## EXECUTIVE SUMMARY

Since the advent of the COVID-19 pandemic, IGAD Climate Prediction and Applications Centre (ICPAC) has adopted a mix of virtual and hybrid formats for its GHACOF forums. The sixty-third Greater Horn of Africa Climate Outlook Forum (GHACOF63), held in Nairobi, Kenya, on 20- 22 February 2023, adopted a hybrid format with online participants joining via the zoom platform. The forum issued regional March, April, and May (MAM) 2023, climate outlook and formulated forecast-based mitigation and response strategies. It also reviewed the October-November (OND) 2022 seasonal rainfall performance and impacts on the different socioeconomic sectors. The forum was supported by the European Union funded Climate Services and related applications (ClimSA), Coproduction of Climate Services for Eastern Africa (CONFER), projects funded by the European Union, the AICCRA project financed by the World Bank, Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), and the Government of Kenya.

The forum was held within the framework of the IGAD regional strategy for mainstreaming climate information into key socioeconomic sectors for resilience and sustainable development. It brought together representatives from National Meteorological and Hydrological Services (NMHSs), global climate centers, regional partners, decision-makers, and users from critical socioeconomic sectors. The agriculture and food security, water and energy, livestock, media, health, and disaster risk management were held in person, while the environment, forestry, and conflict sectors participated virtually. Climate Change experts also had a parallel workshop on day one but joined the various sectors on the second day. All the sectorial sessions were held two days before the main event to formulate responses to the regional climate outlook for the OND 2022 rainfall season over the GHA region. The sectors involved during the sectoral sessions were Agriculture and Food Security, Disaster Risk Management (DRM), Water Resources Management and Energy, Livestock, Health, Environment and Forestry, and Media. Climate Change experts also had a parallel workshop on day one but joined the various sectors on the second day.

The objective seasonal forecast was developed during the PreCOF63 climate capacity building workshop from 14th-18th February 2023. The consolidated objective climate outlook generally indicated a higher chance of drier conditions over much of the region, specifically over Tanzania, Burundi, Rwanda, Kenya, southern, central, north-western Somalia, southern and southeastern Ethiopia, and the Red Sea coast of northern Eritrea. Consistent with increased probabilities for below-normal rainfall, the start of the season is predicted to be delayed, especially over eastern Kenya and southern Somalia. The temperature outlook indicates an increased likelihood of warmer-than-average surface temperatures across most parts of the region. The forum provided a structured means for users, researchers, and climate services providers to interact at the regional level to ensure that user needs for the seasonal prediction are met.

### 1. SETTING THE STAGE AND OFFICIAL OPENING CEREMONY

Dr. Guleid Artan began by extending a warm salutation to all the attendees. He then highlighted the significance of the GHACOF, which marks 25 years today. He acknowledged that the forum had enormously contributed to the region's climate predictions and disaster management. Furthermore, Dr. Artan emphasized that the GHACOF has delivered consensus-based and user-based information and services to different sectors, especially policymakers. He also stressed that the forum has successfully brought together national and regional institutions, global climate producers, and other institutions to work together for resilience building. In conclusion, Dr. Artan's opening statement highlighted the achievements of the GHACOF in the past 25 years, emphasizing the importance of collaboration and consensus-based decision-making in climate predictions and disaster management.

Dr. Workneh Gebeyehu, the Executive Director of IGAD, expressed his gratitude towards the coordination and organization of the partners and ICPAC for organizing this event. He also expressed his appreciation to the Kenyan government for their extended support to ICPAC as a center for the IGAD organization. Thanks to the late former president Daniel Moi, Dr.

Gebeyehu recognized the World Meteorological Organisation for restoring IGAD climate sectors to cover climate services. He highlighted that the region has been able to advance climate forecasting, which has helped build resilience, and that regional disasters do not have to lead to a crisis with early warning. Dr. Gebeyehu emphasized the need to enhance the capacity of member states to provide actionable early warnings. He added that the provision of forecasts and advisories before a season, aids in fast response from humanitarian assistance and policymakers. Despite the progress made, Dr. Gebeyehu acknowledged that there is still room for improvement from forecasting to functional evaluation of the effects. In conclusion, Dr. Gebeyehu's statement emphasized the importance of early warning systems and the need to build capacity to provide actionable early warning to enhance resilience-building efforts in the region.

Dr. David Gikungu, the Director of the Kenya Meteorological Department (KMD), congratulated ICPAC for steering the event and ensuring all participants were present at the forum. He appreciated the excellent relationship between KMD and ICPAC and their efforts to provide users and stakeholders with climate products. Dr. Gikungu highlighted that since KMD started in 1929, the recent occurrence of five failed seasons and the possibility of a sixth one is new. He further noted the establishment of National Climate Outlook Forums at the county level immediately after this forum, which are essential collaborations to enhance the services. In conclusion, Dr. Gikungu's statement emphasized the importance of cooperation and improved technology to enhance the region's climate prediction and disaster management efforts.

Eng. John Enungata, speaking on behalf of the Chief Administrative Secretary (CAS), acknowledged and appreciated the work done at ICPAC, emphasizing the importance of building resilience in the region. He also thanked the sponsors, organizers, and continued partnership in building the region's resilience. In conclusion, Engineer Enungata's statement emphasized the Ministry's commitment to supporting climate change and the importance of collaboration and partnership in building regional resilience.

Cabinet Secretary Ministry of Environment, Climate Change, and Forestry, Hon. Soipan Tuya, congratulated and appreciated ICPAC for organizing the GHACOF events for the past 25 years and acknowledged that it had been a significant role in climate and weather forecasting in the region and beyond. She also mentioned that her Ministry is a substantial consumer of ICPAC products and congratulated them on behalf of that. She emphasized the need for services tailored to the region's needs and provided advisories for policymakers due to continued catastrophic calamities. She noted that both the private and public sectors understand the importance of resilience and adaptation. Hon. Tuya expressed her belief that the climate outlook report will be a great success in the tree-planting initiative and assured ICPAC of continued support and improved advocacy on climate resilience. She also invited ICPAC to the African Climate Summit in Nairobi, where ministers will be invited to support climate activities. The extensive participation will provide an avenue of collaboration and participation for GHACOF. Hon. Tuya emphasized the need for solid partnerships among providers and stakeholders to interpret climate products for decision-making and effective policy formulation. In her closing, she suggested that the theme of future forums should be "Early warning to avoid crisis management" rather than "fighting the crisis." She also acknowledged the presence of nationals from other African countries and encouraged cross-border collaborations and partnerships in climate resilience initiatives.

## **1.1 Introduction**

The organization of Regional Climate Outlook Forums (RCOFs) was initiated in 1996 in Victoria Falls, Zimbabwe, by the WMO's Climate Information and Prediction Services (CLIPS) project in collaboration with NMHSs. RCOFs gained momentum as a regional response to the 1997–1998 El Niño event. IGAD Climate Prediction and Applications Centre (ICPAC), formerly known as Drought Monitoring Centre (DMC), organized the first RCOF in Nairobi, Kenya, for the March to May (MAM) 1998 rainfall season in February 1998. This year marks the celebration of 25 years since the launch of the first GHACOF under the theme: "Early warning for crisis management."

The sixty-third Greater Horn of Africa Climate Outlook Forum (GHACOF63) was organized by ICPAC in collaboration with the GHA National Meteorological and Hydrological Services (NMHSs), World Meteorological Organization (WMO), and other partners to document and share the climate impacts across the region and to formulate mitigation measures to the regional climate outlook for the March-May 2023 rainfall season over the GHA region. The forum is part of the IGAD Regional Strategy for Mainstreaming Climate Services in Key Socioeconomic Sectors' Plans for Sustainable Development.

This report summarizes the deliberations of the sixty-third Greater Horn of Africa (GHA) Climate Outlook Forum (GHACOF63), held in person at Movenpick Hotel in Nairobi and virtually via zoom on 20- 22 February 2023.

## **1.2 Objective of the forum**

The forum's main objective was to provide the regional climate outlook for the March-May (MAM) rainfall season, analyze the potential impacts of the expected climate conditions on different socioeconomic sectors and formulate appropriate mitigation measures and advisories. The performance and effects of the preceding seasonal climate were also assessed. The sectoral reports highlighted the experiences and lessons learned using the forecast and good practices. The challenges encountered during the season were also reported. The forum also provided a regional interaction platform for decision-makers, climate scientists, research scientists, users of climate information, and development partners. The specific objectives were to;

- Reflect on the performance and impacts of the October to December (OND) 2022 season.
- Present the consolidated objective regional climate outlook for the MAM 2023 season.
- Discuss the implications of the MAM 2023 climate forecast and management strategies.
- Provide a regional interaction platform for decision-makers, climate scientists, and research: scientists, users of climate information, and development partners.
- Release the outcomes of the forum and the GHACOF 63 statement.

## **1.3 Participants for the forum**

The key stakeholders included the National Meteorological and Hydrological Services (NMHSs) of Eastern Africa (Institut Géographique du Burundi, Agence Météorologique Nationale de Djibouti, Eritrea Meteorological Service, Ethiopia Meteorological Institute, Kenya Meteorological Department, Rwanda Meteorological Agency, South Sudan Meteorological Service, Sudan Meteorological Authority, Somalia Meteorological Service, Tanzania Meteorological Authority and Uganda National Meteorological Authority) as well as international partner organizations such as the World Meteorological Organisation (WMO), European Union, and Organisation of Africa, Caribbean and Pacific Group of States (OACPS) among others.

The hybrid forum comprised climate scientists from the National Meteorological and Hydrological Services (NMHSs) of ICPAC member countries (Institut Géographique du Burundi, Agence Météorologique Nationale de Djibouti, Eritrea Meteorological Service, Ethiopia Meteorological Institute, Kenya Meteorological Department, Rwanda Meteorological Agency, South Sudan Meteorological Service, Sudan Meteorological Authority, Somalia Meteorological Service, Tanzania Meteorological Authority and Uganda National Meteorological Authority), universities, research institutions, regional and international organizations engaged in climate modeling and applications (European Union, and Organisation of Africa, Caribbean and Pacific Group of States (OACPS). Others were from socioeconomic sectors such as agriculture and food security, health, water resources, energy, disaster risk reduction, civil society, and conflict early warning response. Various regional and international

Governmental and Non-Governmental organizations and the donor community also participated in the forum. A total of 147 (40 female and 107 male) participated in person.

## **1.4 Methodology**

Presentations and plenary discussions were the primary modes used during the online forum. On 20 February 2023, sectors organized a working session to review and discuss the climate products needed by each sector. On 21 February 2023, the sectors reviewed the impact of the OND 2022 season, shared lessons, and good practices, discussed the outlook of MAM 2023, and generated advisories and mitigation measures. On 22 February, the sectors gave consolidated regional presentations on the previous season's impacts and MAM 2023 advisories co-produced in the preceding days. Four side events on various topics were held during the afternoon sessions on the 20- 22 February 2023.

## **2. CO-PRODUCTION SESSION: ENHANCING THE USABILITY OF ICPAC CLIMATE PRODUCTS**

Calistus Wachana started the session by discussing the challenges faced in enhancing the usability of ICPAC products and the solutions to overcome those challenges. The main challenge identified was translating usability into decision-making. The use of technical and non-technical usability was also discussed. The gaps in non-technical usability were identified as weak sectors, language translation, unclear information, and applications and use. The session participants highlighted the need for user guidelines, strengthening of UIPs, training journalists on climate information dissemination, awareness creation, and sensitization. Clear timelines on when the forecasts are to be disseminated were also identified as essential. The training of journalists on using local languages to interpret the products was identified as a successful solution. ICPAC has trained 80 journalists, and 20 journalists from Rwanda and Burundi are yet to be trained. The need for the products to be synchronized from the regional to national levels was also highlighted.

The following recommendations were put forward to enhance the usability of ICPAC products:

- Strengthening of user guidelines and UIPs
- Training of journalists on climate information dissemination, especially in local languages
- Awareness creation and sensitization
- Setting clear timelines on when to disseminate the forecast
- Synchronization of products from the regional to national levels

Dr. Maslin Gudoshava presented on the state of ICPAC products and the use of probabilistic forecasting. He emphasized that forecasting can never be 100% accurate due to the varying parameters that can shift or change. Main Topics Discussed: A demonstration was done to show the use of probability and accuracy in forecasting. The presentation highlighted that seasonal forecasting is interpreted with the understanding that if it is dry, it does not rule out the possibility of other extremes occurring. The Standardized Precipitation Index was also discussed, which explains how dry or wet it is. However, this depends on the region and what is considered extreme or severe by the World Meteorological Organization. Improvements: Dr. Gudoshava recommended the following improvements to enhance the accuracy and effectiveness of ICPAC products: Continued use of probabilistic forecasting; Improving data collection and analysis methods; Strengthening partnerships with regional meteorological agencies; Developing more user-friendly products that are easily accessible and understandable to the public; and increasing awareness and sensitization on the use of ICPAC products.

Edwin Kiplagat provided an update on the various communication channels used by the Intergovernmental Authority on Development (IGAD) Climate Prediction and Applications Centre (ICPAC) to disseminate their products. These channels include websites, emails, newsletters, press releases, technical reports, videos, and graphics. ICPAC has 150,000 subscribers on all platforms and 8,000 subscribers on Mailchimp. Feedback channels include annual and quarterly surveys, contact us forms, face-to-face interactions, and real-time feedback. The product information is available in 8 languages, and Google

translation is currently being used. The session resulted in recommendations for setting timelines for communicating forecasts and collecting and analyzing feedback. Addressing ICPAC Products through East African Hazards Watch Edwin Kiplagat discussed the primary approach for the East African Hazards Watch during the session. The approach involves fetching information from critical platforms, having a centralized platform to access information, and leveraging standardization to access information. The East African Hazards Watch initiative supports disaster risk reduction, food security, and climate adaptation decision-making processes. By providing timely and accurate information, the initiative can help decision-makers to take appropriate action to mitigate the impact of hazards in the region.

### **3. LOOKING BACK: PERFORMANCE AND IMPACTS OF THE OCTOBER TO DECEMBER 2022 SEASON**

This session was mainly dedicated to showing the meeting participants the performance of the previous season and to showcase some of the sectors' impacts observed during the season with regards to the observed rainfall and temperature and other climatic-related factors from seven sectors, including Agriculture and food security, Disaster Risk Management, Livestock and Rangelands, Health, and Water resources.

#### **3.1 Agriculture and Food Security**

On the positive side, the OND season was conducive for harvest and post-harvest activities in unimodal parts of Kenya, Meher crop production in Ethiopia, South Sudan, Sudan, and Uganda, resulting in minimal post-harvest losses. There was a decline in cereal prices in South Sudan and improved food availability (green maize, beans, and other pulses) in the western, eastern, and northern parts of Uganda. Additionally, there was a good production of Irish potatoes and maize in Burundi, which resulted in a decline in potato prices from 1300 BIF to 1000 BIF/KG. Also, the dry conditions experienced in most parts of the region discouraged locusts breeding.

On the negative side, late-onset and poor rainfall performance resulted in moisture stress in southern and southeast Ethiopia, Karamoja, Napak, and Moroto in Uganda, and bimodal parts of Kenya and Somalia, leading to below-average production to crop failure. There was also a prevalence of some crop diseases, e.g., wheat rust in some Meher areas in Ethiopia, bacterial Wilt in Gitega, Burundi) AAW, white cassava flies, sweet potato hornworm, i.e., in the Teso region of Uganda, and bacterial Xanthomonas wilt outbreak in some parts (e.g., Gitega province) in Burundi. The dry conditions resulted in many people needing food aid, particularly in Ethiopia, Kenya, and Somalia. Heavy rainfall experienced in Uganda during the harvesting of legumes and cereals, including maize and millet, resulted in post-harvest losses. As of January 2023, there was increased food insecurity in the region, with more than 46 million at IPC 3 and above for IGAD countries and 49m people for ICPAC member states, not only due to climate change but a combination of drivers, e.g., conflicts and socioeconomic factors, e.g., high prices and inflation.

Following the GHACOF 62, several advisories were implemented in light of the weather forecasting for the season. Some measures include early dissemination of seasonal outlook and agromet advisories, subsidizing farm inputs, strengthening irrigation systems, and providing food relief and humanitarian support to drought-affected people.

Some of the observed long-term seasonal changes during the OND season included: most parts of the region experiencing delayed onset and prolonged dry spells and have experienced five consecutive failed seasons between 2020 and 2022. The dry conditions have resulted in drying permanent springs and rivers in Kenya and a significant increase in rainfall rate in the far northern parts of Sudan. In line with the changes, the following recommendations were made; improving and enhancing continuous extension services and encouraging the use of new farming technologies; opening up and rehabilitating animal-migratory routes to minimize conflict between farmers and pastoralists; strengthening extension services; and farmers and associations and promoting value addition for both livestock products and farm produce.

### **3.2 Disaster Risk Management**

During the OND rain season, floods were reported in Ethiopia, Uganda, South Sudan, Djibouti, and Sudan, while drought was reported in Somalia, South Sudan, Ethiopia, Djibouti, and Kenya but Ethiopia, Kenya, and Uganda were majorly affected. In Uganda, landslides, hailstorms, conflicts, and the Ebola epidemic were reported. Cumulatively, 47 million people were affected by drought, floods, and food insecurity in the region. 878,733 people were displaced due to floods, drought, and landslides, which required 81.5 billion USD for humanitarian response. Following the devastating drought, Ethiopia, Kenya, and Somalia declared a state of emergency. USD 25.5 M was mobilized by the governments of South Sudan and Ethiopia to support affected people. At the same time, the government of Sudan/WFP and partners provided emergency food assistance estimated at 377.4 MT. The lessons learned from the regional shocks were the need for a multi-agency approach in response to disasters and leveraging on host family programs, which have been implemented in Uganda, to assist flood-affected communities, where neighboring communities supported those affected.

### **3.3 Water Resources and Energy**

Rainfall performance varied over the region with both positive and negative impacts. Some of the positive effects highlighted included the recharge of open water pan (water harvesting) in Burundi, Kenya, and Ethiopia, there was no riverine flooding and associated infrastructure damages in major lakes in Burundi, Tanzania, South Sudan, and Uganda, the conditions allowed for river restoration and rehabilitation and construction of infrastructure, e.g., roads. The Northern regions received good rain; some stations recorded heavy rains (more than 160 mm). This alleviated water stress as well as reduced drought intensity. In Uganda, the water levels continued to decline, while groundwater research was enhanced in Burundi, Djibouti, and South Sudan. There was average hydropower generation and water availability in Burundi, South Sudan, Uganda, Kenya, and Ethiopia.

Some of the negative impacts observed during the OND season included: a decrease in hydropower generation, groundwater level, and surface water level in rivers and lakes in Ethiopia, Tanzania, and Kenya; increased conflicts between farmers and pastoralists in Tanzania. And increased migration in Somalia and Kenya, a decline in water flow and quality in Ethiopia; riverine flooding was reported in Kenya and Uganda, and flash floods were recorded in part of Unity, Bahr-el-Ghazal, and floods of farms around Jebel Aulia in South Sudan; increased human-wildlife conflicts in Laikipia Kenya; poor recharge of shallow wells and reduced boreholes yield in Kenya and Somalia; water rationing in Dar es Salaam, Coast Region, and Morogoro in Tanzania; and delayed rains/ completely dry seasonal streams led to dry water pans, sand dams, and rock catchments in Somalia and Kenya.

The observed seasonal changes of the JJA season include; delayed Precipitation onset and a short rainy season experienced in Burundi, Kenya, and Somalia; In Somalia, the season was dry with uneven rainfall distribution and high temperatures; water levels continue to remain higher than the long term means in the White Nile at Juba, South Sudan, there is increased water bodies temperatures leading to high evaporation rates in Kenya and Uganda; and early withdrawal and prolonged dry spells in Uganda.

Following the OND forecast, a press release was created to raise awareness of water conservation and monthly hydrological and catchment conservation bulletins. Measures including rainwater harvesting, irrigation, water pumping, tree, planting, plot contouring, and planting drought-tolerant crops were emphasized. In addition, water trucking, drilling, and rehabilitation of boreholes and wells were done in Ethiopia, Kenya, Somalia, and Tanzania. WASH items, water testing services, and water treatment chemicals were provided in Ethiopia and Kenya, and the desilting of water pans in Kenya.

### **3.4 Livestock and Rangelands**

One of the most significant positive impacts of rainfall has been the improvement of pastures and water availability in some areas. This has increased livestock production, including kidding, lambing, milk, and meat production. As a result, the body conditions of livestock have improved, leading to better market prices and terms of trade for farmers. In Somalia, there were no animal disease outbreaks reported, which is a significant positive development. On the other hand, one of the most important negative impacts has been the feed and drinking water shortage due to prolonged drought, which affected livestock production in many areas, including Kenya, Ethiopia, and Somalia.

In summary, there have been animal deaths and feed distribution in Ethiopia, Kenya, and Somalia due to the prolonged drought. There were also conflicts between humans, human-wildlife, pastoralists, and farmers, with increased conflict in South Sudan. Displacement of pastoralists was observed in Ethiopia and South Sudan due to flooding. Long-term observed seasonal changes have shown that the performance agrees with the presented OND verification by ICPAC, with some areas receiving adequate rain and others depressed rainfall or continued dry spells. Additionally, flash floods occurred in some areas, leading to flooding in Ethiopia, Djibouti, and South Sudan, increasing disease outbreaks and displacement and death of livestock.

On implementing advisories provided, commercial fodder production is growing in countries such as Ethiopia, Kenya, Djibouti, Sudan, and Somalia, which has helped to mitigate the impact of droughts on livestock. Timely vaccination against transboundary diseases has also been facilitated by climate services and advisories, resulting in improved animal health and productivity. Furthermore, awareness of water harvesting was created, leading to the adoption of various water harvesting techniques, such as rainwater harvesting and the construction of water pans, helping improve water availability for both humans and animals during dry spells. In addition, awareness of weather forecasts is increasing in countries such as Uganda, Kenya, Ethiopia, Djibouti, Sudan, and South Sudan. Lastly, the uptake of livestock insurance has been facilitated by climate services and advisories. For instance, in the Puntland State of Somalia, the World Bank-funded drive project has supported 1,780 pastoralists, improving resilience to climate-related shocks and better livelihoods. Overall, implementing climate services and advisories has helped build resilience and improve the livelihoods of communities in the region.

### **3.5 Health and Nutrition**

The positive impacts of the long-term observed seasonal changes in the region include Less climatic suitability for bacterial, viral, or parasitic infections due to warmer conditions in Kenya, Somalia, and Ethiopia. This has resulted in a reduction of vector-borne infectious diseases such as malaria, dengue fever, chikungunya, and yellow fever in Kenya; Water quality has improved, resulting in fewer cases of waterborne contagious diseases such as cholera, diarrhea, dysentery, hepatitis A, and typhoid in Uganda; Good food production resulting in food availability, declined food prices, and improved nutrition in Uganda. This has been facilitated by implementing climate services and advisories, which have helped farmers plan their activities better and make informed decisions on issues such as planting and harvesting.

The negative impacts of the long-term observed seasonal changes in the region include Water scarcity resulting in food scarcity and increased incidences of malnutrition in Ethiopia, Kenya, and Somalia. In Kenya, Turkana, Samburu, Marsabit, and Isiolo, parts of Kilifi, Tana River, Garissa, Wajir, and Mandera counties were affected. This has led to food insecurity, malnutrition, and increased cases of related illnesses; Malaria prevalence in Sudan at 12.7%, typhoid at 1.2%, and diarrhea at a rate of 1% of the total frequency. This has led to increased cases of malaria, typhoid, and diarrhea, which are climate-sensitive diseases; In South Sudan, a measles outbreak has been confirmed in 15 counties. This outbreak has been attributed to the displacement of people due to conflicts and limited access to healthcare services; the Malaria outbreak has been reported in Uganda, Ethiopia, Sudan, and Rwanda. Overall, the negative impacts of the long-term observed seasonal changes have led to an increase in climate-sensitive diseases, food insecurity, and displacement of people due to conflicts and limited access to healthcare services.

The advisories undertaken during the OND season in response to positive and negative impacts associated with the health and nutrition sector include awareness creation, resource allocation and monitoring of the food chain, surveillance, and control of flying and crawling insects and rodents, distribution of mosquito nets and indoor residual spraying.

#### **4. STATE OF THE CLIMATE: MARCH TO MAY 2023 SEASONAL FORECAST**

Dr. Tufa highlighted the usefulness of AICCRA tools and climate information products for early warning support. The CGIAR focuses on Climate Smart Agriculture and Climate Information Services, with AICCRA implemented in six African countries in partnership with local organizations. The tools improve access to and use of data through national service use and training. The products offer risk management and assessment advantages for early warning forecasts. An Open Science Conference is scheduled for October 2023 in Rwanda, with abstract submissions and financial aid applications closing in March 2023.

IFRAH's presentation underscored the need for urgent action to address food insecurity in the region. The set of standardized tools that classify the severity of food insecurity can be used to guide interventions aimed at reducing food insecurity. Dr. Linda's update on the IGAD Climate Security Coordination Mechanism highlights the importance of addressing climate security in the region and the need for a security mechanism to analyze recommendations and make policy changes. Overall, the meeting highlights the urgent need for concerted efforts to address food and climate security in the region to improve the population's well-being.

Eunice Koech presented the forecast for March- May 2023, which predicts that rains in Eastern Africa will come from the south. Dry conditions are expected to continue, leading to widespread drought until the end of the period. The region is likely to experience warmer than usual temperatures, especially in Sudan, Ethiopia, and South Tanzania. The forecast is probabilistic and uncertain; confidence can only be placed on how the season will turn out.

#### **5. SECTOR DISCUSSIONS: MARCH TO MAY 2023 SEASONAL ADVISORIES**

This session addressed the implications of the MAM 2023 climate outlook to various sectors, including anticipated impacts and critical management strategies in different sectors. Below are the co-developed likely effects and mitigation measures for the other sectors.

##### **5.1 Agriculture and Food Security**

###### Expected positive sectoral impacts

Good crop prospects are likely in the western part of Ethiopia, the South Sudan-Ethiopia border, Western, Northern, and Southern parts of Rwanda, and southern and eastern parts of Kenya due to predicted normal to above normal rains. While the expected below-average rainfall in Kenya, western parts of South Sudan and Somalia will result in a lower outbreak of diseases and pests associated with wet weather, e.g., aflatoxins and desert locust breeding and fewer weeds, hence reduced production cost due to reduced cost of herbicides/ weeding. The condition will be conducive for pre- and post-harvest management in Tanzania and Sudan.

###### Expected negative sectoral impacts

Dry conditions in the eastern and southeastern parts of Ethiopia, Kenya, Djibouti, Western parts of South Sudan, Somalia, Eastern parts of Rwanda, and Tanzania will lead to soil moisture deficit, reduced yields, and increased food prices, further deteriorating food security situation which is already dire. Reduced water levels in Shabelle and Juba rivers in Somalia, used for irrigation, will result in loss of livelihoods due to reduced labor opportunities. The consecutive failed season in the Horn of Africa, this being the 6th, will likely result in reduced investment in crop farming. Below-normal rains favor the breeding

of crop pests and diseases such as fall armyworms. Post-harvest losses for the last season crop might be experienced in Burundi, especially in areas with normal to early onset.

#### Key advisories

Encourage governments and relevant stakeholders to disseminate early warning information for early anticipatory/early action at the local level and the farming/pastoral community. Through the Ministry of Agriculture, the government should enhance extension services to farmers, including timely delivery of climate information to farmers. With advice from extension workers, farmers are encouraged to practice climate-smart agriculture, soil and water conservation practices, cultivate drought-tolerant crops, diversify crop production, planting early maturing crops in areas expected to receive depressed rains, and regular crop monitoring to fight pests and diseases.

Farmers are advised to expand water harvesting for domestic and agricultural use in areas with expected normal to above normal rainfall and encourage farmers to boost crop production due to conducive conditions. In regions with depressed rains and low crop production resulting in increased food prices, governments should support and facilitate food import to mitigate against expected crop production gaps to balance market prices and establish national grain/food reserves to supply food to the areas with high shortages. With the prolonged drought, e.g., in Ethiopia, Kenya, and Somalia, governments are encouraged to declare the drought a national disaster, expand procurement and intervention of food relief for humans, livestock, and wildlife, and scale up cash and food aid assistance from government and humanitarian agencies the most vulnerable people. In the long term, governments are urged to promote policy-level intervention for sustainable resilience programmes, including those that promote supplementary irrigation practices to ensure maintained food production even during dry spells. Encourage farmers to join subsidized programs like Small Scale Irrigation Technologies (SSIT) and the National Agricultural Insurance Scheme (NAIS) to minimize the impacts of drought conditions that may occur in MAM 2023.

## **5.2 Disaster Risk Management**

#### Expected positive sectoral impacts

Drier-than-normal conditions coinciding with the harvesting period in Ethiopia and North Rift Kenya will reduce post-harvest losses. Feeder roads will continue to be good and easily passable due to dry conditions, thus, improving access to food commodities. The dry conditions will allow irrigation and water harvesting infrastructure repairs across irrigated areas.

#### Expected negative sectoral impacts

Floods riverine and flash floods will likely continue in Sudan and South Sudan, resulting in displacement and loss of farmlands. Persistent drought and its impacts, including an increase in food prices, an increase in the number of people in need of humanitarian aid, deterioration of water and pasture shortage, loss of livestock, and displacement of people, will likely intensify in Ethiopia, Kenya, Somalia, and Karamoja, Uganda. Resource-based conflict along cross-border areas due to migration by pastoralists and human-wildlife conflicts will likely intensify in Djibouti, Ethiopia, and Kenya. Late onset is likely to affect planting season in Ethiopia. Low temperatures may cause frost and affect crops in some parts of Ethiopia, while malaria cases are expected to rise among children in Uganda. Wildfires are expected in Uganda and Sudan due to high temperatures.

#### Key Advisories

Encourage governments and relevant stakeholders to strengthen early warning, disseminate early warning information, and create awareness to support decision-making for early anticipatory/action. Water harvesting at the household level is encouraged. Due to the drier-than-normal conditions, governments are encouraged to help livestock farmers and pastoralists in destocking. Governments and partners should activate a multi-agency response by enhancing water trucking, relief food and animal feed distribution, school feeding programmes, and cash transfers due to deteriorating water and food scarcity

due to prolonged drought, especially in the most hit countries such as Ethiopia, Kenya, and Somalia. A multi-sectoral approach should be taken to reduce climate and non-climate shocks. For flood-prone areas, e.g., in Sudan and South Sudan, promote the host family approach to support those displaced by floods and to strengthen water harvesting and storage systems—preposition resources to curb wildfires in Uganda and Sudan. Governments urged to offer financial support to the DRM (Disaster Risk Management) office to enable them to manage disasters and develop a national contingency plan for drought. Undertake water resources and irrigation canal rehabilitation.

### **5.3 Water Resources and Energy**

#### Expected positive sectoral impacts

Reduced river and lake water levels due to expected drier conditions will reduce flooding risks in Burundi and South Sudan. Despite the expected drier-than-normal conditions, the availability of sufficient stored water in reservoirs will sustain hydropower production in Ethiopia and Sudan. On the other hand, wetter conditions in Rwanda and Tanzania will result in increased groundwater recharge and availability of water for irrigation and hydropower production. Water availability in Tanzania will result in a low risk of water-related conflicts.

#### Expected negative sectoral impacts

The drier conditions in Burundi, Djibouti, Ethiopia, Kenya, South Sudan, Somalia, and Uganda will reduce groundwater recharge and water shortage, affecting livestock and agricultural production and disrupting power supply due to a decline in hydropower production. Water shortage will also likely result in increased water resource-based conflicts and migration. Drying docking places in Uganda will likely affect water transport (ferries). Expected wetter-than-normal conditions in Tanzania will in increasing the risk of flooding.

#### Key Advisories

Rainwater harvesting, proper water management, water governance, and coordination between upstream and downstream, including promoting efficient irrigation practices, are encouraged. The government and relevant stakeholders are encouraged to continuously monitor water resources and raise community awareness of waterborne disease prevention and control. Due to projected water resource-based conflicts, governments are advised to establish a water conflict resolution plan, sensitize communities on the peaceful use and sharing of water resources, and plan for the resettlement of migrated people.

### **5.4 Livestock and Rangelands**

#### Expected positive sectoral impacts

Good pasture management in areas expected to experience wetter conditions, including Rwanda and Tanzania, will improve animal body conditions and milk and blood availability.

#### Expected negative sectoral impacts

The drier conditions predicted in Djibouti, Southern Ethiopia, Kenya, Somalia, South Sudan, Sudan, and Uganda will result in deteriorated pasture and water inadequacy, thus affecting livestock production, including livestock products- milk availability, meat, blood, etc. This will further result in increased livestock movement, disease outbreaks, e.g., TADs (PPR, CCPP, CBPP, FMD, Anthrax, and Clostridial diseases), livestock death, overgrazing and land degradation, and a decline in livestock prices due to poor body condition. Poor disposal of dead animals will result in environmental pollution. Cattle conflicts between pastoral and farming communities, rustling, and banditry are expected to increase in Southern Ethiopia, Kenya, Somalia, South Sudan, and Sudan. Human-wildlife conflicts are also predicted to increase due to competition between wildlife-

domestic animals over grazing areas and water in Kenya, Somalia, and Sudan. Vector-borne disease outbreaks are expected in the regions that are to receive rain, while in displacement and deaths of animals due to floods in cross-border areas of Ethiopia and South Sudan.

#### Advisories

Downscale the forecast to subnational and local levels for precise community-level response targeting and disseminating advisories for early action. Governments and relevant stakeholders are encouraged to monitor human-wildlife conflict hotspot areas and the spread of zoonotic diseases in eastern and coastal regions. The provision of fodder and water for wildlife in protected areas should be continued to prevent human-wildlife conflicts and to conduct fire management practices in coastal protected areas, e.g., Tsavo National parks. Water harvest, conservation, rehabilitation of watering points, fodder storage, and preservation of crop residues for animal feed should be promoted. Livestock insurance and destocking should also be encouraged. Convene peace dialogues between pastoralists and farmers and establish committees to engage communities for peaceful coexistence in Southern Ethiopia, Kenya, Somalia, South Sudan, and Sudan.

### **5.5 Health and Nutrition**

#### Expected positive sectoral impacts

Due to high temperatures and dryness, there will be a reduction of flu and cold-related illnesses in Sudan and other countries that will experience drier-than-average conditions.

#### Expected negative sectoral impacts

Malnutrition is expected in most countries with predicted below-normal rainfall due to severe food insecurity for animals and humans. An outbreak of water and food-borne diseases such as cholera and diarrhea are expected both due to water shortage in most parts of Djibouti, Ethiopia, Kenya, Somalia, Sudan, South Sudan, and Uganda and due to flash floods due to heavy rainfall, destroying WASH system in western zones of Ethiopia and Tanzania. Water scarcity will lead people to store water in open containers, creating mosquitos breeding sites, thus increasing the number of Malaria cases. The dry, high temperature and water scarcity conditions in the northern region of Sudan will increase the possibilities of meningitis, heat stroke, and skin and eye diseases. Cases of bronchial asthma are expected to increase due to sandstorms, especially in northern Sudan.

#### Advisories

Governments and relevant actors are encouraged to practice cholera preventive measures and case management activities, including enhancing surveillance, hygiene promotion, water source chlorination, ORS and Zinc Tablet distribution, and capacity building of health workers. Use diverse media to conduct health education, including public and personal hygiene practices. Enhance malaria and meningitis surveillance and expedite campaigns that promote mosquito net use and immunization against meningitis. Due to food and water scarcity, cash vouchers, food aid, and clean water should be provided to drought-affected people.

### **5.6 Media Sector**

The media plays a critical role in communicating weather and climate information. During the GHACOF 63 session, co-production sessions were held with the participating journalists and communication experts from the NMHS. The discussions on challenges faced in communicating weather and climate information, including limited resources, lack of interagency coordination, lack of public awareness, and inadequate infrastructure were undertaken. Additionally, the participants

identified the need for regular training of journalists and communications experts as key to better weather and climate information communication.

A co-production session on strengthening the Network of Climate Journalists of the Greater of Africa (NECJOGHA) through collaboration with ICPAC was also held. During this session, participants proposed various collaboration opportunities between ICPAC and NECJOGHA that could be leveraged, including conducting joint training programs, research, workshops, advocacies, and joint implementation and reporting for projects. As a way forward, the following were proposed;

- Developing a formal agreement between NECJOGHA and ICPAC that outlines the scope of their collaboration.
- Convening joint training programs and workshops for journalists and climate scientists.
- Share links for ICPAC climate events and projects to be covered by journalists in different countries and encourage journalists trained by ICPAC to join the network.
- NECJOGHA to come up with a formal Initiative to play a coordination role in media engagement.
- Involving NECJOGHA in other ICPAC country Projects.
- Building solid relationships with local media outlets and community journalists to help facilitate the flow of information and feedback from the grassroots level by establishing effective communication channels for feedback.

## **6. THE TRANSFORMATION OF GHACOF, 25 YEARS IN THE MAKING**

During the panel discussion on the transformation of GHACOF, Dr. Guleid Artan observed a minute of silence in honor of the pioneers of the GHACOF process who have passed on. The pioneers mentioned were Professor Laban Ogallo, Patrick Luganda, and Professor Obasi. It was noted that Professor Obasi's ideas in teaching had been imprinted on GHACOF and all climate-related issues in the region and beyond the continent. The panelists discussed the current weather situation in the region, highlighting that the region has experienced five consecutive below-average rainfall and is on course to see the sixth below-average rains. The probability of seeing five seasons below average is 0.12%, and the likelihood of six consecutive seasons below average is 0.4%. The panelists emphasized the importance of improving the productionally used data of climate forecasts to achieve climate-proofing in the region, which heavily depends on agriculture and livestock. They highlighted the need for accurate and timely climate information to inform decision-making and effective policy formulation. In conclusion, the panelists stressed the urgency of addressing the challenges of climate change in the region and the need for continued collaboration among stakeholders to develop and implement effective climate resilience initiatives.

Dr. Buruhani Nyenzi discussed the original vision and evolution of early warning generation in the context of climate change. In the 1980s, climate change was recognized as a significant issue, and initiatives were launched to support climate change adaptation and economic development. Adaptation to the impacts of climate change became a top priority, particularly in African countries experiencing severe drought and desertification. The IPCC was established in 1988 to assess the science of climate change, and the UNFCCC and UNCCD were established in 1992 and 1996, respectively, to address the role of climate change in drought and desertification. African countries established a regional approach through the DMC in 1998 to serve 22 countries. The DMC expanded its reach to Southern Africa with a sub-office in Harare and the Greater Horn of Africa, with Nairobi as the headquarters. In 2003, the DMC in Nairobi became an IGAD center, and in 2007, its protocol changed to become an ICPAC center. In 1999, a workshop in Kadoma, Zimbabwe, initiated the RCOF process, effectively producing and communicating seasonal information and products.

Michele McNabb discussed the origin of GHACOF, its vision, and its motivation for supporting GHACOF 1. USAID funded an initiative to work with countries to improve their early warning systems for potential food crises. The Kenya Meteorological Department (KMD) was a crucial partner in the project. In 1994, the US government established the Greater Horn of Africa Initiative (GHA) under President Bill Clinton's administration. The objective was to strengthen African capacity to enhance food security and improve access to regional climate information.

Dr. Maxx Dilley discusses the evolution of GHACOF, highlighting the acceleration of the process due to the El Nino of 1997-1998. He noted that GHACOF 52 was a significant milestone because it transitioned from a center space outlook to an objective foundation approach that applied human judgment to determine the best model combination with the highest skill level. This was a first in Africa and possibly globally. Dr. Dilley emphasized the importance of the national level in decision-making for the best socioeconomic outcomes. He also mentioned the Climate Risk and Early Warning System (CREWS) project, which aimed at improving early warnings by strengthening the assimilation of warning forecasts from different global warning and operational data services at the regional level.

In 1998, Professor Semazzi chaired a meeting in Kadoma which led to the creation of the climate outlook forum concept. One of the key outcomes of the forum was the realization that there needed to be more communication between climate information providers and users. Overall, Professor Semazzi played a significant role in developing the GHACOF concept and the organization's efforts to address the impact of climate change in the region. The climate outlook forum and the GHACOF framework have since become essential platforms for collaboration between climate information providers and users to develop effective strategies to mitigate the impact of climate change on the region.

In summary, the way forward for addressing the impact of climate change in the Greater Horn of Africa region involves building on the training capacity of organizations like ICPAC while also addressing gaps in research and improving communication and collaboration between scientists and policymakers.

In closing, Dr. Guleid Artan acknowledged the contributions of several individuals in the development and implementation of GHACOF and ICPAC. He expressed appreciation for Mr. Zachery Atheru, who has been with ICPAC since its inception and has been involved in the GHACOF process. He recognized Mr. Atheru's dedication and service to the organization. Dr. Artan also acknowledged Mr. Zebu for his instrumental role in implementing objective forecasts and Dr. Hassan and Mr. Jully for providing impact-based forecasts. He further recognized Dr. Hussein and Maslin for their work generating ICPAC forecasts.

## **7. IMPACT AND PROSPECT OF THE PROLONGED DROUGHT**

During the margins of the GHACOF 63, a panel discussion was held to discuss the impact and prospect of the prolonged drought in the region. The panel comprised representatives from various countries and institutions who provided insights into the current drought situation and the challenges faced due to this crisis. The Director of the National Drought Management Authority (NDMA) in Kenya spoke about the devastating effects of the drought on the country. He highlighted that the situation is dire, with millions facing food insecurity, water scarcity, and loss of livelihoods. The NDMA is working with other stakeholders to provide relief aid to affected communities and implement long-term solutions to mitigate the effects of future droughts.

The Deputy Commissioner of the Disaster Management Agency in Somalia also spoke about the challenges faced by the country due to the prolonged drought. He emphasized that the situation is critical, with many communities experiencing acute water shortages, displacement, and loss of livestock. The agency is working with international partners to provide emergency relief aid to affected communities and address the root causes of the drought.

A representative from the Disaster Risk Management Commission of Ethiopia provided insights into the challenges faced by the region due to the drought. He emphasized the need for a coordinated approach by all stakeholders to address the crisis, including governments, international organizations, and civil society.

The Regional Director of the International Federation of Red Cross and Red Crescent Societies (IFRC) spoke about the humanitarian impact of the drought. He highlighted that the crisis had left millions needing emergency assistance, including food, water, and healthcare. The IFRC works with its partners to provide humanitarian aid to affected communities and support long-term recovery efforts.

The UNDP Resilience Hub representative provided insights into the long-term impact of the drought on the region's development. He emphasized that the crisis has reversed decades of development gains, with many communities facing poverty, hunger, and displacement. The UNDP is working with governments and other stakeholders to support long-term resilience-building efforts and address the root causes of the drought.

Finally, the ICPAC Director spoke about the prospects of the drought situation in the region. He highlighted that the region would likely experience below-average rainfall in the coming months, exacerbating the current drought situation. He emphasized the need for urgent action to address the crisis and build long-term resilience to future droughts.

Based on the panel discussion, the following are the recommendations for the way forward and what needs to change to address the prolonged drought crisis in the region:

1. Increase livelihood options for Agro pastoralists: There is a need to increase the livelihood options for Agro pastoralists to provide them with alternative sources of income during droughts.
2. Move from crisis management to addressing drivers of drought: There is a need to move progressively from crisis management to addressing the drivers of drought to prevent future occurrences.
3. Include the private sector to tap into the resources available: Development partners should also include the private sector to tap into the available resources.
4. Return displaced persons home to build their resilience and promote economic development: Displaced parties should be returned home to build their resilience and encourage economic growth.
5. Use new technology to combat drought: New technology should be used to combat droughts, such as water harvesting and efficient irrigation systems. Investments should also be made in water, agriculture, and climate services to ensure that communities can access water and food during droughts
6. Provide a linkage between the humanitarian and development programs: There is a need to provide a link between the humanitarian and development programs to ensure a smooth transition from emergency relief to long-term resilience-building efforts. There is a need to scale up diplomacy for evidence collection. There is a need to scale up investments for protecting against shocks, such as drought, to give time for recovery.
7. Scale up resource mobilization, with emphasis on the domestic avenue: Governments and institutions should scale up resource mobilization, with a focus on the domestic avenue, to address the prolonged drought crisis.
8. Track down media to provide coverage: The media should be tracked down to give a range of the drought situational update to support resource mobilization.
9. The proper response should equate to the crisis at the local capacity: The answer to the drought crisis should be proportional to the local ability to ensure that communities have the resources to cope with the situation.
10. Interregional cooperation: There should be interregional cooperation, including data sharing, information sharing, and acting together as one, to address the drought situation.

The recommendations and way forward provide a comprehensive approach to addressing the prolonged drought crisis in the region. Implementing these recommendations will require a collective effort from all stakeholders, including governments, institutions, development partners, and communities, to ensure long-term resilience-building efforts. The focus should be on

building capacity at the local level, diversifying income sources, investing in water and agriculture, and promoting interregional cooperation to address the drivers of drought and prevent future occurrences.

## **8. RELEASE OF FORUM STATEMENT AND CLOSING OF THE FORUM**

In conclusion, Dr. Guleid Artan's speech has shed light on the alarming situation of below-average rainfall in the region for five consecutive seasons and the resulting humanitarian crisis affecting 27 million people. He emphasized the need for continuous monitoring of weather patterns and urged the delegates present to stay informed on ICPAC's East Africa Hazard Watch and national agencies' meteorological forecasts. Furthermore, Dr. Artan expressed his gratitude towards ICPAC's partners, including the European Union, GIZ, World Bank and the Government of Kenya for their contribution to the success of the silver jubilee of GHACOF. We must continue to work together to address the challenges posed by climate change and ensure that the region is prepared to face the future. Thank you all for your attention and participation in this event.

According to Dr. David Gikungu, the Permanent Representative of Kenya with the WMO, the consensus forecast for the region indicates that most parts of the region will experience below-normal rainfall during the MAM season after almost three years of persistent drought. The probability of drier-than-normal rainfall is enhanced for parts of Rwanda, Tanzania, and western South Sudan. On the other hand, wetter than normal conditions are expected over cross-border areas of Ethiopia and South Sudan, North-Western Kenya, and parts of Central and Southern Tanzania. The forecast also predicts that the region will experience warmer than average temperatures during the MAM season, particularly over Djibouti, Eritrea, Sudan, northern and western Kenya, and parts of Southeastern and Western Tanzania. The forecast highlights raised chances of delayed onset over North-Eastern Tanzania and early onset over much of Western South Sudan. However, probabilities indicate a normal onset timing with delayed and earlier onset in small pockets elsewhere in the region. It is important to note that these forecasts are subject to change based on evolving weather patterns. It is crucial to monitor them closely to prepare for any potential impacts on the region.

In addition to the forecast, Dr. David Gikungu highlighted the concern that food insecurity will likely intensify in the region over the MAM season. This further underscores the urgent need for immediate scaling up of humanitarian and risk reduction efforts by different actors in the region. Dr. Gikungu also mentioned that Dr. Workner Gebeyehu, the Executive Secretary of IGAD, has called for immediate action to address the challenges posed by the forecasted weather patterns. All stakeholders must work together to prepare for the potential impacts of below-normal rainfall and warmer-than-average temperatures on food security and other sectors. It is essential to take these forecasts seriously and implement early warning systems, contingency plans, and other preparedness measures to minimize the potential impacts of weather patterns on vulnerable populations. The call for scaling up humanitarian and risk reduction efforts should be heeded by all actors to prevent a worsening of the already dire humanitarian crisis in the region.

The statement for the GHACOF63 is provided in **Annex I**.

## ANNEXES

### Annex I: Statement for the GHACOF63



#### Statement from the 63<sup>rd</sup> Greater Horn of Africa Climate Outlook Forum (GHACOF63) 20-22 February 2023 - Nairobi, Kenya

##### 1. Consolidated Objective Climate Outlook for the March to May 2023 Rainfall Season

March to May (MAM) constitutes an important rainfall season, particularly in the equatorial parts of the Greater Horn of Africa (GHA), where MAM rainfall contributes up to 60% of the total annual rainfall. Analysis of global climate model predictions from 7 Global Producing Centres (GPCs) customized for the GHA indicates that drier than normal conditions are most likely to continue over the drought affected regions of Ethiopia, Kenya, and Somalia (Figure 1). Enhanced probability for below normal rainfall is also expected over parts of Uganda, Rwanda, Burundi, Tanzania, and western South Sudan. On the other hand, wetter than normal conditions are expected over the cross-border areas of Ethiopia and South Sudan, north-western Kenya, and parts of central and southern Tanzania. In other parts of the region, including parts of central to western Kenya, north-eastern and south-western Uganda, northern Burundi, central and northern Tanzania, and eastern South Sudan, there is no favoured rainfall category with predictions indicating equal chances of below, normal, and above normal rainfall.

The consolidated objective temperature forecast from 7 GPCs indicates an increased likelihood of warmer than normal surface temperatures over the entire region (Figure 2). Probabilities for warmer than normal temperatures are most enhanced over Djibouti, Eritrea, Sudan, north-western South Sudan, southern, central, and north-eastern Ethiopia, northern Somalia, northern and western Kenya, and parts of south-eastern and western Tanzania.

Standardized Precipitation Index (SPI) analysis of observed and predicted precipitation for 3-, 9- and 15-month timescales ending on 31 May 2023 (Figure 3) indicates that the extended drought in many parts of the equatorial and southern regions will continue. Notably, the 15-month SPI shows moderate to severe multi-season drought conditions in the region, particularly over Kenya, Uganda, southern Somalia, southern and south-eastern Ethiopia, southern South Sudan, Burundi, and parts of eastern Tanzania. This indicates that the long-term rainfall deficits, experienced over consecutive seasons, are expected to persist in these areas.

The predicted start of the March to May 2023 season, based on 5 Global Climate Model forecasts that provided daily outputs, is shown in Figure 4. There are raised chances of a delayed onset over north-eastern Tanzania and raised chances of an early onset over much of western South Sudan. Elsewhere probabilities generally favor a normal onset timing, with delayed or early onset favored only in small pockets.

The World Meteorological Organisation (WMO) and the major global climate centres have noted that Sea Surface Temperatures (SSTs) anomalies over the equatorial central Pacific Ocean are likely to return to neutral over the coming months with El Niño development becoming the most likely outcome during summer 2023. Likewise, global models further indicate that the Indian Ocean Dipole (IOD) will likely remain neutral. Updates on the El Niño Southern Oscillation (ENSO) conditions will be provided regularly by WMO and the major climate centres.

Whilst the MAM season contributes a larger fraction to the annual total for much of the GHA, seasonal anomalies are generally less predictable compared to other seasons. This is largely a consequence of the weak linkage between rainfall and global large-scale modes of variability such as ENSO and IOD.

*The outlook is relevant for seasonal timescales and covers relatively large areas. Local and month-to-month variations might occur as the season progresses. Spells of heavy rain and above normal rainfall may occur in areas with an increased likelihood of below normal seasonal totals and vice versa. ICPAC will provide regional updates on a regular basis while the National Meteorological and Hydrological Services (NMHSs) will provide detailed national and sub national climate updates.*

## **2. The Climate Outlook Forum**

The 63<sup>rd</sup> Greater Horn of Africa Climate Outlook Forum (GHACOF63) was convened on 22 February 2023 by the IGAD Climate Prediction and Applications Centre (ICPAC) in collaboration with the National Meteorological and Hydrological Services (NMHSs) of IGAD Member States, World Meteorological Organization (WMO), and other partners. The objective of the forum was to document and share the climate impacts across the region and formulate responses to the regional climate outlook for the March to May 2023 rainfall season over the GHA. The GHA region comprises Burundi, Djibouti, Eritrea, Ethiopia, Kenya, Rwanda, Somalia, South Sudan, Sudan, Tanzania, and Uganda. The forum reviewed the state of the global climate system including the ENSO conditions, IOD, and SSTs over the Pacific and Indian Oceans, and considered their impacts on the GHA during March to May 2023 rainfall season. Climate information users from all relevant sectors (disaster risk management, agriculture and food security, livestock, health, environment, water resources, conflict, and media) as well as NGOs and development partners actively participated in the formulation of mitigation strategies.

## **3. Methodology**

Guidance and valuable forecast information on factors expected to influence the upcoming season were drawn from a wide range of sources. Predictions from dynamical seasonal climate models, including those of the World Meteorological Organisation's Global Producing Centres Long-Range Forecasts (WMO GPCs-LRF) formed the primary forecast inputs.

The objective seasonal forecast was developed during PreCOF63, a one-week climate capacity building workshop held from 14-18 February 2023. During the workshop, experts from the regional NMHSs, ICPAC, UK Met Office, and the NOAA CPC-International Desks, examined the prevailing and predicted SSTs over the Pacific, Indian and Atlantic Oceans as well as other global, regional, and local climate factors that affect the rainfall evolution during the MAM season. These factors were assessed using dynamical and statistical models. The regional consolidated objective forecast is produced by recalibrating outputs from 7 global state-of-the-art seasonal prediction systems. The recalibration includes use of statistical relationships between MAM rainfall and model predictions of climatic factors over a historical training period. Regional scientists and national forecasters from 10 ICPAC Member States used ICPAC's High- Performance Computing (HPC) cluster through remote connection to co-develop regional and national-level climate outlooks. Climate prediction products were used by sectoral experts and climate providers to jointly assess expected impacts, draft mitigation strategies, and co-produce advisories. The sectoral meetings were held from 20<sup>th</sup> – 21<sup>st</sup> February 2023, preceding GHACOF63.

The current capability of seasonal to inter-annual climate forecasting allows for the prediction of departures from climatology on a regional domain, with consideration of scales of processes that contribute to regional and sub- regional climatic conditions. Forecast probability distributions are established objectively to indicate the likelihood of above-, near-, or below-normal rainfall for each zone. Above-normal rainfall is defined as within the wettest third of recorded rainfall amounts in each zone; near-normal is defined as the middle third of the recorded rainfall amounts; below-normal rainfall is defined as occurring within the driest third of the rainfall amounts. Climatology here refers to weather conditions, averaged over a 30-year period (1991-2020). Probability distributions for temperature are also established.

The rainfall and temperature outlooks for March to May 2023 for various zones within the GHA region are given in Figure 1 and Figure 2, respectively. Figure 3 provides Standardized Precipitation Index for 3-, 9, and 15-month time scale. Figure 4 provides an outlook for onset dates of the March to May 2023 season.

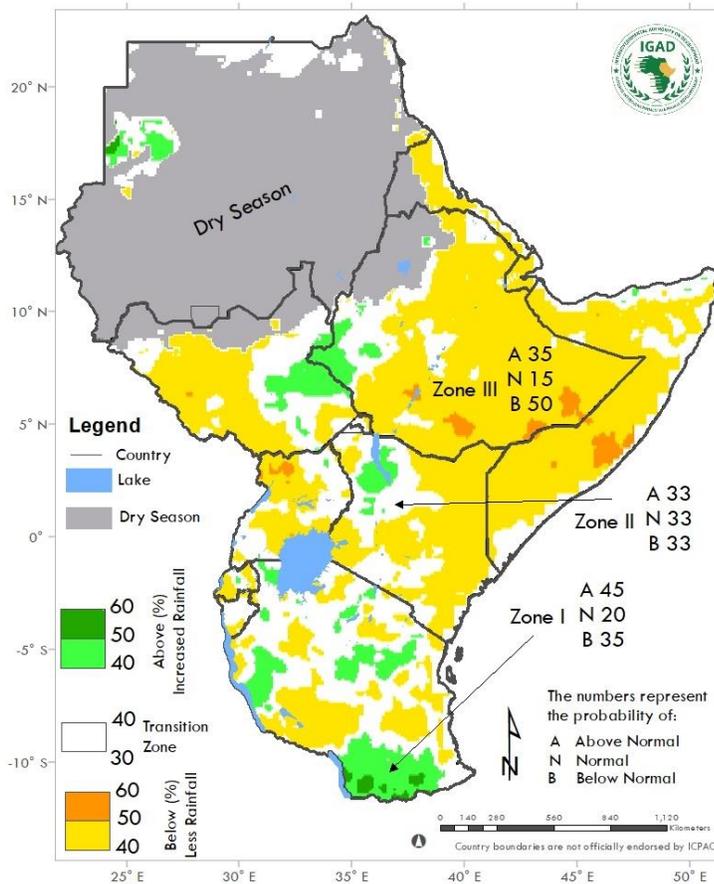
#### 4. Rainfall Outlook for March to May 2023

The rainfall outlook for various zones within the GHA region is given in Figure 1 below.

**Zone I:** In this Zone (light green), the wetter than normal rainfall category has the highest probability (45%). The probability for near normal and drier than normal categories are at 20% and 35%, respectively.

**Zone II:** In this Zone (white color), the probabilities of below, normal, and above are equal at 33%. This equal probability zone is also considered a transition zone.

**Zone III:** In this Zone (orange), the below normal rainfall (drier) category has the highest probability (50%). The probabilities of the normal and above normal categories are 15% and 35%, respectively.



#### 5. Temperature Outlook for March to May 2023

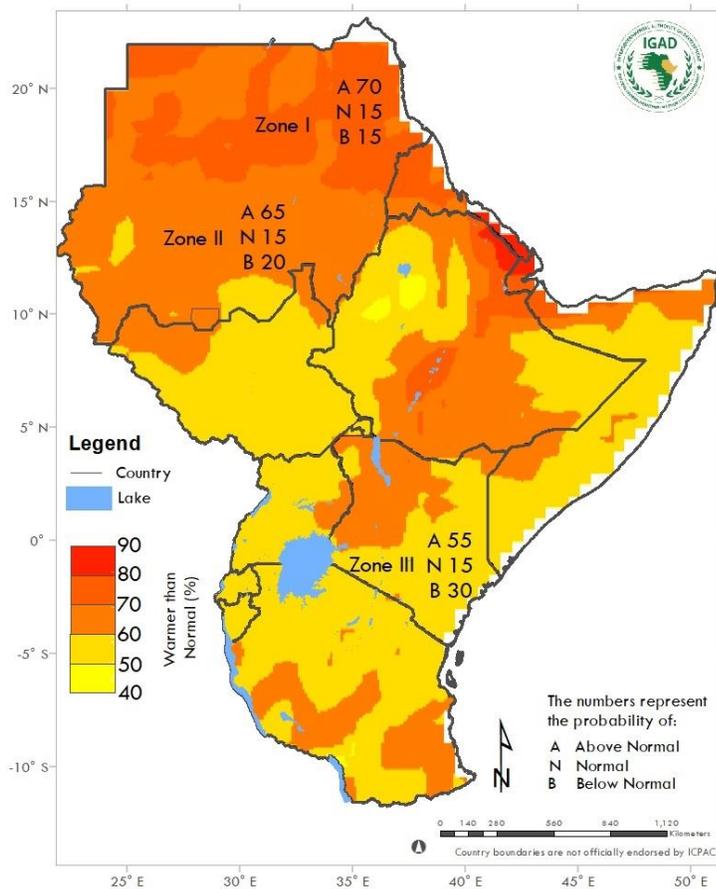
The temperature outlook for various zones within the Greater Horn of Africa is given in Figure 2 below.

**Zone I:** In this Zone (dark orange), the above normal mean temperature (i.e., warmer) category is most likely at 70%. The probability for near normal and below than normal categories are each at 15%

**Zones II:** In this Zone (orange), the above normal mean temperature category has the highest probability (at 65%). The probabilities of the normal and below normal categories are 15% and 20%, respectively.

**Zones III:** In this Zone (light orange) also, the above normal mean temperature category has the highest probability (at 55%). The probabilities of the normal and below normal categories are 15% and 30%, respectively

**Note:** The numbers for each zone indicate the probabilities of rainfall/temperature in each of the three categories, above-, near-, and below-normal. The top number (A) indicates the probability of rainfall/temperature occurring in the above-normal category; the middle number (N) is for near-normal and the bottom number (B) for below-normal category. For example, in Zone III in Figure 1, there is 50% probability of rainfall occurring in the below-normal category; 15% probability of rainfall occurring in the near-normal category; and 35% probability of rainfall occurring in the above-normal category.



## 6. Precipitation-based Drought Outlook based on Standardized Precipitation Index (SPI)

The intensity and duration of droughts are indicated in the 3, 9, and 15-months SPI ending on 31 of May 2023 in Figure 3 below.

3-month SPI (Mar-May 2023)

9-month SPI (Sep 2022-May 2023)

15-month SPI (Mar 2022-May 2023)

( $\sigma$ )

0 -0.5 -1.0

-1.5

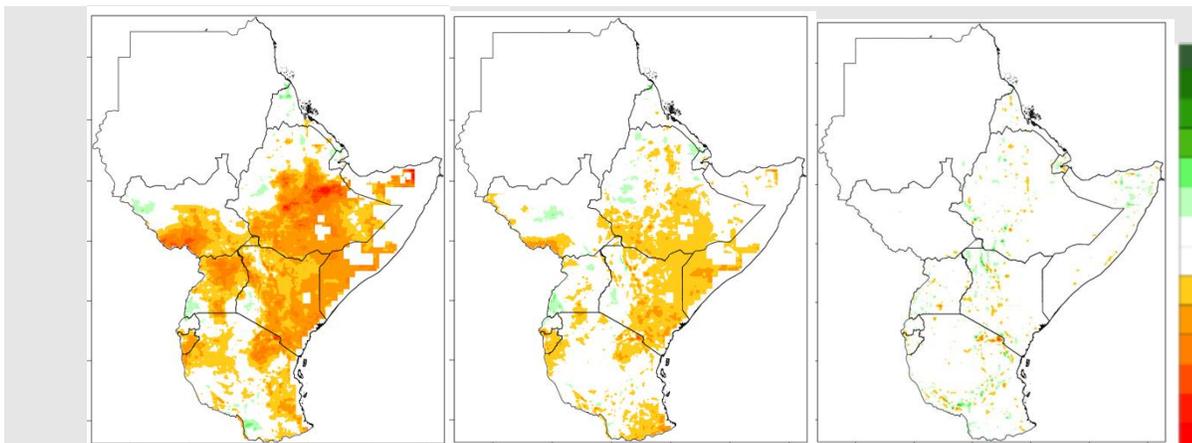
-2.0

-3.0 Extremely Dry

Severely

Dry

-2.5



3.0

2.0 Severely Wet 1.5

1.0 Moderately Wet 0.5

Extremely

Wet

2.5

Figure 3: Standardized Precipitation Index (SPI) at 3-month, 9-month and 15-month timescale ending on 31 of May 2023 (forecast appended to the observation) over the region showing persistent below-normal rainfall over the drought affected areas.

## 7. Probability Forecasts of the Start of MAM 2023 Season and the Expected Average Onset Dates

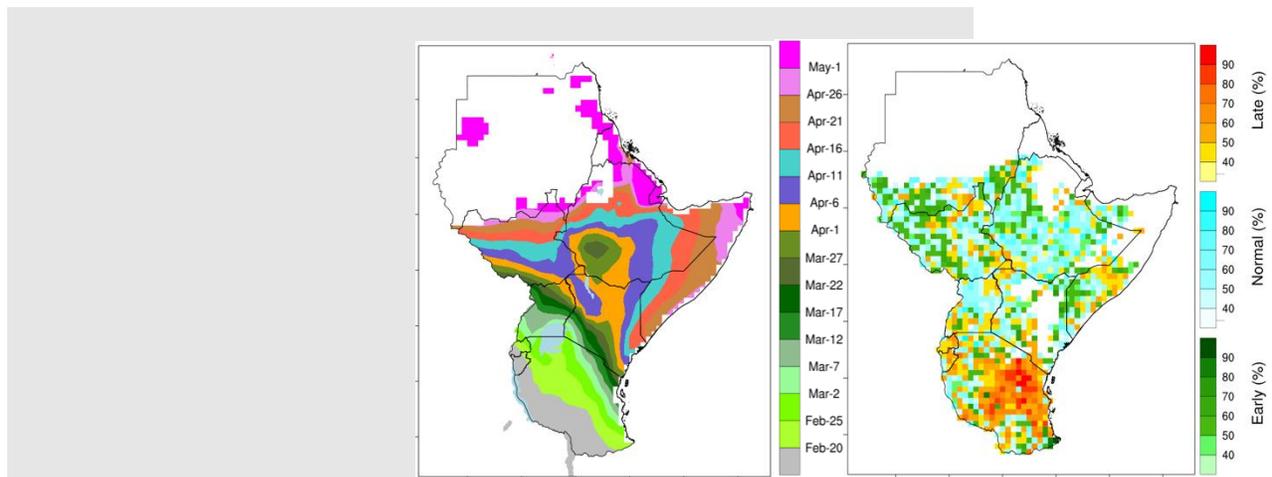
The average start dates of March to May 2023 season and their probability outlook are provided in Figure 4. The forecast was processed using daily rainfall forecasts from 5 Global Climate Models (ECMWF, Météo-France, CMCC-Italy, DWD-Germany, ECCS-Canada) obtained from the C3S Climate Data Store.

Onset Climatology Onset Probability

**Figure 4:** The map on the left indicates the expected rainfall onset dates (the average predicted date over the 5 models used). The map on the right indicates the probabilities of the start of the rainfall season in each of the three categories, early-, normal-, and late.

Near Normal

Moderately Dry



**8. Contributors**

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