Statement from the 63rd 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 southwestern 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 63rd 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 20th – 21st February 2023, preceding GHACOF63.

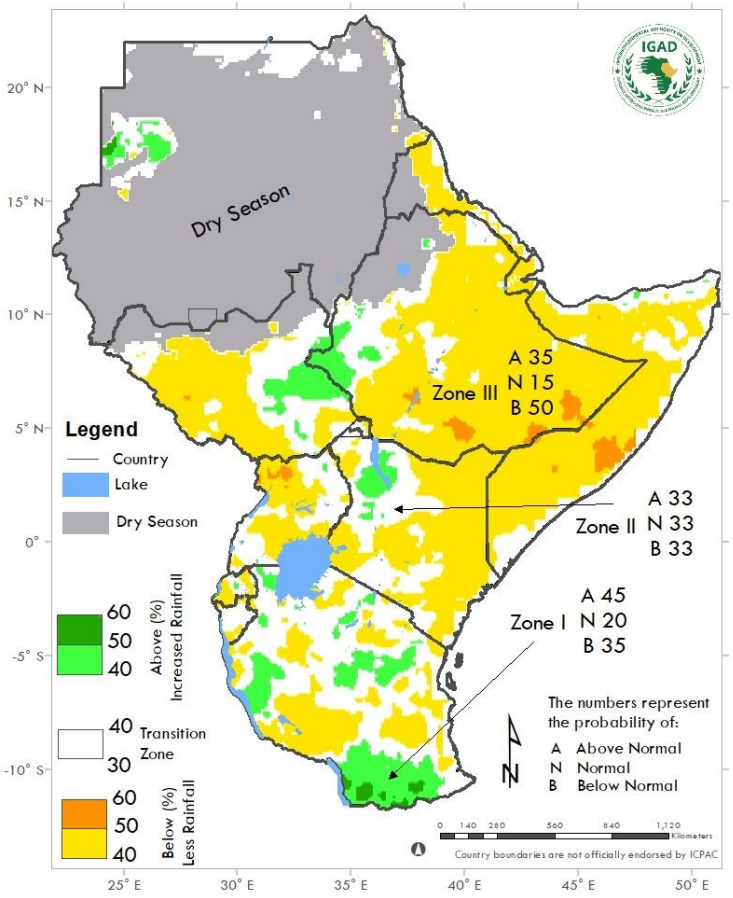
The current capability of seasonal to inter-annual climate forecasting allows for the prediction of departures from climatology on a regional domain, with consideration of scales of processes that contribute to regional and sub-regional climatic conditions. Forecast probability distributions are established 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.



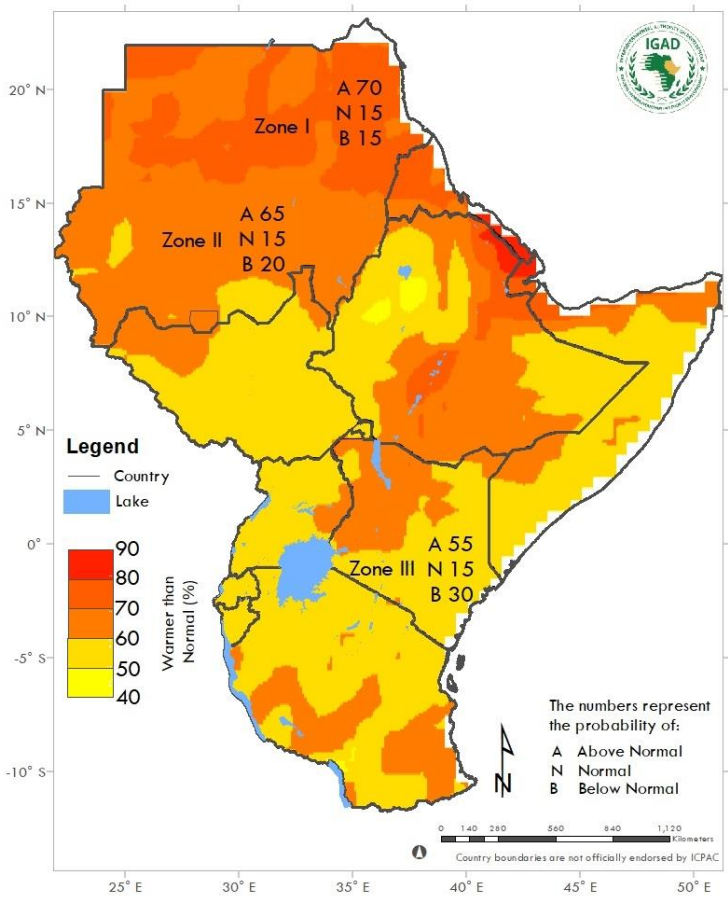
Zone I: In this Zone (light green), the wetter than normal rainfall category has the highest probability (45%). The probability for near normal and drier than normal categories are at 20% and 35%, respectively.

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.

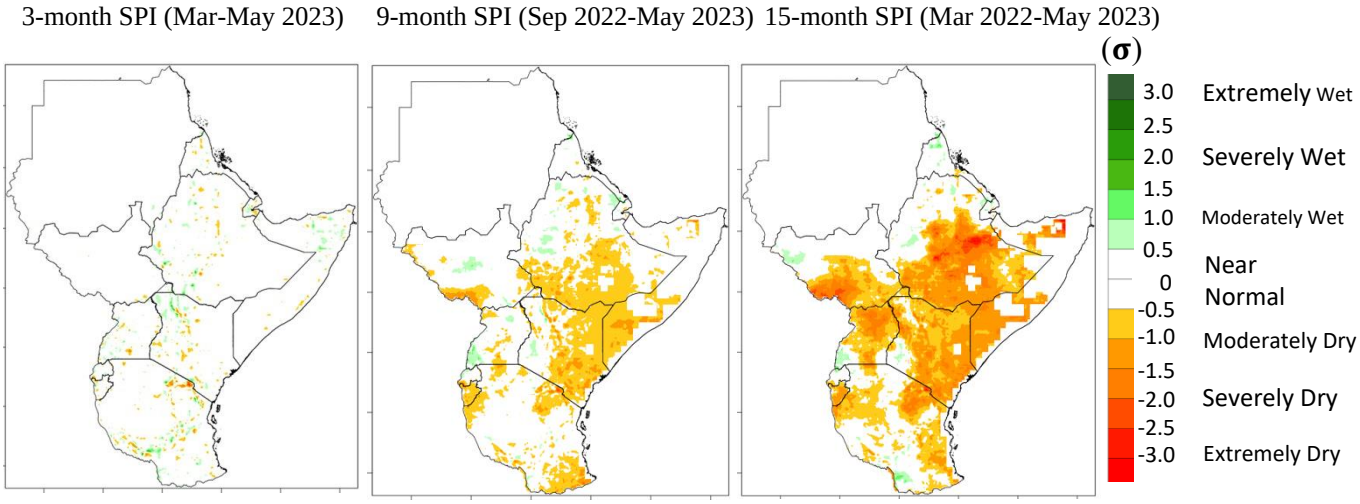


Figure 3: Standardized Precipitation Index (SPI) at 3-month, 9-month and 15-month timescale ending on 31 of May 2023 (forecast appended to the observation) over the region showing persistent below-normal rainfall over the drought affected areas.

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, ECCC-Canada) obtained from the C3S Climate Data Store.

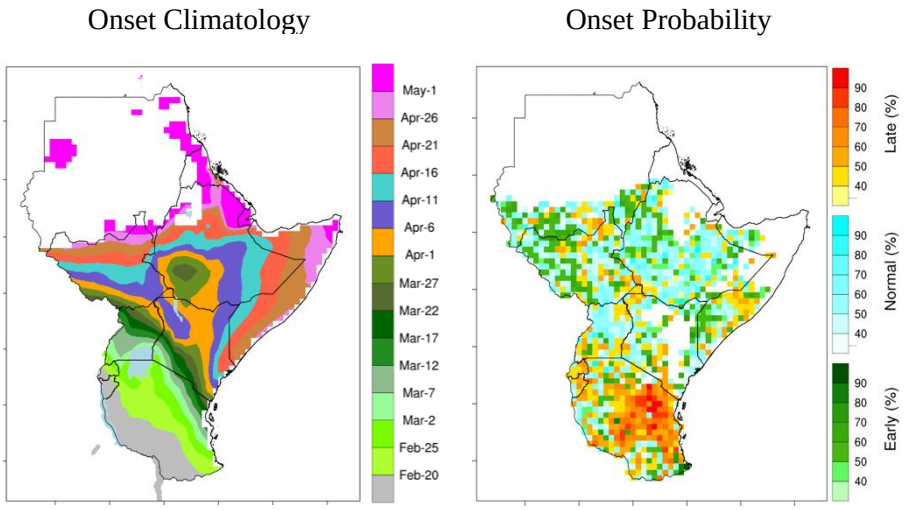


Figure 4: The map on the left indicates the expected rainfall onset dates (the average predicted date over the 5 models used). The map on the right indicates the probabilities of the start of the rainfall season in each of the three categories, early-, normal-, and late.

8. Contributors

GHACOF 63 was organized jointly by the IGAD Climate Prediction and Applications Centre (ICPAC) and National Meteorological and Hydrological Services (NMHSs) of the Greater Horn of Africa (GHA). The forum was supported by the ClimSA and CONFER projects funded by the European Union, and by the AICCRA project funded by the World Bank. Contributors to the regional climate outlook included representatives of NMHSs from GHA countries (Institut Géographique du Burundi, Météorologie Nationale de Djibouti, Ethiopia Meteorological Institute; Kenya Meteorological Department, Rwanda Meteorological Agency, South Sudan Meteorological Service, Sudan Meteorological Authority, Somalia Meteorological Service, Tanzania Meteorological Agency, and Uganda National Meteorological Authority) and climate scientists as well as other experts from national, regional, and international institutions and organizations (ICPAC, UK Met Office, NOAA CPC-International Desks, ACMAD and WMO Global Producing Centres).

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