Statement from the 67th Greater Horn of Africa Climate Outlook Forum (GHACOF67)

20-21 May 2024; Juba, South Sudan

1. The Climate Outlook Forum

The 67th Greater Horn of Africa Climate Outlook Forum (GHACOF67) was held from May 20 to 21, 2024, organised by the IGAD Climate Prediction and Applications Centre (ICPAC) in collaboration with the National Meteorological and Hydrological Services (NMHSs) of the Greater Horn of Africa (GHA), the World Meteorological Organization (WMO), and other international partners. The forum aimed to review and document the performance and impacts of the March to May 2024 season, release the consolidated objective regional climate outlook for the JJAS 2024 season, discuss the implications of the JJAS 2024 climate forecast, and develop advisories and management strategies in various climate-sensitive socio-economic sectors.

The GHA region includes Burundi, Djibouti, Eritrea, Ethiopia, Kenya, Rwanda, Somalia, South Sudan, Sudan, Tanzania, and Uganda. Climate information users from the relevant socio-economic sectors such as disaster risk management, agriculture and food security, livestock, water resources, health, conflict, and media, as well as NGOs and development partners, actively participated in the formulation of mitigation strategies.

2. Consolidated Objective Climate Outlook for the June to September 2024 Rainfall Season

June to September (JJAS) is an important rainy season, especially in the northern and western parts of the GHA, where it generally contributes more than 40% of the annual rainfall and more than 90% in parts of the north. The post-processed seasonal forecast for JJAS 2024, consolidated from nine different global models initialised in May 2024, indicates increased chances for wetter conditions (above-average rainfall) over most areas where JJAS is a rainy season (Figure 1). This is particularly evident in Djibouti, Eritrea, central and northern Ethiopia, western and coastal Kenya, as well as much of Uganda, South Sudan, and Sudan. Enhanced probabilities (65%) of above-average rainfall are predicted over drought-prone areas of northeastern Ethiopia, isolated areas of central Sudan, and Eritrea. Raised probabilities (55%) of wetter conditions are also indicated over southwestern and central, Ethiopia, much of Sudan, eastern South Sudan, eastern Uganda, and parts of western and coastal Kenya. On the other hand, parts of northern Somalia, isolated areas over western Ethiopia, and western South Sudan are likely to experience drier-than-average (below-normal) conditions.

Standardized Precipitation Index (SPI) analysis of observed and predicted precipitation for 4- and 12-month periods ending on 30 September 2024 indicates the potential for moderately wet conditions over much of Ethiopia, Eritrea, eastern South Sudan, eastern Uganda, western Kenya, southern Somalia and eastern Tanzania. In contrast, the 15-month rainfall analysis indicates the potential for long-term rainfall deficits to persist over central and northern Ethiopia, parts of Sudan and South Sudan, and western Uganda (Figure 2), which is linked to the depressed rainfall

during the JJAS 2023 season. The forecast also indicates the potential for long-term (12- and 15-month) rainfall deficits to persist over parts of Burundi and Rwanda.

The predicted start of the JJAS 2024 season, based on 5 Global Climate Model forecasts that provided daily outputs, is shown in Figure 3. The forecast indicates that there are raised chances of normal to early onset over much of central and northern Ethiopia, Eritrea, Sudan and South Sudan. On the other hand, a higher chance for a delayed onset is indicated in Djibouti, parts of eastern and western Ethiopia, and central and western Sudan.

Examining analogue years using the current Sea Surface Temperature (SST) pattern across the tropics and the predicted evolution of the Nino3.4 index indicates that 1998 and 2010 closely resemble the conditions expected in 2024 (as shown in Figure 4). Rainfall performance during JJAS in 1998 and 2010 shows wetter-than-normal conditions over much of the region, consistent with the JJAS 2024 objective consolidated forecast. The above-normal rainfall observed in the identified analogue years (both of which had La Niña active in JJAS) supports the likely influence of a developing La Niña in the objective forecast for JJAS 2024 (Fig. 4); however, the analogue-year rainfalls should not be considered replacements or alternatives to the objective forecast.

The consolidated objective temperature forecast from 9 GPCs indicates an increased likelihood of warmer-than-normal surface temperatures over most parts of the region (Figure 5). Probabilities for warmer-than-normal temperatures are most enhanced over northern Sudan, central and western Ethiopia, Somalia, Kenya, Rwanda, Burundi and Tanzania.

The outlook is relevant for seasonal timescales and for relatively large geographical areas. Local and month-to-month variations might occur as the season progresses. While wetter than usual conditions are most probable over much of the northern and western parts of the GHA region, which usually receive rain in the JJAS season, dry spells may occur in areas with an increased likelihood of above-normal to near normal rainfall and vice versa. ICPAC will provide regional updates regularly while the National Meteorological and Hydrological Services (NMHSs) will provide detailed national and sub-national climate updates.

3. Methodology

In line with the recommendation of the World Meteorological Organization (WMO), ICPAC has implemented an objective seasonal forecast procedure to generate climate forecasts for the Greater Horn of Africa (GHA). May 2024 initialized seasonal forecasts from 9 Global Producing Centres (GPCs) were utilized and processed using three calibration techniques (canonical correlation analysis, linear regression, and logistic regression) to develop the JJAS 2024 seasonal climate outlook. The final consolidated forecast is obtained by averaging the forecasts generated by the three different approaches.

Forecast probability distributions are established objectively to indicate the likelihood of above-normal, normal, or below-normal rainfall for each zone. Above-normal rainfall is defined as the upper third of historical JJAS rainfall totals, below-normal as the lower third, and normal as the range between the upper and lower third of the rainfall totals. Climatology here refers to the historical series of observed weather conditions over the 30-year period (1991-2020). Forecast probability distributions for temperature are also established. The rainfall and temperature outlooks for JJAS 2024 for various zones within the GHA region are given in Figure 1 and Figure 5, respectively.

Experts also examined the prevailing and predicted SSTs over the Pacific, Indian, and Atlantic Oceans as well as other global and regional climate factors that affect the rainfall evolution during the JJAS season. These factors were assessed using dynamical and statistical models. SST conditions over the equatorial Pacific Ocean were warmer than average over the past few months. The World Meteorological Organization (WMO) and major global producing centers have indicated that El Niño is transitioning towards neutral conditions. A transition from El Niño to neutral is likely in June, and La Niña conditions may develop in the July-September period with a 70% chance. Currently, higher-than-average temperatures are present in the tropical Indian Ocean, and the Indian Ocean Dipole

(IOD) is in a positive phase. The multi-model forecast from the global producing centers indicates that the IOD is expected to become strongly positive in June but return to neutral conditions by September 2024.

The JJAS rainfall interannual variability in the GHA is strongly linked with SST anomalies in the tropical Pacific Ocean. El Niño (La Niña) episodes have been shown to be associated with dry (wet) JJAS rainfall across much of the northern part of the GHA region. However, historically, the IOD has shown little to no effect on JJAS rainfall over the GHA. Updates on the ENSO and IOD conditions will be provided regularly by the WMO and the major climate centres.

The seasonal forecast was developed during the pre-COF67 climate capacity building workshop held virtually from the 13th to the 17th of May 2024. During this workshop, regional scientists and national forecasters from ICPAC Member States used ICPAC's High-Performance Computing (HPC) cluster and developed regional and national-level climate outlooks.

4. Probability Forecast of Rainfall for June to September 2024

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

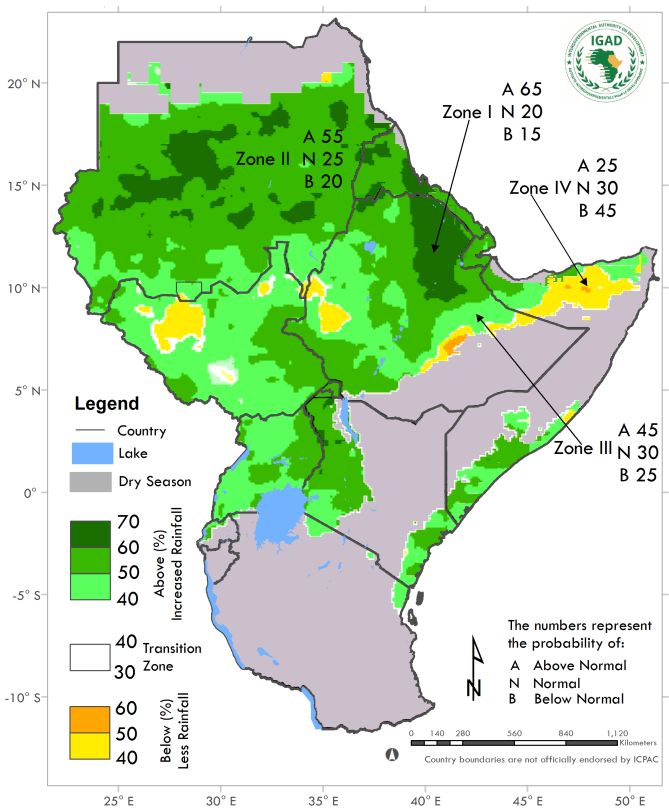

Figure 1. Probability forecast of rainfall for various zones within the GHA region for June to September 2024. Grey shading indicates regions where JJAS is climatologically a dry season.

Zone I: In this zone (dark green), the probability for the above normal (wetter) category is the highest (65%). The probabilities for the normal and below normal categories are 20% and 15%, respectively.

Zone II: In this zone (green), the above-normal rainfall (wetter) category also has the highest probability. The probability for the above-normal category is 55%; the probabilities for the normal and below-normal categories are 25% and 20%, respectively.

Zone III: In this zone (light green), the above-normal rainfall (wetter) category has the highest probability (45%). The probabilities for the normal and below-normal categories are 30% and 25%, respectively.

Zone VI: In this zone (yellow/orange), the below-normal rainfall (drier) category has the highest probability (with an area average of 45%). The probabilities of the near normal and above normal categories are 30% and 25% respectively.

Note: In Fig 1, the numbers (next to A, N and B) for each zone indicate the probabilities of rainfall in each of the three categories: above, near, and below normal. For example, in Fig. 1, the top number (A) indicates the probability of rainfall occurring in the above-normal category; the middle number (N) is for near-normal and the bottom number (B) is for the below-normal category. In the case of Zone-I (Fig. 1) for instance, there is 65% probability of rainfall occurring in the above-normal category, 20% probability of rainfall occurring in the near-normal category; and 15% probability of rainfall occurring in the below-normal category. It is emphasized that boundaries between zones should be considered as transition areas.

5. Analysis of Longer-term Rainfall Surfeits/Deficits based on Standardized Precipitation Index (SPI)

The Standardized Precipitation Index (SPI) is a widely used measure that enable*s* consistent comparison of rainfall deficits and surfeits on different timescales. It is frequently used to characterize meteorological droughts. Figure 2 shows the SPI calculated from predicted precipitation for June-September 2024 as well as from observed plus predicted precipitation for 12- and 15-month periods ending on 30 September 2024.

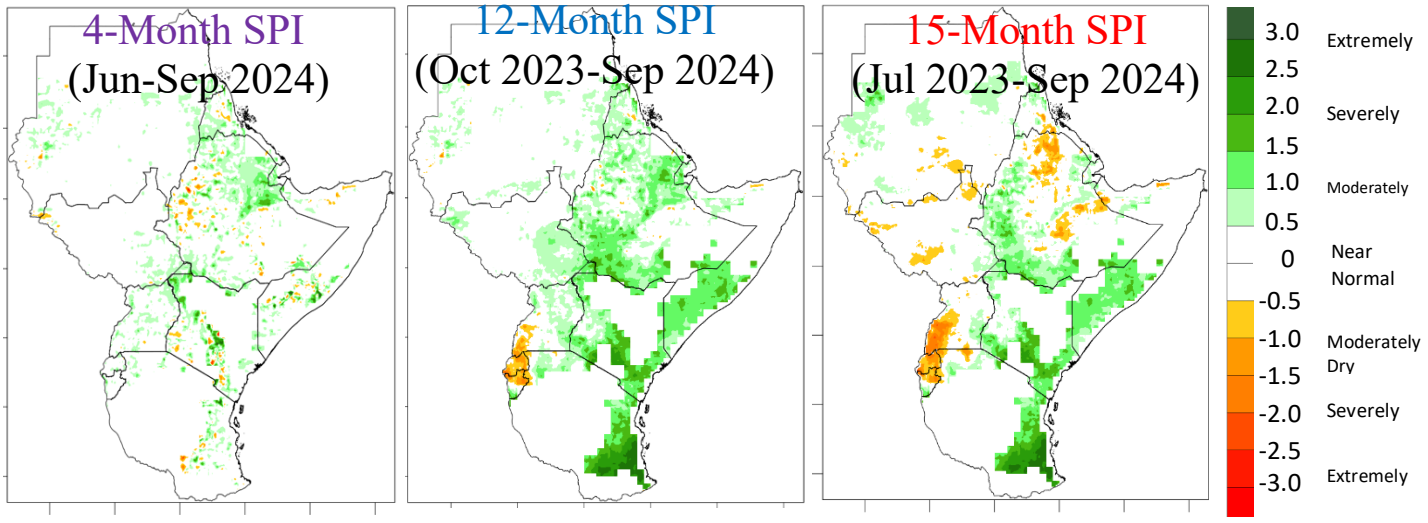

Figure 2: Standardized Precipitation Index (SPI) projections for the 4- (June-Sep 2024), 12 (Oct 2023-Sep 2024) and 15 (Jul 2023-Sep 2024)-month periods:

6. Probability Forecasts of the Start of the JJAS 2024 Season and the Expected Average Onset Dates

The predicted most likely start dates of the June to September 2024 season as well as forecast probabilities for three categories of onset time (early/normal/late) are provided in Figure 3. The forecast was generated by utilizing daily rainfall forecasts derived from five Global Climate Models (ECMWF, Météo-France, CMCC-Italy, DWD-Germany, ECCC-Canada) from the C3S Climate Data Store, incorporating a collective of 212 ensemble members.

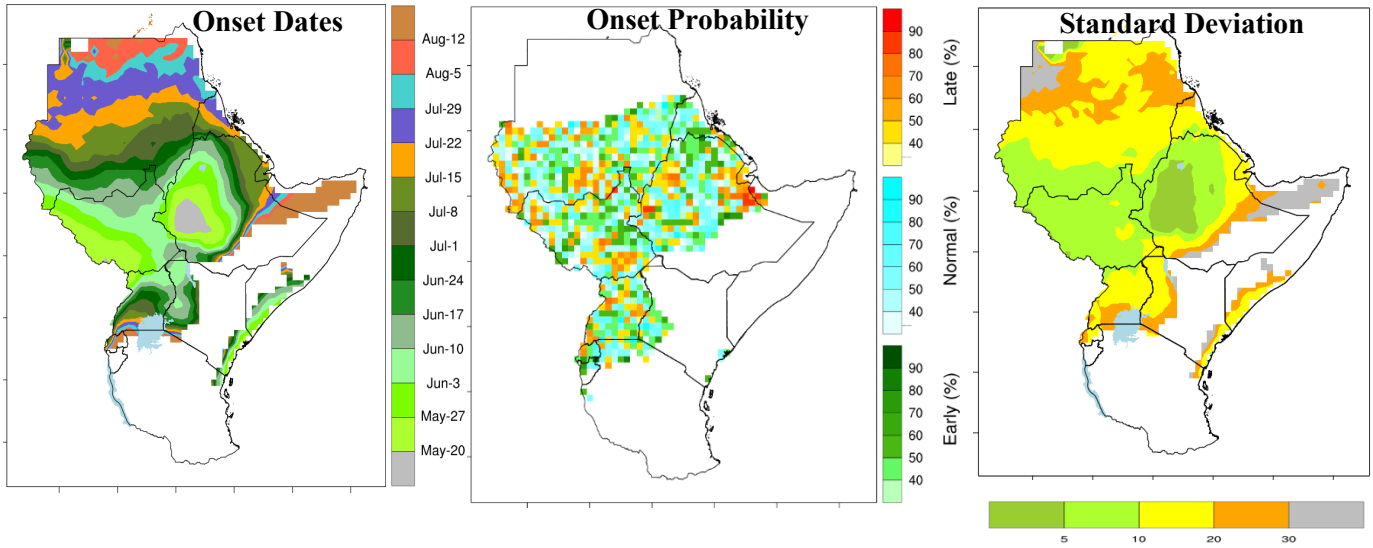

Figure 3: The map on the left indicates the most likely rainfall onset dates for the JJAS 2024 season from model ensemble mean values. The middle map indicates the forecast probabilities for three (tercile) categories of onset timing (early/normal/late). The map on the right shows the standard deviation of predicted onset dates from the different ensemble members (days), and is a measure of uncertainty in the ensemble mean values.

7. Analogue Years based on the Current Global SST Pattern & Nino3.4 Index Evolution

The selection of analogue years based on the Nino3.4 index is carried out by calculating the correlation and the mean difference between the combined observed and forecast evolution of Nino3.4 in the target year and the corresponding Nino3.4 index for the same period in previous years (Fig. 4). The evolution of the Nino3.4 index in the analogue years as well as the observed/predicted evolution in 2024 indicates transition from El Nino to La Nina conditions.

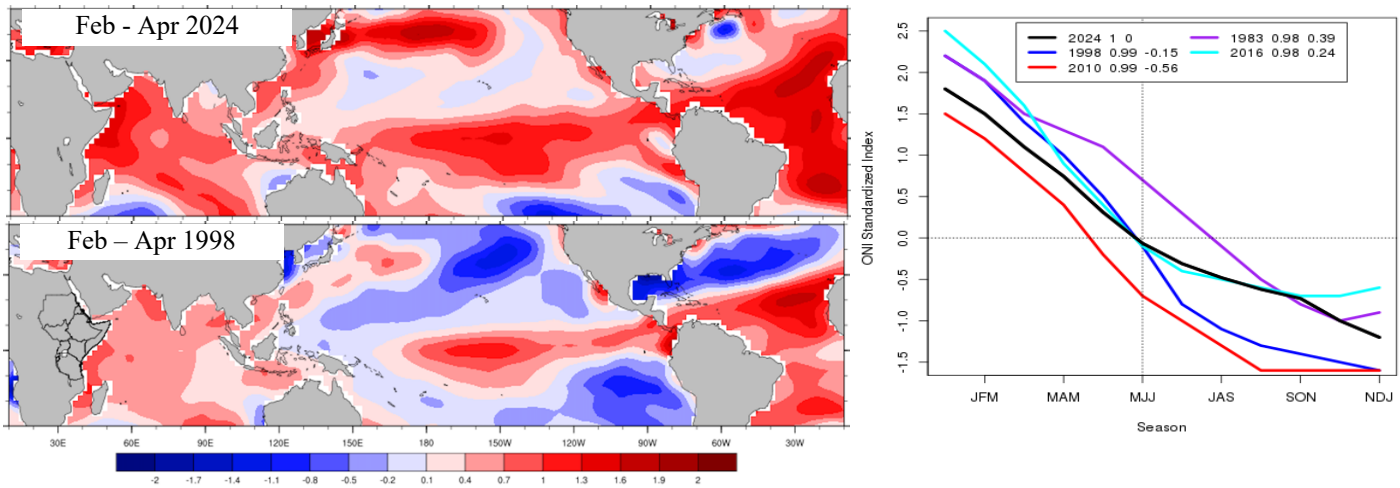

Figure 4: The plot on the left (top) shows the current (February - April 2024) pattern of SST anomalies over the tropical Oceans. The plot on the right shows the evolution of the Nino3.4 index extended by the predicted values (black) compared with the observed evolution for years which the evolution most closely matches that shown for 2024. The closeness of the match is measured by the temporal correlation and the mean difference (given in the boxes). The February-April SST anomalies for one of the selected analogue periods (1998) are provided (left, bottom) for comparison with the February – April 2024 anomalies.

8. Probability Forecast of Temperature for June to September 2024

The temperature outlook for various zones within the GHA region is given in Figure 5 below.

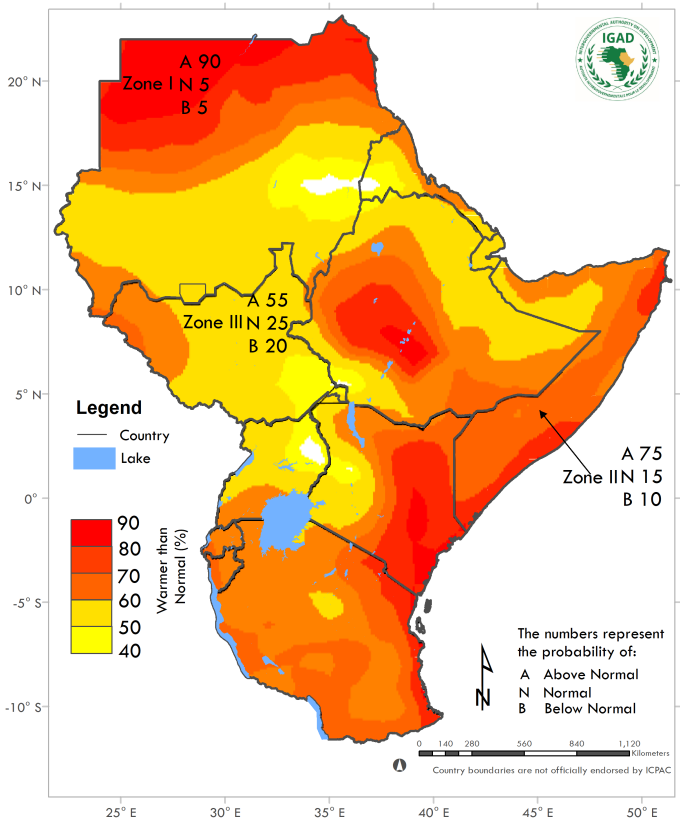

Figure 5: Probability forecast of mean surface temperatures for the June to September 2024 season.

Zone I: In this Zone (red), the above-normal mean temperature (i.e., warmer) category is most likely at 90%. The probabilities for the near normal and below normal categories are 5% and 5% each.

Zones II: In this Zone (dark orange) also, the above-normal mean temperature category has the highest probability (at 75%). The probabilities of the normal and below-normal categories are 15% and 10%, respectively.

Zones III: In this Zone (orange) also, the above-normal mean temperature category has the highest probability (at 55%). The probabilities of the normal and below-normal categories are 25% and 20%, respectively.

9. Contributions

GHACOF 67 was organized jointly by IGAD's Climate Prediction and Applications Centre (ICPAC) and the National Meteorological and Hydrological Services (NMHSs) of the Greater Horn of Africa (GHA). The forum was supported by the ClimSA, CONFER and Down2Earth projects funded by the European Union, AICCRA-East Africa project funded by the World Bank, SCII project funded by the Swedish government, Emergency Locust Response Project (ELRP) funded by the World Bank, Web-mapping Technology for Disaster Risk Reduction project funded by the European Union under the Join Research Centre, and PAStoral livelihoodS in the African Greater horn through Effective anticipatory action (PASSAGE). 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, National Hydro-Meteorological and Monitoring Service of Somalia; South Sudan Meteorological Service, Sudan Meteorological Authority, 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 Desk and WMO Global Producing Centres (GPCs).

End -