Statement from the 69th Greater Horn of Africa Climate Outlook Forum (GHACOF69)

20-21 January 2025 -Addis Ababa, Ethiopia

1. Consolidated Objective Climate Outlook for the March to May 2025 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 seasonal climate model predictions from nine Global Producing Centres (GPCs) customised for the GHA region indicates that drier-than-normal conditions are likely over much of Somalia, eastern and northern Kenya, southern and north-eastern Ethiopia, Djibouti, coastal parts of Eritrea, western South Sudan, southern and western Uganda, Rwanda, Burundi, and north-western Tanzania (Figure 1). An enhanced probability of drier-than-normal conditions (55%) is indicated for the cross-border areas of Ethiopia-Kenya-Somalia, north-eastern Eritrea, and parts of southwestern South Sudan. On the other hand, wetter than normal conditions are expected over parts of central and southern Tanzania, northeastern Uganda, eastern South Sudan and western Ethiopia.

The probability of seasonal rainfall exceeding 200mm indicates a high likelihood (over 70%) of surpassing this threshold in southwestern Ethiopia, western Kenya, much of Uganda, Rwanda, Burundi, and Tanzania. Additionally, a comparison between the forecasted probabilities of exceeding 200mm and historical climatological probabilities shows that the predicted chances are more than 20% higher than historical averages in much of eastern South Sudan, parts of western Ethiopia, central to southern Kenya, and central Tanzania, while much of western Ethiopia, central Somalia and western Kenya are forecast to have lower chances than historical.

The predicted start of the MAM 2025 season, based on 5 Global Climate Model forecasts that provided daily rainfall outputs, is shown in Figure 3c. There are high chances of early to normal onset over most parts of the GHA region except in a few localized areas. Raised chances of an early onset is indicated over northern Tanzania, eastern Rwanda and Burundi, parts of central Uganda, western Kenya, southwestern Somalia and parts of south-central Ethiopia. On the other hand, a higher chance for delayed onset is indicated over localized areas over central Kenya as well as parts of southern Ethiopia and central Somalia.

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 2016/2017 and 2020/2021 closely resemble the observed SSTs conditions in October—December 2024 and expected evolution of Nino3.4 in 2024/2025 (Figure 4a). Rainfall performance during MAM in 2017 and 2021 shows drier-than-normal conditions over much of the eastern parts of the region (Figure 4b), consistent with the objective consolidated MAM 2025 forecast. The identification of analogue years based on recognized climate drivers offers additional information to users about the climate impacts observed in previous similar years.

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 Sudan, Ethiopia, Eritrea, Djibouti, northern Somalia, northern Kenya and

southern parts of south-eastern Tanzania.

Whilst the MAM season contributes a larger fraction to the annual total for much of the GHA regions, its interannual variability is 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 El Nino Southern Oscillation (ENSO) and the Indian Ocean Dipole (IOD).

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 drier than usual conditions are most probable over much of the GHA region usually receiving rain in the MAM season, wet spells may occur in areas with an increased likelihood of near normal to above 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.

2. The Climate Outlook Forum

The 69th Greater Horn of Africa Climate Outlook Forum (GHACOF69) was convened from 20th to 21st January 2025 by the IGAD Climate Prediction and Applications Centre (ICPAC) in collaboration with the National Meteorological and Hydrological Services (NMHSs) of IGAD Member States, the 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 2025 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 expected impacts on the GHA during the March to May 2025 rainfall season. Climate information users from all relevant sectors (disaster risk management, agriculture and food security, livestock, health, water resources, and media), as well as NGOs and development partners, actively participated in the formulation of mitigation strategies.

3. Methodology

In line with the recommendation of the WMO, ICPAC has implemented an objective seasonal forecast procedure to generate climate forecasts for the GHA). January 2025 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 MAM 2025 seasonal climate outlook. The final consolidated multi-model ensemble 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, or below-normal rainfall for each zone. Above-normal rainfall is defined as the upper third of MAM climatology rainfall totals, below-normal as the lower third and normal as the range between the upper and the lower third of the rainfall totals. Climatology here refers to the historical series of observed weather conditions over the 30 years (1991-2020). Forecast probability distributions for temperature are also established. The rainfall and temperature outlooks for MAM 2025 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 MAM season. These factors were assessed using dynamical and statistical methods. SST conditions over the equatorial Pacific Ocean were slightly colder than average over the past few months. The ENSO in the tropical Pacific remains in a neutral phase. Although several indicators have recently reached La Niña thresholds, they have not been sustained long enough or at sufficient levels to confirm a La Niña event. The WMO and major global producing centres have indicated ENSO remains neutral through the MAM 2025 period. The IOD is currently in the neutral phase and is expected to remain neutral throughout the MAM

season. The MAM rainfall interannual variability is weakly linked with the SST conditions in the tropical Oceans and the known large-scale modes such as ENSO, IOD and SST gradients between the western and eastern Pacific Ocean. ENSO and IOD are ocean-atmosphere phenomena associated with global atmospheric and oceanic circulation changes that influence regional climate conditions by modulating regional circulation patterns, especially monsoonal winds, upper-level and low-level winds. Their effects also are modulated by topography and large inland water bodies. Updates on the ENSO and IOD condition will be provided regularly by WMO and the major climate centres.

The seasonal forecast was developed during the pre-COF69 climate capacity building workshop held from 13th to 18th January 2025 at ICPAC in Nairobi, Kenya. During this workshop, regional scientists, national forecasters from ICPAC Member States, and partners from Met Office of the United Kingdom's national weather service used ICPAC's High-Performance Computing (HPC) cluster and developed regional and national-level climate outlooks.

4. Rainfall Outlook for March to May 2025

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

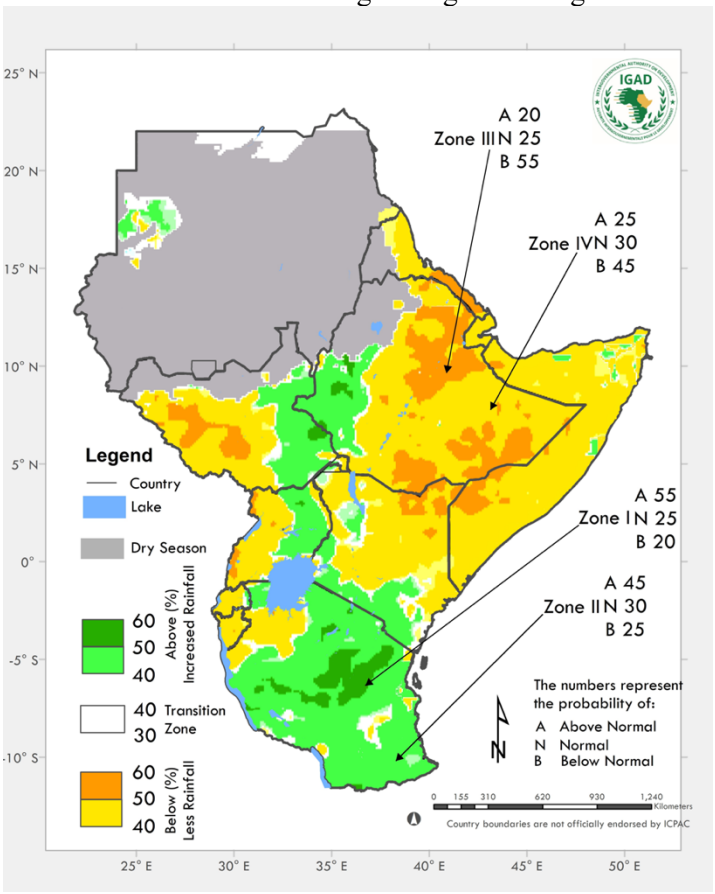

Figure 1. The rainfall outlook for various zones within the GHA region for March to May 2025.

Zone I: In this zone (dark green), the probability for the above normal (wetter) category is the highest (55%). Probabilities for the normal and below normal categories are 25% and 20%, respectively.

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

Zone III: In this zone (yellow/orange), the below normal rainfall (drier) category has the highest probability (45%). The probabilities for the normal and above normal categories are 30% and 25%, respectively.

Zone VI: In this zone (dark orange), the below normal rainfall (drier) category has the highest probability (with an area average of 55%). The probabilities of the near normal and above normal categories are 25% and 20% respectively.

Note: In Fig 1, 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, for 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 below-normal category. In the case of Zone-I (Fig. 1) for instance, there is a 55% probability of rainfall occurring in the above-normal category; 25% probability of rainfall occurring in the near-normal category; and 20% probability of rainfall occurring in the below-normal category. It is emphasised that boundaries between zones should be considered as transition areas.

5. Probability of Exceedance

The probability of seasonal rainfall exceeding 200mm and the probability anomalies relative to historical climatological probabilities are shown in Figure 2.

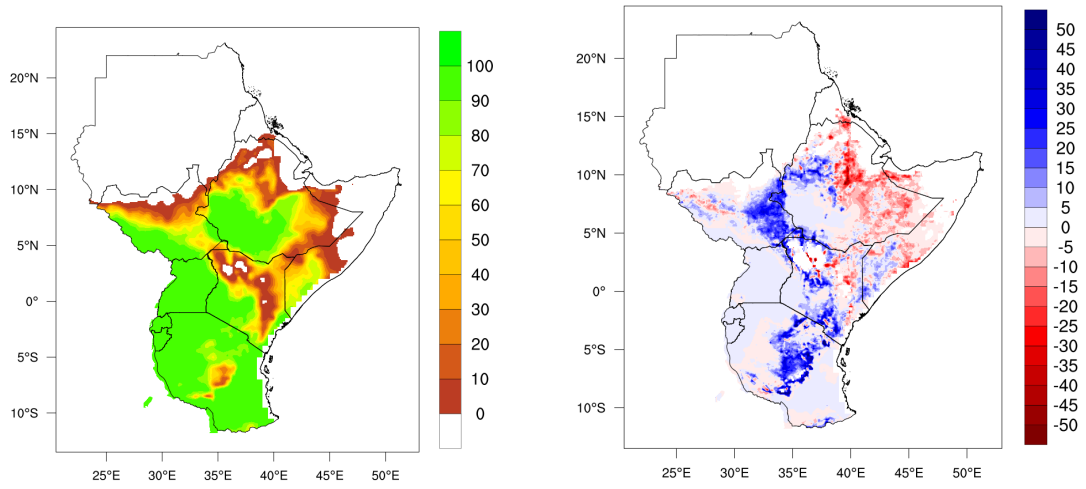

Figure 2: The map on the left indicates the probability of seasonal rainfall exceeding 200mm. The map on the right indicates probability anomalies relative to historical climatological probabilities.

6. Probability Forecasts of the Start of MAM 2025 Season and the Expected Average Onset Dates

The predicted most likely start dates of the March to May 2025 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.

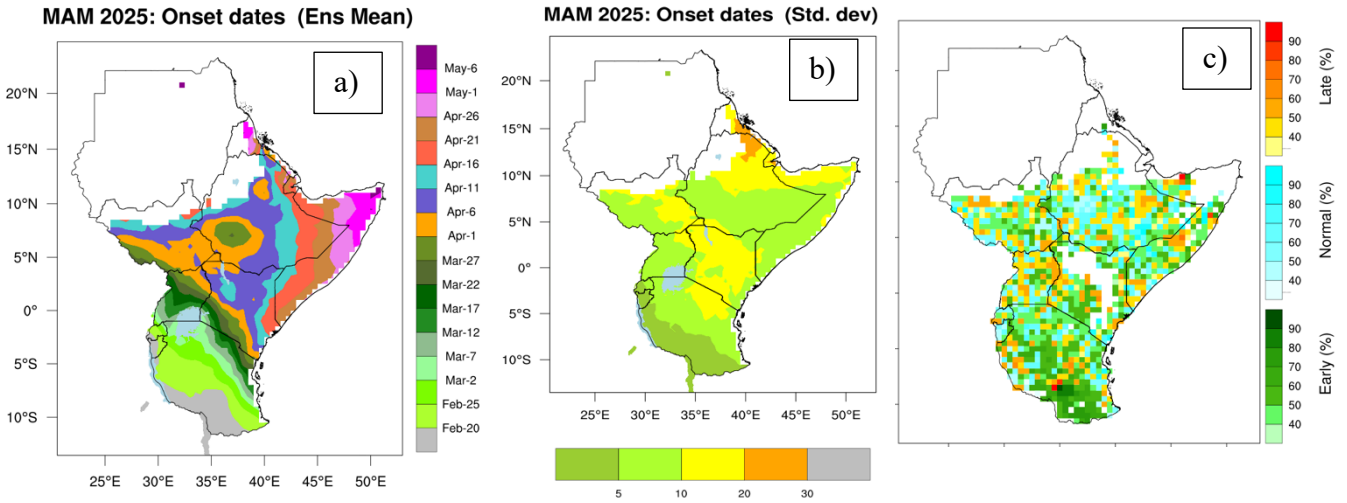

Figure 3: The map on the left indicates the most likely rainfall onset dates for the MAM 2025 season from model ensemble mean values. The middle map shows the standard deviation of predicted onset dates from the different ensemble members (days) and is a measure of uncertainty in the ensemble mean values. The map on the right indicates the forecast probabilities for three (tercile) categories of onset timing (early/normal/late).

7. Analogue Years based on the global SST Patterns

The selection of analogue years is based on the pattern correlation carried out by calculating pattern correlations between the observed SSTs from the most recent past season and the corresponding seasons of previous years within the tropical ocean basin. In addition, the evolution of Nino3.4 index is carried out by calculating the correlation and the mean difference between the combined observed and forecast evolution of Nino3.4 of the target year and the corresponding Nino3.4 index for the same period in previous years (Fig. 4).

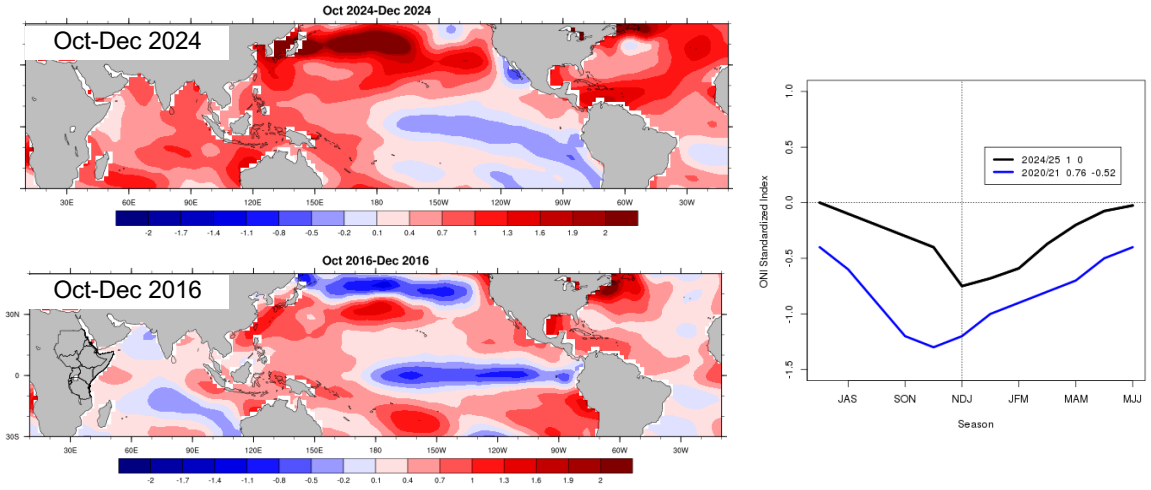

Figure 4a: The plot on the left (top) shows the current (October - December 2024) pattern of SST anomalies over the tropical Oceans. The plot on the right shows the evolution of the Nino3.4 index extended by the predicted values (black) compared with the observed evolution for years in when the evolution most closely matches that shown for 2025. The closeness of match is measured by the temporal correlation and the mean difference (given in the boxes).

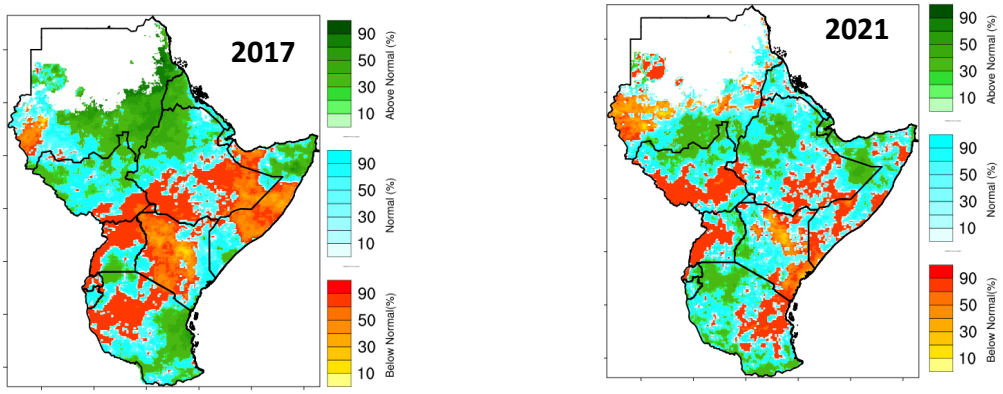

Figure 4b: Rainfall patterns/distribution for the selected analogue years (Mar-May 2017 on the left and Mar-May 2021 on the right).

8. Temperature Outlook for March to May 2025

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

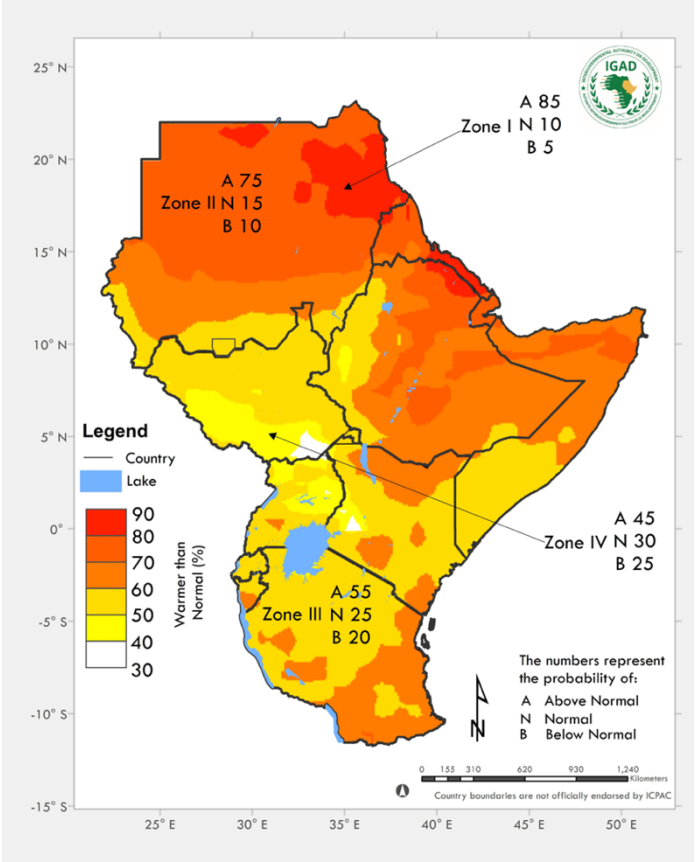

Figure 5: Probability forecast of mean surface temperatures for March to May 2025 season.

Zone I: In this Zone (red), the above normal mean temperature (i.e., warmer) category is most likely at 85%. The probabilities for the near normal and below normal categories are 10% 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.

Zones IV: In this Zone (yellow) also, the above normal mean temperature category has the highest probability (at 45%). The probabilities of the normal and below normal categories are 30% and 25%, respectively.

9. Contributions

GHACOF 69 was organized jointly by IGAD's 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 funded by the 11th EDF, ACACIA project funded by Horizon Europe research and innovation program, AICCRA-East Africa project funded by the World Bank, WISER-PASS and WISER Kenya funded by United Kingdom's FCDO, CREWS Horn of Africa, SEWAA, PASSAGE funded by CLARE program, IGAD Support Platform on Forced Displacement and SCII projects funded by the Swedish government, Emergency Locust Response Project (ELRP) funded by the World Bank and ARIPHA project funded by German Federal Foreign Office. 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 and WMO Global Producing Centres (GPCs).

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