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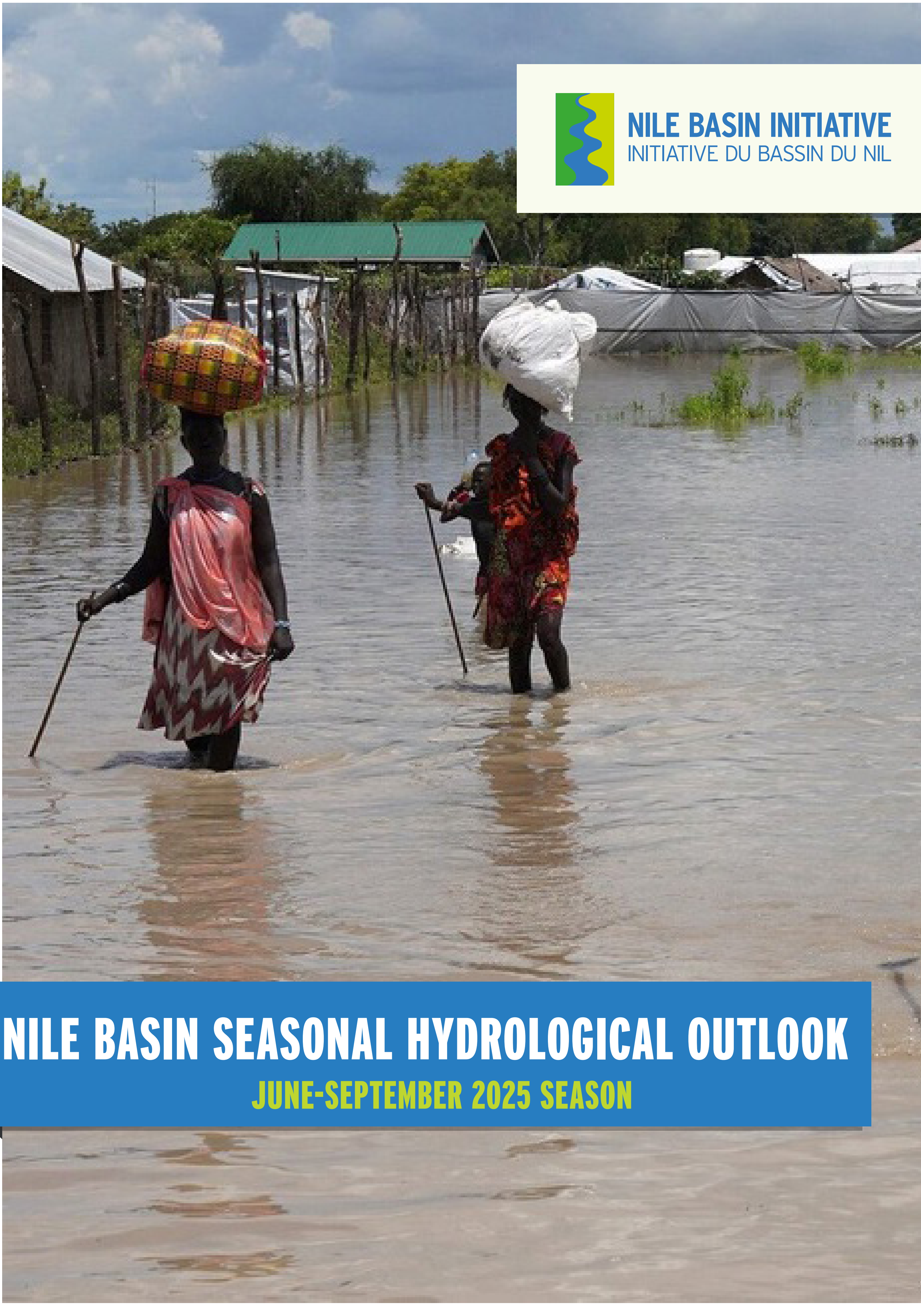

NILE BASIN SEASONAL HYDROLOGICAL OUTLOOK

JUNE-SEPTEMBER 2025 SEASON

1. FORWARD

Dear Partners and Stakeholders,

It is with great pleasure that I present to you the Nile Basin Seasonal Hydrological Outlook and Advisory for the period of June, July, August and September (JJAS) 2025 Season. This outlook serves as a vital tool for informing Member States, water users, national planners, regulators, water resource management, agriculture, hydropower generation, and decision-making across the Nile Basin region on the upcoming season.

The Nile Basin continues to face significant challenges in managing its water resources amidst growing demands, climate variability, and changing patterns of rainfall and hydrological extremes. This seasonal hydrological outlook offers a critical assessment of anticipated rainfall, river flow and lake level conditions for the next four months, enabling countries within the Basin to better prepare for the upcoming JJAS season. By leveraging these insights, we aim to provide early warning information to mitigate potential risks and enhance collaboration to ensure the optimization and sustainable use of the Nile's water resources for all.

We acknowledge the importance of cooperation among the Nile Basin countries in managing these shared resources. The Nile Basin Initiative (NBI) remains committed to strengthening governance, information sharing, regional integration, fostering collective solutions, and providing the necessary data, tools and information to support resilience to climate shocks and hydrological extremes in the basin.

We encourage all stakeholders to make use of this hydrological outlook, integrating its insights, recommendation and advisories into national planning processes, and continue working together with resilience toward a prosperous and sustainable future for the Nile Basin.

I would like to extend my gratitude to all the partners and the Nile Basin Regional Expert Working Group (REWG) on Hydrology, who have worked diligently to prepare this Outlook. Your continued support and dedication are critical in building a resilient the Nile Basin.

Thank you and I look forward to continued collaboration in advancing our shared objectives.

Sincerely,

Dr. Florence Grace Adongo
Excutive Dirctor
Nile Basin Initiative

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1. INTRODUCTION

The Nile River Basin is one of the most significant and vital river systems in the world, supporting over 300 million people, agriculture, and ecosystems across northeastern Africa. The basin encompasses eleven riparian countries of Burundi, Democratic Republic of Congo, Egypt, Eritrea, Ethiopia, Kenya, Rwanda, South Sudan, Sudan, Tanzania, and Uganda, making it the longest river system in the world, with a length of around 6,650 kilometers. The river system is of unparalleled social, historic and economic importance in the region for both upstream and downstream nations. The basin is formed by three principal streams- the White Nile- the headstreams of which flow into Lakes Victoria, Kyoga and Albert, the Blue Nile, Baro-Akobo-Sobat and the Tekeze-Setit-Atbara which flow from the highlands of Ethiopia. However, the river basin is extremely sensitive to changes in meteorological forcings such as precipitation and evapotranspiration with variations impacting both river flows and lake levels. This alternating hydrological imbalance often results in hydrological extremes, mostly flood and drought in some parts of the basin with significant impacts to lives and livelihood.

There are three distinct rainy seasons in the Nile Basin. March-April-May (MAM) and October-November-December (OND) are long and short rainy seasons respectively in the Nile Equatorial Lake (NEL) region. June-July-August-September (JJAS) is a rainy season characterizing the Eastern Nile covering the regions of the Ethiopian highlands. Therefore, JJAS is a key season in the basin, as it signals the onset of seasonal rains in the equatorial and central parts of the basin, with significant hydrological implications for river flows and lake levels both upstream and downstream. Therefore, monitoring and forecasting the hydrometeorological variables of the river system provides early warning information that plays a critical role in the reduction of risks through timely, reliable and actionable river flow and lake level information that allows the vulnerable communities to prepare in time and optimize on the extremes.

The IGAD Climate Prediction and Applications Centre (ICPAC) released the climate outlook for June-July-August (JJAS) 2025 season at the 70th Greater Horn of Africa Climate Outlook Forum (GHACOF 70) on 20th May 2025 in Addis Ababa, Ethiopia. The outlook predicts wetter -than-normal and drier than normal conditions in some parts of the basins. In addition, ICPAC carried out a comparative analysis of the current atmospheric and oceanic conditions with similar patterns from the past seasons as part of its approach for seasonal climate forecasting. Sea Surface Temperatures (SSTA) and NinO-3.4 were analyzed to develop the analogue year for the (JJAS) 2025 season as; 2001 and 2006. Based on the climate outlook, the Nile Basin Regional Expert Working on Hydrology – Flood Advisory - convened an expert workshop on 21st and 22nd May 2025 in Addis Ababa Ethiopia. The expert forum analyzed the implications of the ICPAC's released climate outlook on the Nile Basin hydrology and its impacts on water resources availability, irrigated agriculture and food security, energy and transport and probable disaster risk.

This report presents an expert evaluation of the performance of the MAM 2025 outlook and analysis of the implication of JJAS 2025 Climate Outlook on the Nile Basin's hydrology and anticipated impacts on lives and livelihoods, water resources, agriculture and food security, energy and transport sectors as well as disaster risk areas. It provides specific recommendations and advisories to guide Member States and relevant agencies in the planning and strategic response that enhances benefits and reduces the risk of hydrological disasters.

2. TOOLS AND SYSTEM

2.1. Nile Basin Regional Hydrological Monitoring System

The Nile Basin Regional Hydrological Monitoring System (NB-RHMS) is a collaborative hydrological monitoring system consisting of stations and a data management system. It was established to enhance collaborative monitoring of the basin developed for transboundary cooperation. It facilitates real-time data collection, transmission, sharing and analysis of hydrological and meteorological data among Nile Basin countries. It provides hydrological data and information on river flows, lake levels, rainfall, and water quality parameters which are key hydrological variables for water resources management including early warning and flood forecasting, data-driven decision-making for water allocation and management and Transboundary cooperation and transparency among the riparian states(https://nilebasin.org/hydromet/about).

2.2. Eastern Nile Flood Forecasting and Early Warning System

The Eastern Nile Flood Forecast and Early Warning System (EN-NEWS) is an integrated, real-time and 3-day flood forecasting and early warning at 55 locations system designed to reduce flood risks in the Nile sub-basins of Ethiopia, South Sudan, and Sudan. It provides forecasts and early warnings for riverine floods in key flood-prone areas in Lake Tana, Baro-Akobo-Sobat, Blue Nile, and Tekeze-Setit-Atbara. The system is a key component of the Eastern Nile Technical Regional Office (ENTRO)(https://nilebasin-dss.azurewebsites.net/workspaces).

2.3. Nile Basin Flash Flood Early Warning System

The Nile Basin Flash Flood Early Warning System (NB-FFEWS) is a web-based system that provides near real time and forecast information on the occurrence of flash flood to enhance preparedness and resilience of communities within the Nile basin (https://flashfloodalert.nilebasin.org/). Early warning information from the NB-FFEWS supports the National Meteorological and Hydrological Services in the Nile Basin Member States for effective flash flood early warnings in flash flood prone areas. This improves disaster management efficiency at local, national and regional levels hence reducing the risk of flash flood related disasters. The early warning information is disseminated daily via email with 48 hours lead time through the existing national dissemination channels.

2.4. ICPAC Water Forecast Portal

The ICPAC Water Forecast Portal is a hydrological forecasting system that delivers key hydrological variables at locations of interest which were identified by the member states. The variables include Lake/Reservoir levels, water levels and discharges among others. The portal was developed by the ICPAC to enhance water resources management and disaster resilience in East Africa. It integrates advanced multi-model hydrological modelling framework, real-time monitoring, and capacity-building initiatives to provide accurate and timely streamflow forecasts.

2.5. UEGCL Lake Level Forecasting and Hydropower Optimization System

The Operational Decision Support System for hydropower (ODSS-HP) is a system developed and operated by Uganda Electricity Generating Company Ltd (UEGCL) for the purpose of hydropower planning and operations. It provides: (i) seasonal forecast of the hydrological conditions and the performance of the cascade of hydropower plants over the coming nine months, (ii) short-term forecasts of these conditions in greater detail using a version of the model, which includes the variation of power demands over the day and (iii) flow and water level forecasts at selected locations, particularly Lake Kyoga, where severe flooding occurred in recent years.

3. PERFORMANCE OF MARCH-APRIL-MAY 2025

The March-April-May (MAM) season holds significant hydrological importance in the Nile Basin, particularly for the Nile Equatorial Lakes and eastern parts of the basin, including Uganda, Kenya, Ethiopia, and South Sudan. This period typically marks the "long rains" season, especially in the East African highlands, which are critical headwaters for the Nile River system. The rainfall during MAM contributes substantially to the flow of major tributaries such as the White Nile and the Blue Nile. This seasonal influx supports agriculture, replenishes water storage in lakes and reservoirs like Lake Victoria, and maintains base flows that are vital for downstream water availability.

3.1 Climate

The MAM's climate outlook issued by ICPAC at the 69th GHACOF held on the 20th January 2025 in Addis Ababa Ethiopia predicted increased likelihood of drier conditions in the Eastern Nile (EN) due to the declining rainfall. It also predicted wetter-than-normal conditions in most parts of the Nile Equatorial Lakes region due to the predicted increased rainfall in most parts of the region (Figure 1). Warmer than normal conditions were predicted in most parts of the basin, especially the areas of Lake Tana and Tekeze Setit Atbara region. Above normal rainfall was predicted in western Kenya, northern Uganda, southeastern and upper eastern part of South Sudan. Some parts of southern Ethiopia were expected to experience drier conditions, potentially exacerbating water shortages and impacting agricultural productivity. Conversely, western parts of Ethiopia were likely to receive increased rainfall.

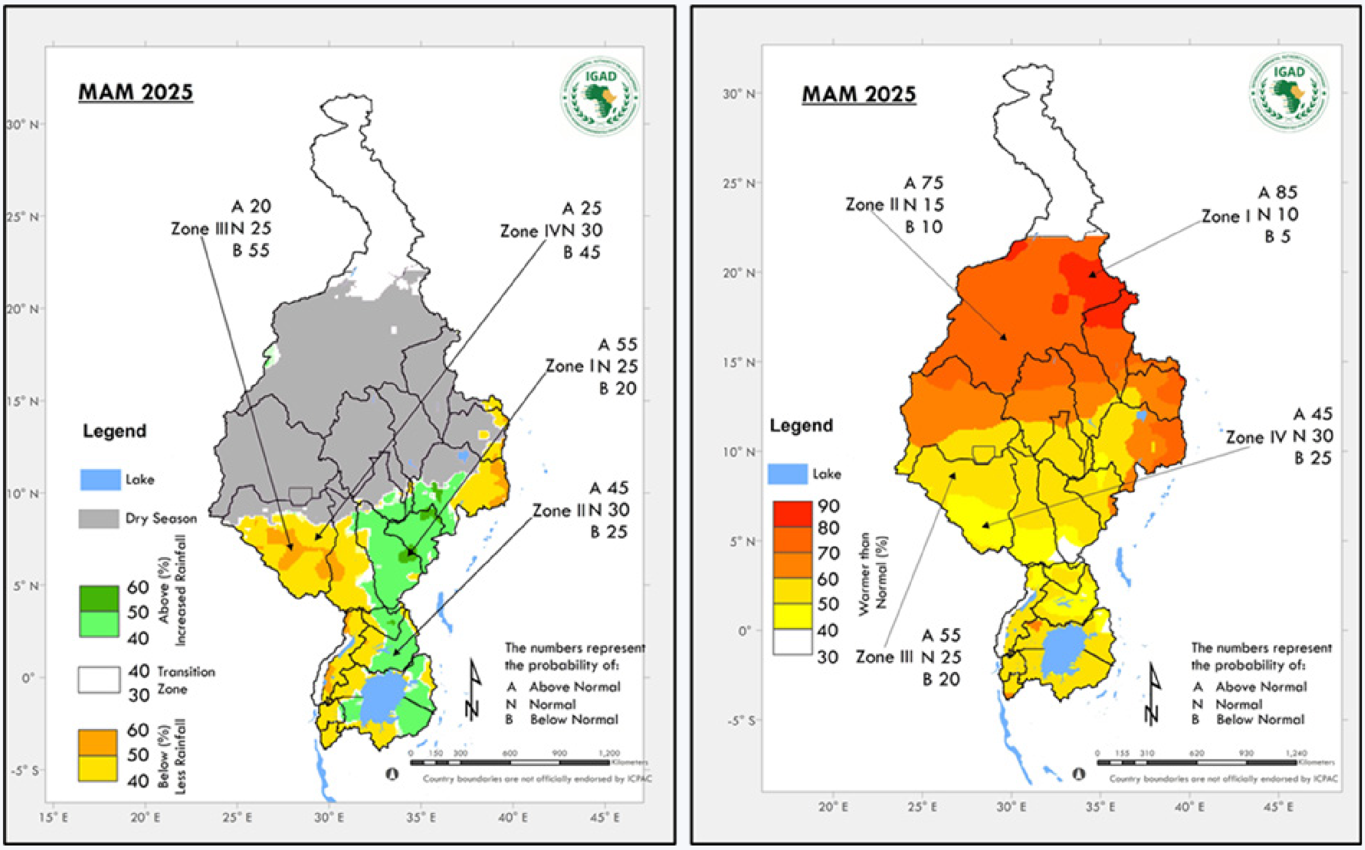

Figure 1: Figure 1: Nile Basin Climate conditions as were expected in March-April-May (MAM) 2025

Ground observations confirmed this prediction in several areas. However, in many parts, the prediction varied. The spatial deviations of ground observations from the forecasted climate outlook for MAM indicated increased anomaly in March especially in NEL regions of western Kenya, eastern South Sudan and Uganda (Figure 2).

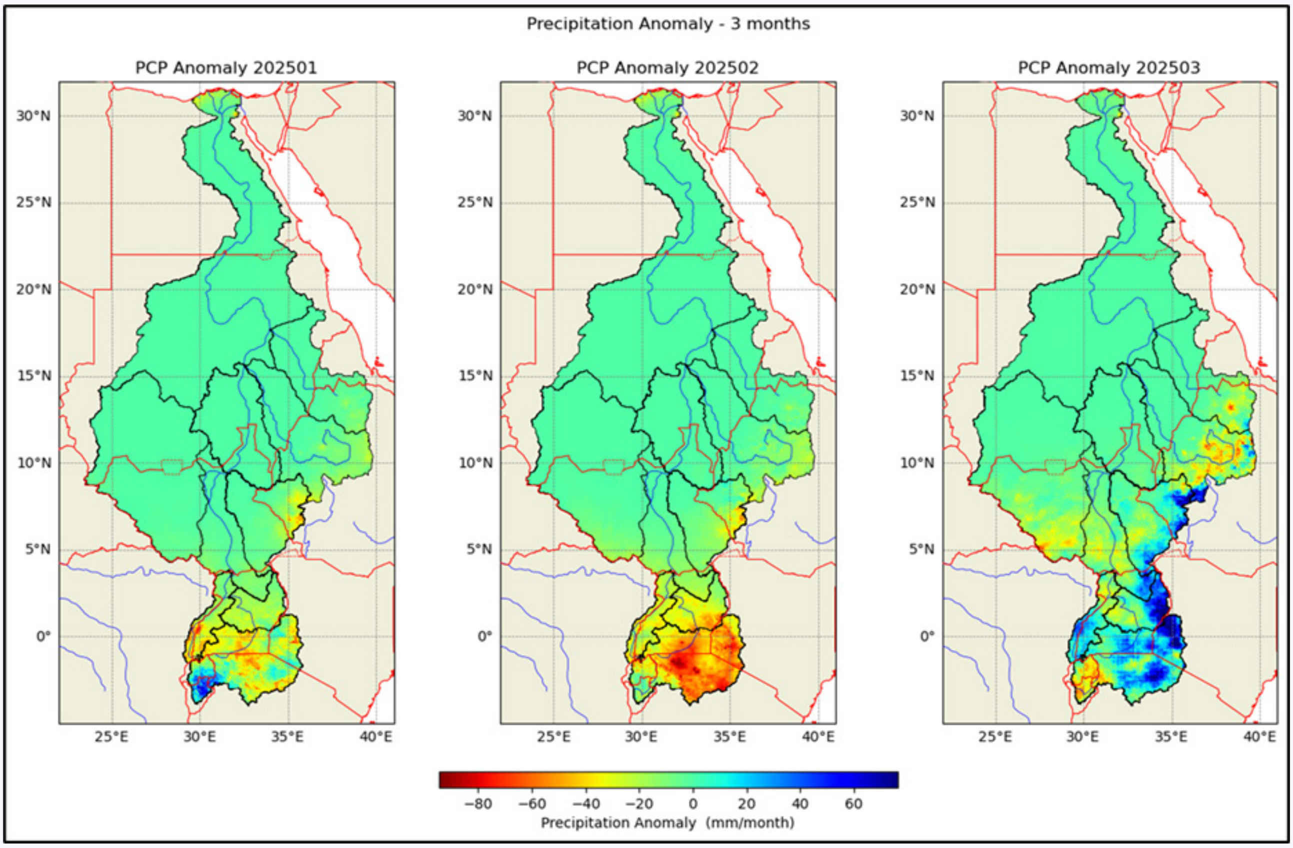

Figure 2: Nile Basin rainfall anomaly for Jan-March 2025

3.2 Hydrology

The wetter-than-normal conditions predicted in most parts of the NEL region were expected to impact on the hydrology of the basin with increased flow in rivers and lakes in the region. Figure 3 shows an increased trend in river levels based on the observation from the Nile Basin Regional Hydrological Monitoring System hence confirming the predictions of increased trends in river levels and slightly above normal flows in NEL region during the MAM 2025 Season.

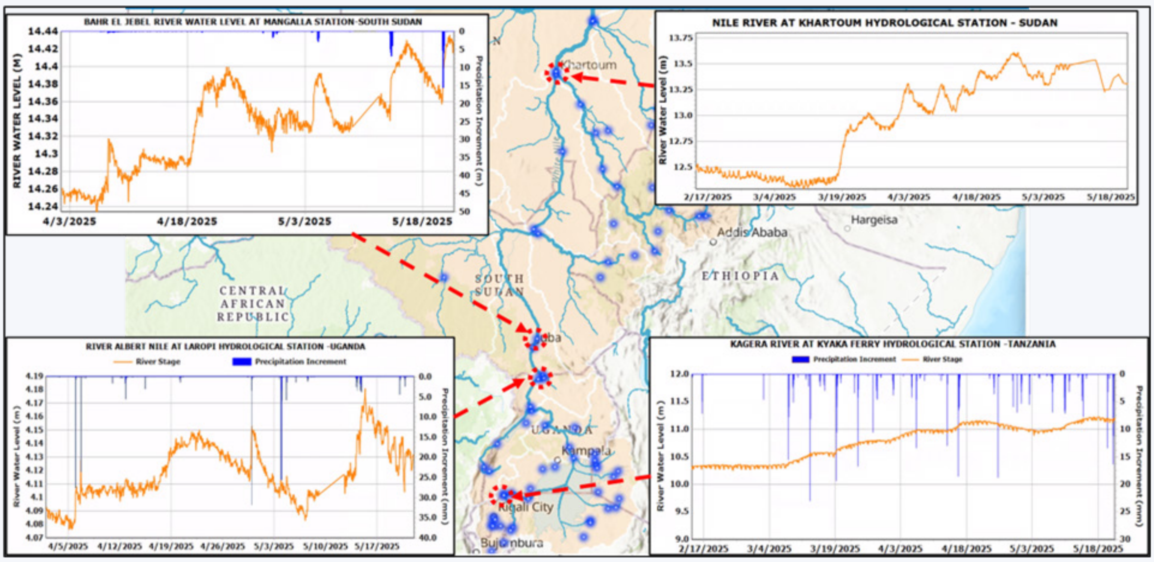

Figure 3: Observed river water level at various Regional Hydrological Monitoring Stations during the MAM 2025 season

3.2.1 Observed Flood Occurrence MAM 2025

Flash Flood Occurrence

During MAM 2025 season, the NB FFEWS forecasted flash floods in the NEL region on 10 March in Mara ward, Narok West, Narok, Rift Valley, Kenya, and on 29th March in the areas of Mwajishepo, Meatu, Lake Zone, Tanzania, Sagamian ward, Narok South, Narok, Rift Valley, Kenya and Byangabo, Musanze, Northern Province, Rwanda.

There were more flash floods forecasted in the month of April in various areas such as Tambua ward, Hamisi, Vihiga County, Western, Kenya on 4th April, in Gigoro, Rutshuru, North Kivu, Democratic Republic of the Congo on 6th April, in Gisuka, Kiremba and Bwitoyi, Tangara, Ngozi, Burundi on 8th April, in Moroto, Northern Region, Uganda on 13th April, Kangarame, Kanungu, Western Region, Uganda and Okwamor, Pallisa, Eastern Region, Uganda on 16th April, Loggi, Bugisa sub-region, Bulambuli, Eastern Region, Uganda and Elgon_gagai, Bugisa sub-region, Sironko, Eastern Region, Uganda on 20th April. There were more flash floods forecasted in the rift valley areas of Western Kenya on various dates and places including Narok.

In the Month of May, the rift valley areas in western Kenya continued to experience flash floods and these were confirmed to have occurred as forecasted by the system especially in Keiyo South, Elgeyo-Marakwet County, Rift Valley, Kenya from 5th to 7th May 2025. Other areas that experienced flash floods during the month of May include Mugando, Masisi, North Kivu, Democratic Republic of Congo, Bugembwe, Masisi, North Kivu, Democratic Republic of the Congo, Lubale, Masisi, North Kivu, Democratic Republic of the Congo and Lokumomoe, Kaabong, Northern Region, Uganda (Figure 4).

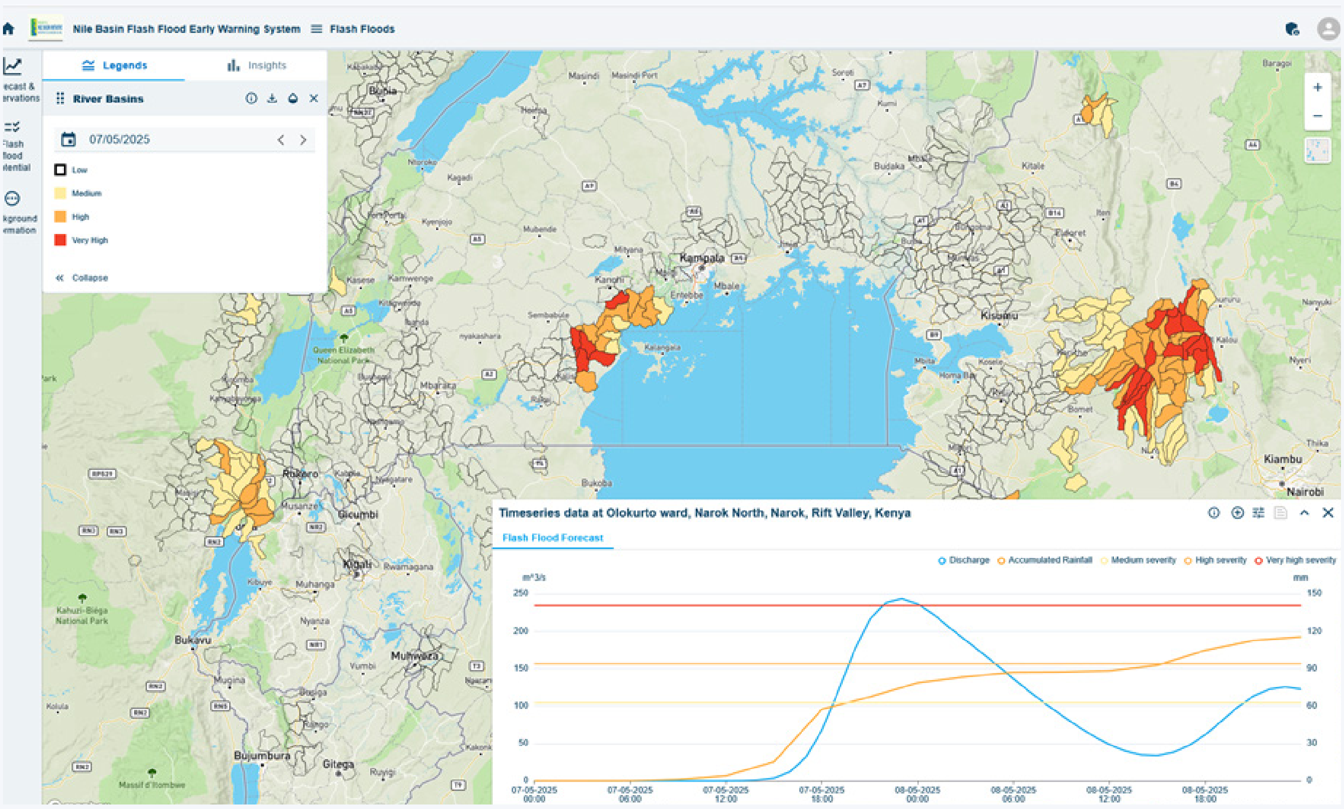

Figure 4: Example of forecasted flash flood events during the MAM 2025 season. (Source: Nile Basin Flash Flood Early Warning System)

Riverine Flood Occurrence in the EN

No riverine flood observed in the EN countries, as the MAM 2025 was not the main rainy season

4. JUNE-SEPTEMBER 2025 OUTLOOK

The June–September (JJAS) season plays a critical role in both the Nile Equatorial Lakes region and the Eastern Nile region, though its hydrological significance varies across these sub-basins. In the Eastern Nile region, particularly the Ethiopian Highlands, JJAS is the main rainy season, driven by the northward migration of the Intertropical Convergence Zone (ITCZ). This period supplies the bulk of the Blue Nile's flow, contributing up to 80% of the total annual discharge of the Nile. The rainfall supports agriculture, water storage (including at the GERD and Lake Tana), and sediment transport essential for downstream floodplains in Sudan and Egypt.

In the Nile Equatorial Lakes region, which includes countries like Uganda, Rwanda, Burundi, and western Kenya, JJAS coincides with a secondary rainy season, following the primary March–May rains. However, it still contributes to maintaining the levels of key water bodies such as Lake Victoria, Lake Kyoga and Lake Albert that feed the White Nile. This low seasonal rainfall helps sustain base flows during the dry months and supports local agriculture, ecosystems, and hydropower production.

4.1 Climate Outlook

The key climate drivers that impact East Africa are the El Niño Southern Oscillation (ENSO), Indian Ocean Dipole (IOD) and the Madden-Julian Oscillation (MJO). However, these are not critical for the JJAS season. The JJAS season climate outlook released on the 20th May 2025 at the 70th Greater Horn of Africa Climate Outlook (70th GHACOF) by ICPAC, indicated an increased likelihood of near normal to above-normal rainfall over much of the northern Greater Horn of Africa (GHA), including western Kenya, eastern Uganda, most parts South Sudan, Sudan and most parts of Ethiopia. In particular, the regions of eastern Uganda, eastern South Sudan, and northwestern Sudan are predicted to experience above normal rainfall with a 55% likelihood of occurrence (Figure 5). The forecast also indicated drier than normal conditions expected over Rwanda, Burundi, western Uganda, north-western Tanzania while the rest.

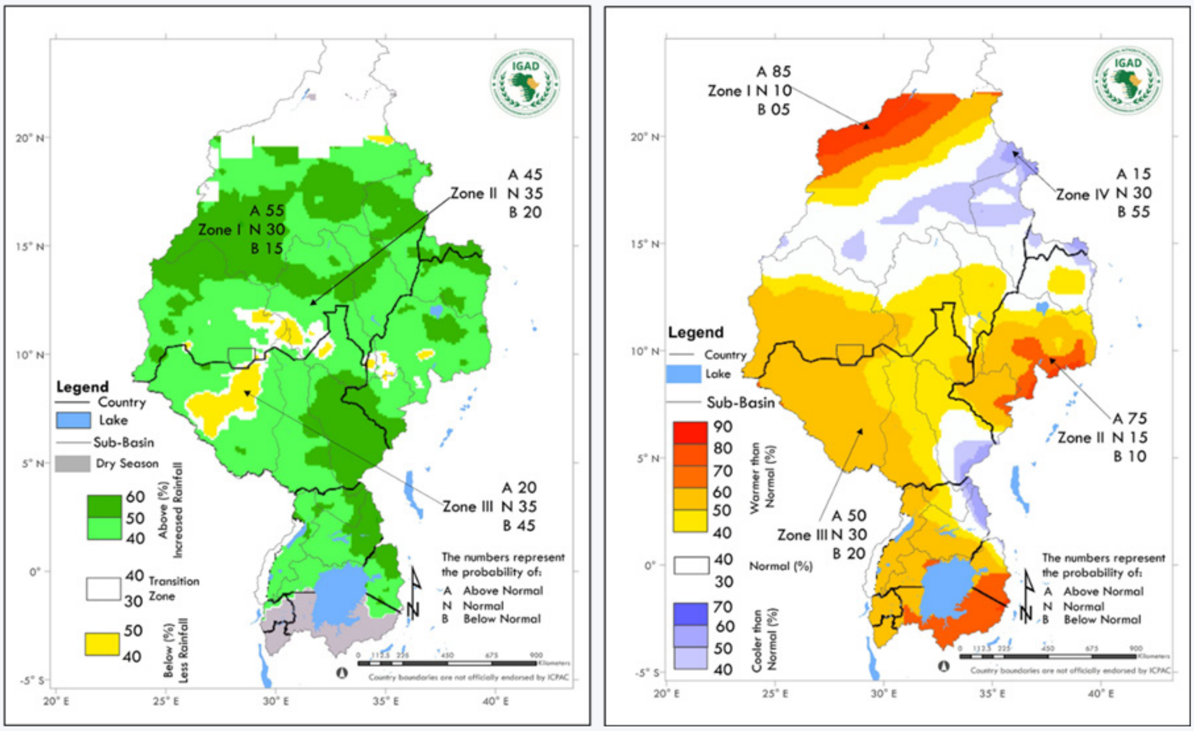

Figure 4: An example of forecasted flash flood events that occurred during the MAM 2025

4.2 Hydrological Outlook

The JJAS climate outlook has significant implications for river hydrology during the similar period, influencing various aspects of river levels and flows, lake levels, water availability, and ecosystem health. Here are several keyways in which the projected climate outlook is most likely to impact the hydrology of the Nile River Basin with significant impacts expected on the rivers and lakes of the Eastern Nile and highlands of Ethiopia.

4.2.1 Impacts on river flow and reservoir

The impacts of the climate outlook are expected to be more pronounced in the Eastern Nile region during JJAS. The hydrological simulations of the projected climate outlook using mean and 25th and 75th percentile of the 51 ensembles members indicated likelihood of increased river flow slightly above the long term mean from the Blue Nile mostly as a result increased likelihood above normal rainfall predicted from the highlands of Ethiopia and the region (Figure 6). In contrast, the rivers of the NEL regions were expected to be in a slowing trend with minimal variations throughout the JJAS period. However, the outflow from Bara-Akobo-Sobat is projected to rise steadily from June and peak in the last week of September and early October above the long-term mean and lag the peak of 2022 and 2023 during the similar period (Figure 7).

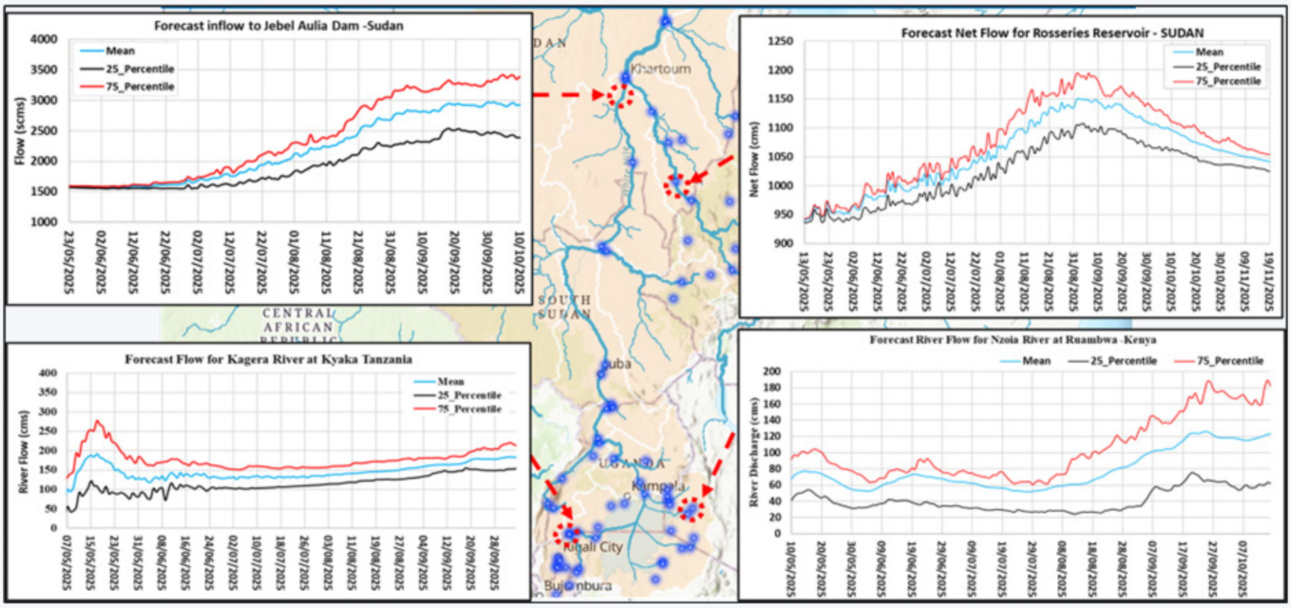

Figure 6: Forecast river flows for the NEL and EN for JJAS 2025

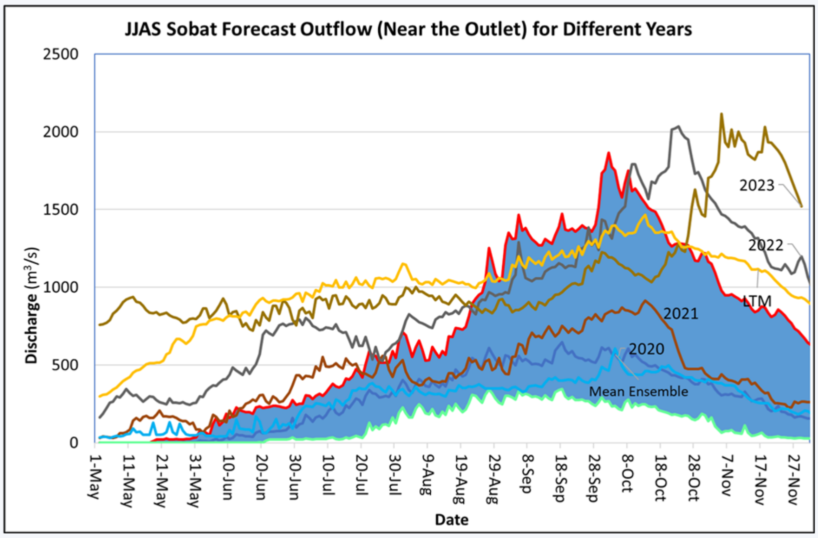

Figure 7: Forecast river flows for the Sobat River outlet in the JJAS 2025 Season

4.2.2 Impacts on the Lakes Levels and Reservoirs

The impact of river flows and rainfall on lakes and reservoir levels and discharge is a key component of the hydrological dynamics of the Nile River Basin. These factors play a crucial role in maintaining or altering the water balance in the lake, influencing its storage, outflows, and ecosystem. The water levels in Lake Victoria, Lake Kyoga and Lake Albert are expected to remain steadily on the decline (Figure 8). Lake Albert levels will continue on a downward trend but are expected to remain above 621 m below the observed 2021 level and near observed levels of 2020 by the end of September.

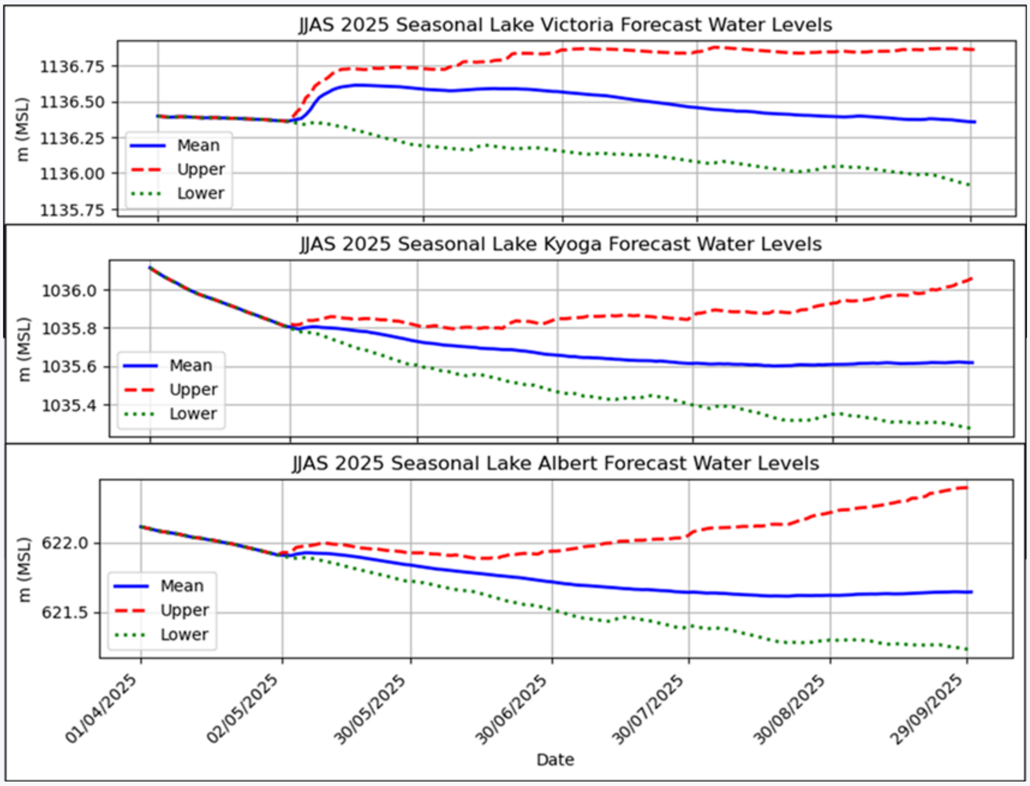

Figure 8: Forecast lake levels and outflows for the JJAS 2025 Season.

As anticipated, the Lake Victoria water level is predicted to be near MAM 2024 but above 2023 mostly as result of reduced rainfall and the near normal predicted rainfall in the lake catchments for June-September season (Figure 9).

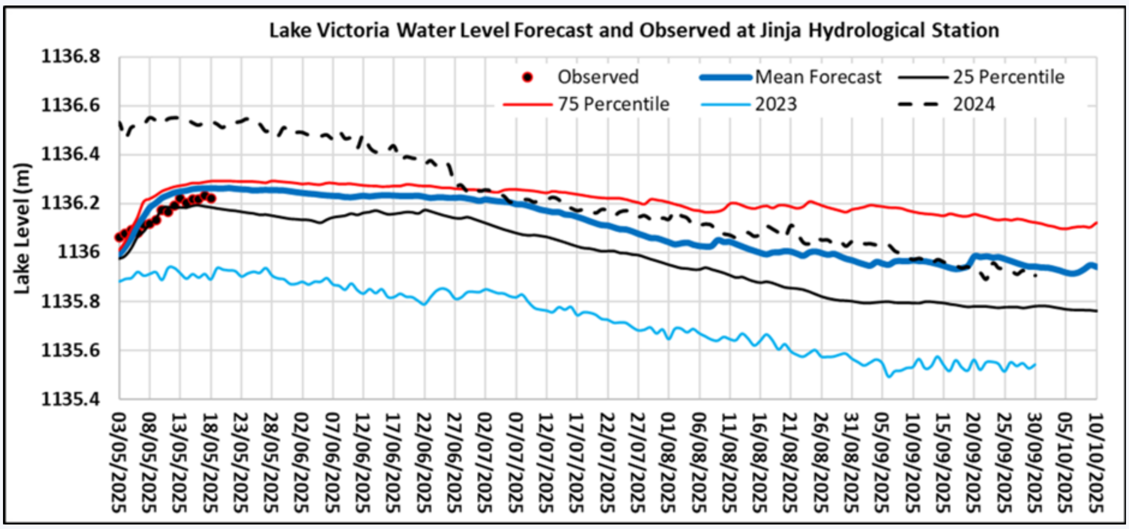

Figure 9: Forecast lake levels and outflows for the JJAS 2025 Season.

Like Lake Victoria, Lake Kyoga and Lake Albert netflow are expected to remain constantly high with minimal variations throughout the June-September Season (Figure 10). However, Lake Tana water levels and net flows are expected to increase steadily from the onset- of projected rainfall with peak in the last week of September and first week of October (Figure11).

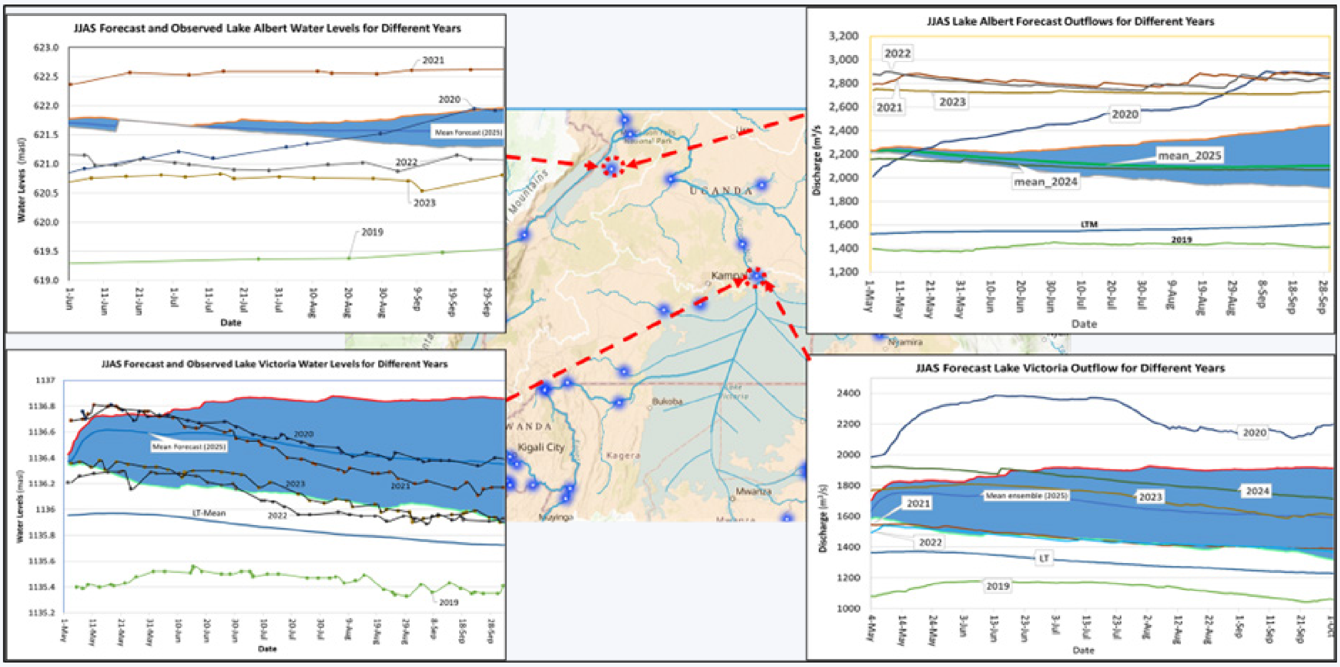

Figure 10: Forecast lake levels and outflows for the JJAS 2025 Season.

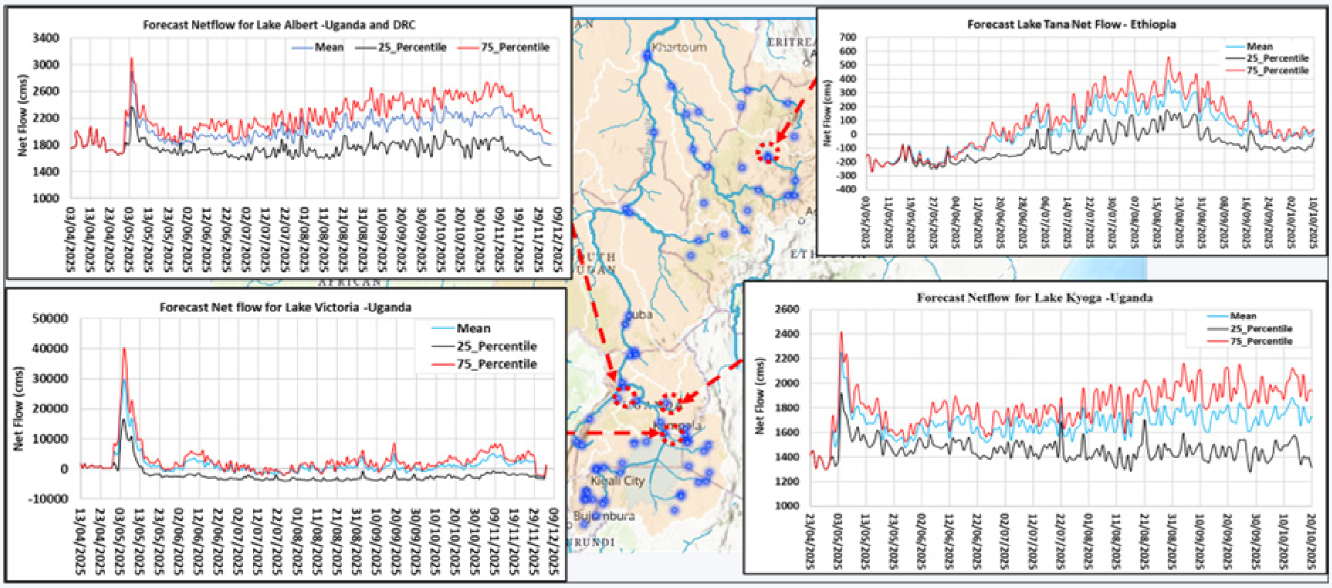

Figure 11: Forecast lake net flows for the Sobat River outlet in the JJAS 2025 Season

5. COUNTRY OUTLOOK AND IMPLICATIONS

This section provides a summary of current situations and implications of the projected climate and hydrological outlook in the Nile Basin Member States for the JJAS 2025 Seasonal.

5.1 Burundi

Burundi has a surface area of 27,834 km2 of which about 48% is within the Nile Basin hence constituting 0.4 percent of the basin drainage area (Figure 12). The annual rainfall varies between 850mm and 1,600mm with an average mean rainfall of 1,100mm. The low-land areas of Burundi are sometimes affected by floods during heavy rains. The flood prone areas include the shorelines of Lake Tanganyika, Rweru and Cohoha and some parts of the small streams and rivers such as Ruvyironza, Rusizi and Ruvubu.

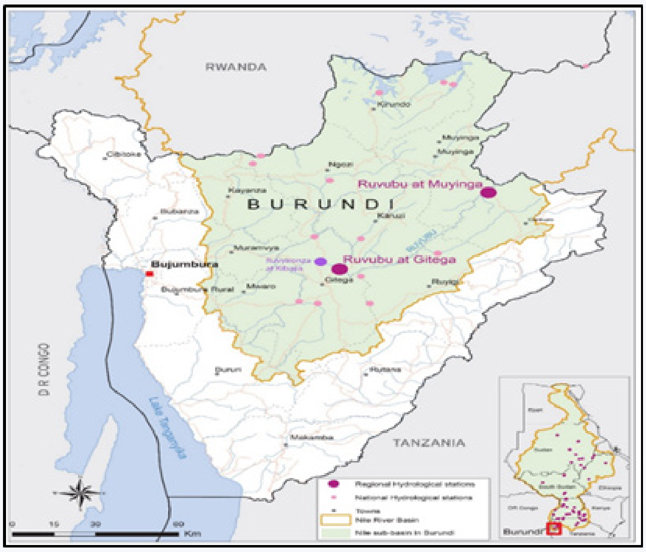

Figure 11: Burundi Nile Basin

5.1.1 Performance of the MAM 2025 Season and Impacts

The national forecast indicated that zone I was expected to receive near average to above average rainfall and zone II to receive near average to below average rainfall. However, most stations across the country have indicated that the region received near average rainfall while the north-eastern and a part of western side of the country recorded above average rainfall (Figure 13). Also, most parts of central, north-western and south-western had received below average rainfall in March and April.

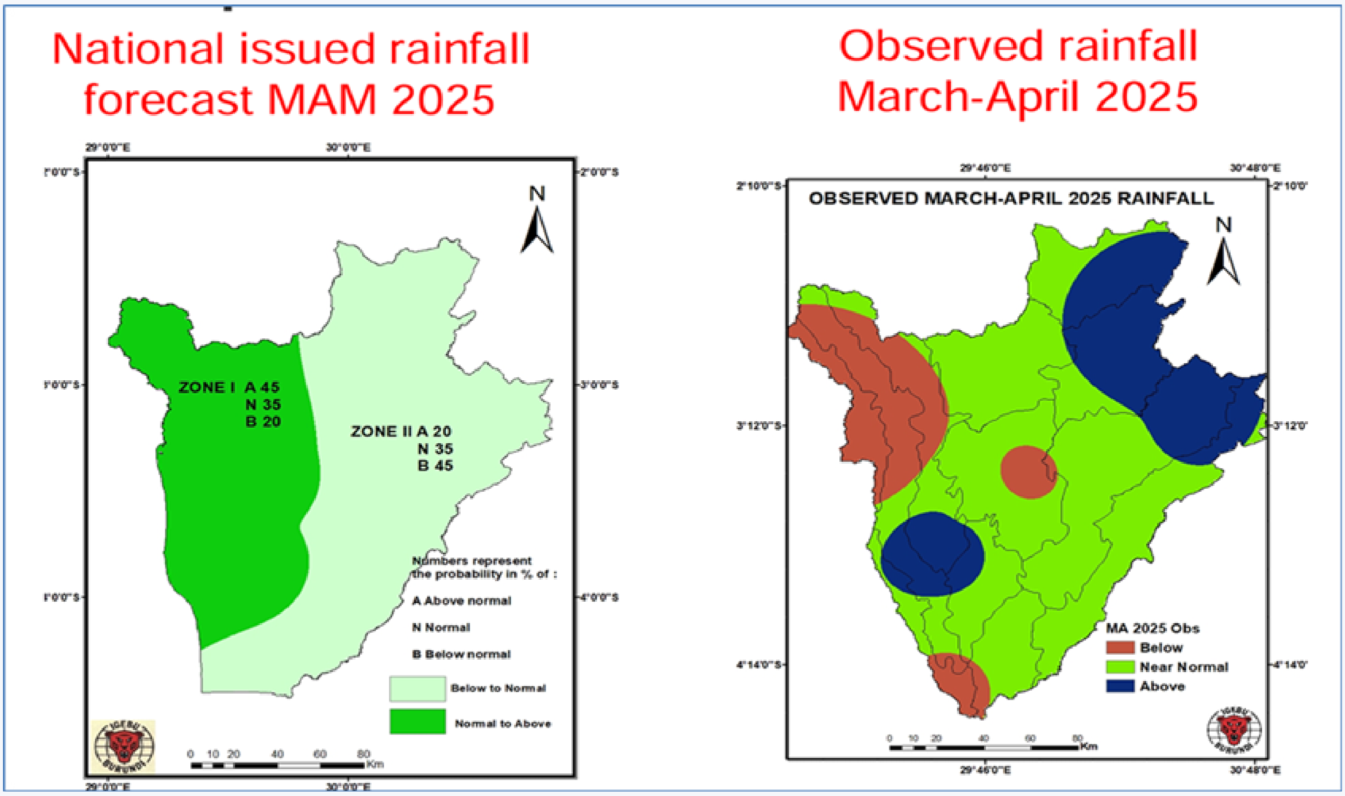

Figure 13: Forecasted and observed Rainfall during the MAM 2025 Season in Burundi.

In hydrology, normal conditions like streamflow water levels and flows were expected in rivers and lakes in Burundi for MAM season and this is what is observed. The evolution of the Ruvubu River water level at Gitega regional hydrological station, the main tributary of the Nile in Burundi, with water level variations between 1.4m in the beginning of March and 3.8m in end of May 2025 with discharge between 40m3/s and 156m3/s (Figure 14). The maximum discharge of 156m3/s recorded at the Gitega hydrological station was estimated to be about 5% above long term mean discharge for a similar period (Figure 15).

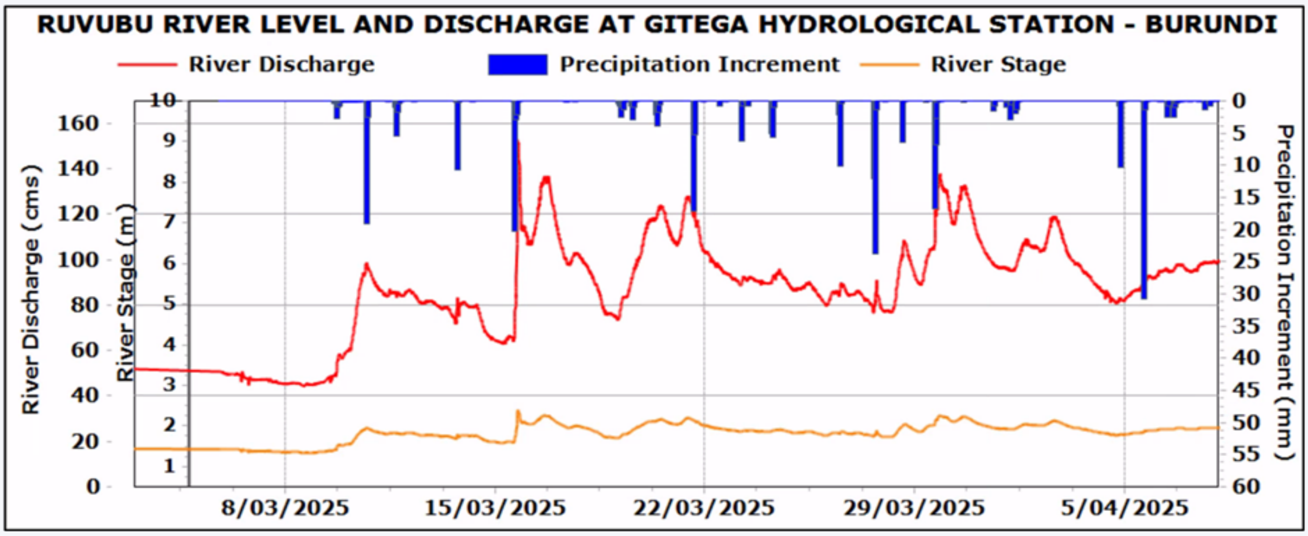

Figure 14: Observed Ruvubu rRiver water level and discharge at Gitega Hydrological Station in Burundi during the MAM 2025.

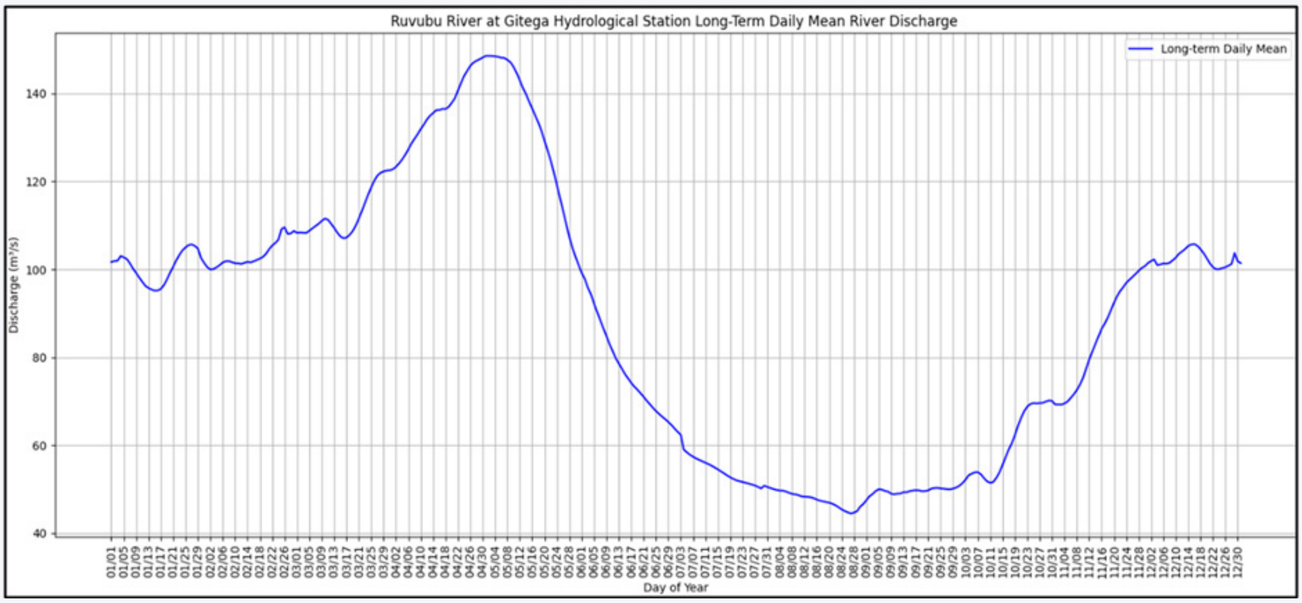

Figure 15: Observed Long Term mean of Discharge at Gitega Hydrological Station in Burundi.

5.1.2 Climate and Hydrological Outlook for JJAS 2025 and Implications

The JJAS season is normally a dry season in Burundi and the ICPAC forecast for this season indicates that the dry season condition will affect the decrease in river flows and lakes. This condition is demonstrated by the short-term forecast for both Gitega and Muyinga Hydrological Stations indicating low discharge variation in June (Figures 16 and 17).

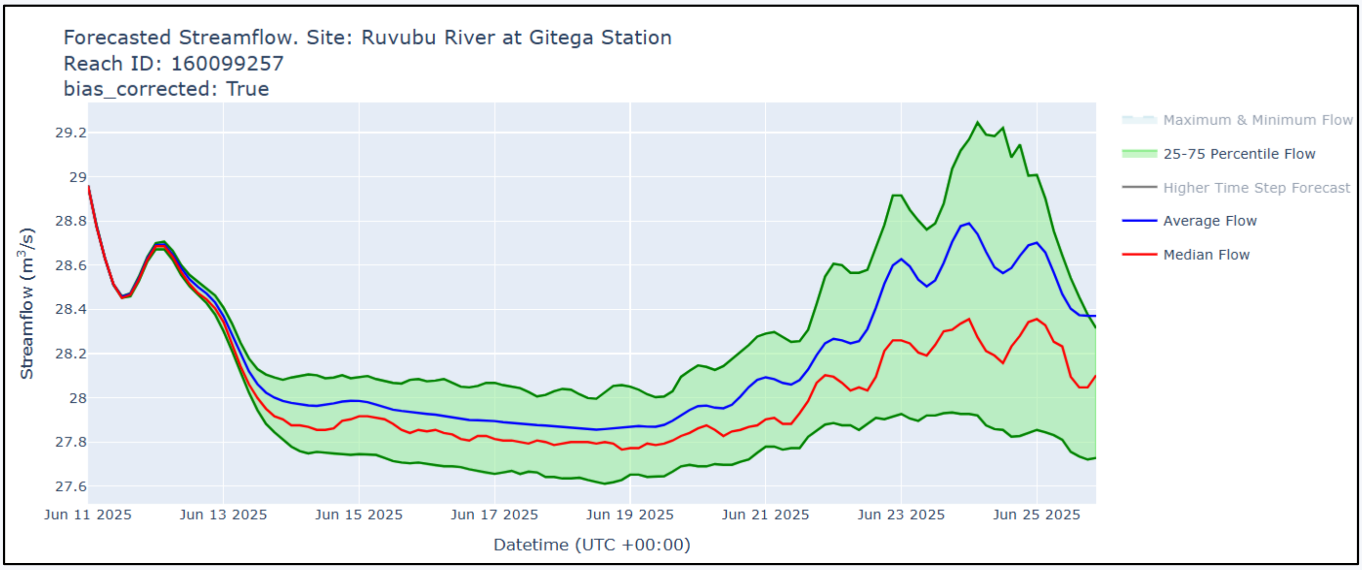

Figure 16: Short-term forecast of Ruvubu River discharge at Gitega Hydrological Station in Burundi.

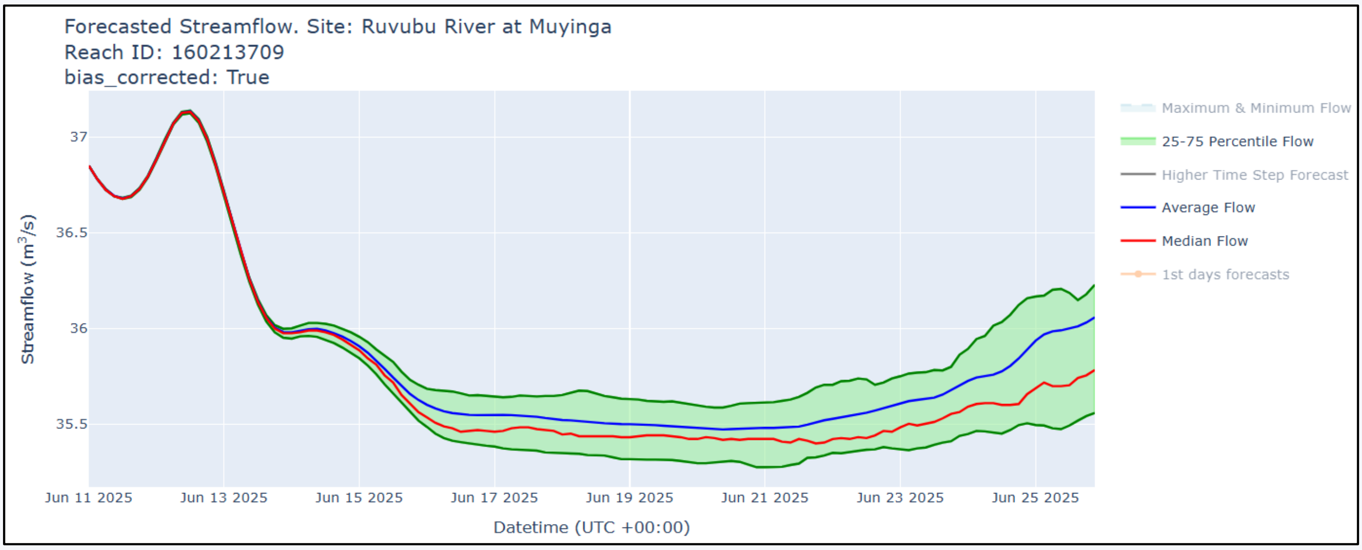

Figure 17: Short-term forecast of Ruvubu River discharge at Muyinga Hydrological Station in Burundi.

5.1.3 Recommendations and Advisories

Given the near and below average rainfall expected during the JJAS period the following recommendations and advisories are provided.

i. Conserve and efficiently use the available water resources -especially in water scarce areas - to last until the next rainfall season - October -November-December 2025.

ii. Owing to the spatial variability of climate outlook, continuous weather and hydrological monitoring of water levels to regularly inform users and adopt accordingly.

iii. Take advantage of this low water period to rehabilitate destroyed flood protections and hydrological stations during the MAM flooding period.

iv. Improve collaboration between producers and users of hydrological information and raise awareness among them to provide feedback for improvement.

5.2 DR Congo

The Democratic Republic of the Congo is a country in Central Africa with a land surface area of 2.3 million km2. The Country is drained mainly by the Congo River. About 1% of the country drains to the Nile River Basin constituting about 0.7% of the Nile Basin area. Despite the small part of the country in the Nile Basin, the impact of the climate and hydrology is still considerable as it shares borders with five other NBI Member States (Burundi, Rwanda, South Sudan, Uganda, and Tanzania). The shared water resources of Lake Albert, Lake Edward between DR Congo and Uganda are vital for both countries and support the lives and livelihood of several communities.

The Nile Basin Regional Hydrological Monitoring Stations for Lake Albert and Semiliki River indicated low response to the MAM rainfalls and climatic conditions showing minimal variations in lake levels and river flows (Figures 18 and 19).

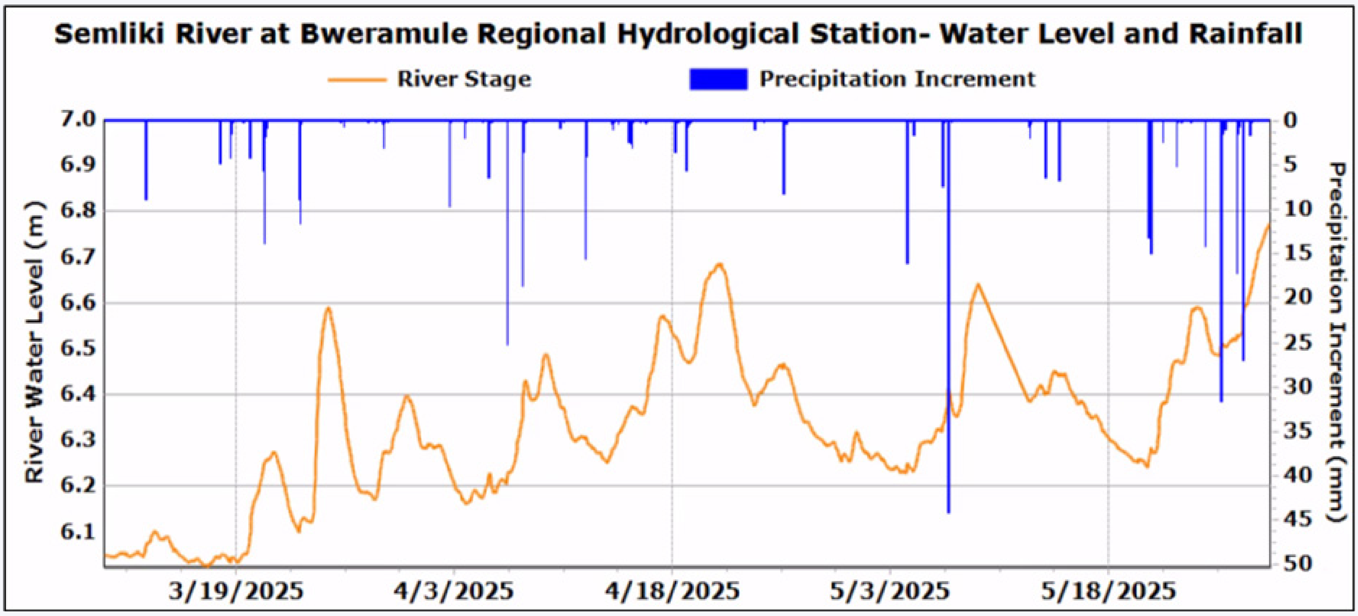

Figure 18: Semiliki River water level variation at Bweramule station in the MAM 2025 season.

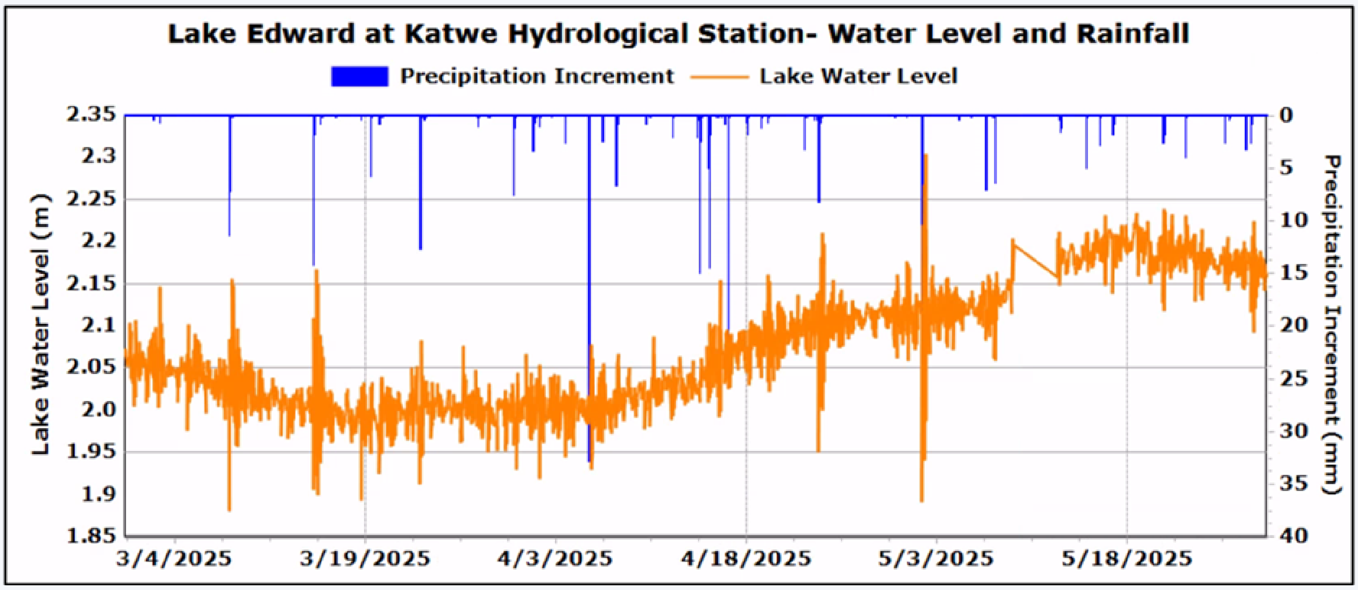

Figure 19: Water level variation in Lake Edward at Katwe station in the MAM 2025 season.

DR Congo Nile is projected to remain near normal-to-normal rainfall in JJAS season hence little variation is expected with minimal hydrological imbalance with insignificant impacts on lives and livelihood, energy, water resources and agricultural sectors in that part of the basin.

5.3 Ethiopia

Ethiopia is a landlocked country located in the Horn of Africa region of East Africa with a land surface area of about 1.1 million Km2 of which about 33% is within the Nile Basin, constituting about 12% of the basin area. The Blue Nile known as Abbay, Baro Akobo, Mereb and Tekeze are the main tributaries of the Nile River (Figure 15). Abbay is the source of the Blue Nile. It accounts for 20% of Ethiopia's land area, for about 50% of its total average annual flows which emanate from the Ethiopian highlands. The rivers of the Abbay basin contribute on average about 62 percent of Nile River flows. Together with the contribution of Baro Akobo and Tekeze rivers, Ethiopia accounts for at least 85% of the flows to the Nile River.

4.4.1 Performance of the OND 2024 Season and Impacts

The MAM 2025 season was expected to experience below-normal rainfall in many regions since the period marks the last quarter of the dry season, with significant implications for agriculture, water resources availability for energy and agriculture production, and livelihoods of many communities. However, the southeastern Akobo, Baro and Gambela region were expected to experience near to above normal rainfall while the rest of the regions experienced below normal rainfall as expected (Figure 20).

Although the MAM is a drier season, the rainfall still contributed to help enhance the water availability on rivers, ponds, reservoirs, and groundwater recharge hence ensure modest improvement of access to water for irrigation and stabilized hydropower generation.

As predicted, most storages and dams were expected to be in the last phase of declining trends driven by enhanced competition between consumption and evaporation losses. Records and observations indicated below average performance during the MAM period. The analysis on water balance for most reservoirs and dams to understand how much water is available and how it moves through the reservoir system, done by the Ministry of Water and Energy of Ethiopia for more than ten dams indicated below average performance in MAM.

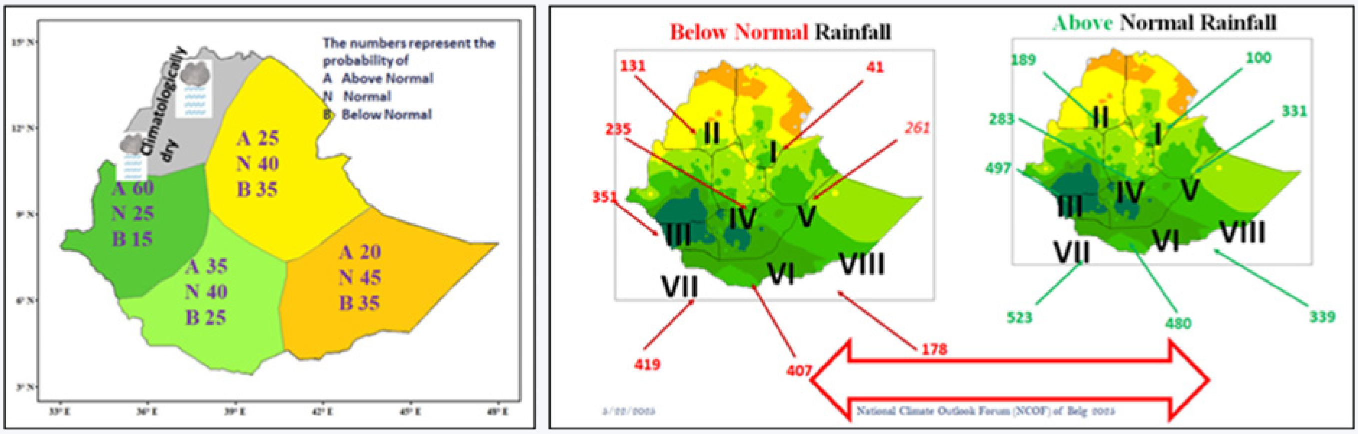

Figure 20: Rainfall outlook for MAM 2025 season in Ethiopia.

Figures 21 and 22 indicated below average performance for two dams/reservoirs (Tekeze and Tana) compared to the long term mean average and the analogue hydrological year provided by the Ethiopian Meteorological Agency (EMA) in the MAM period.

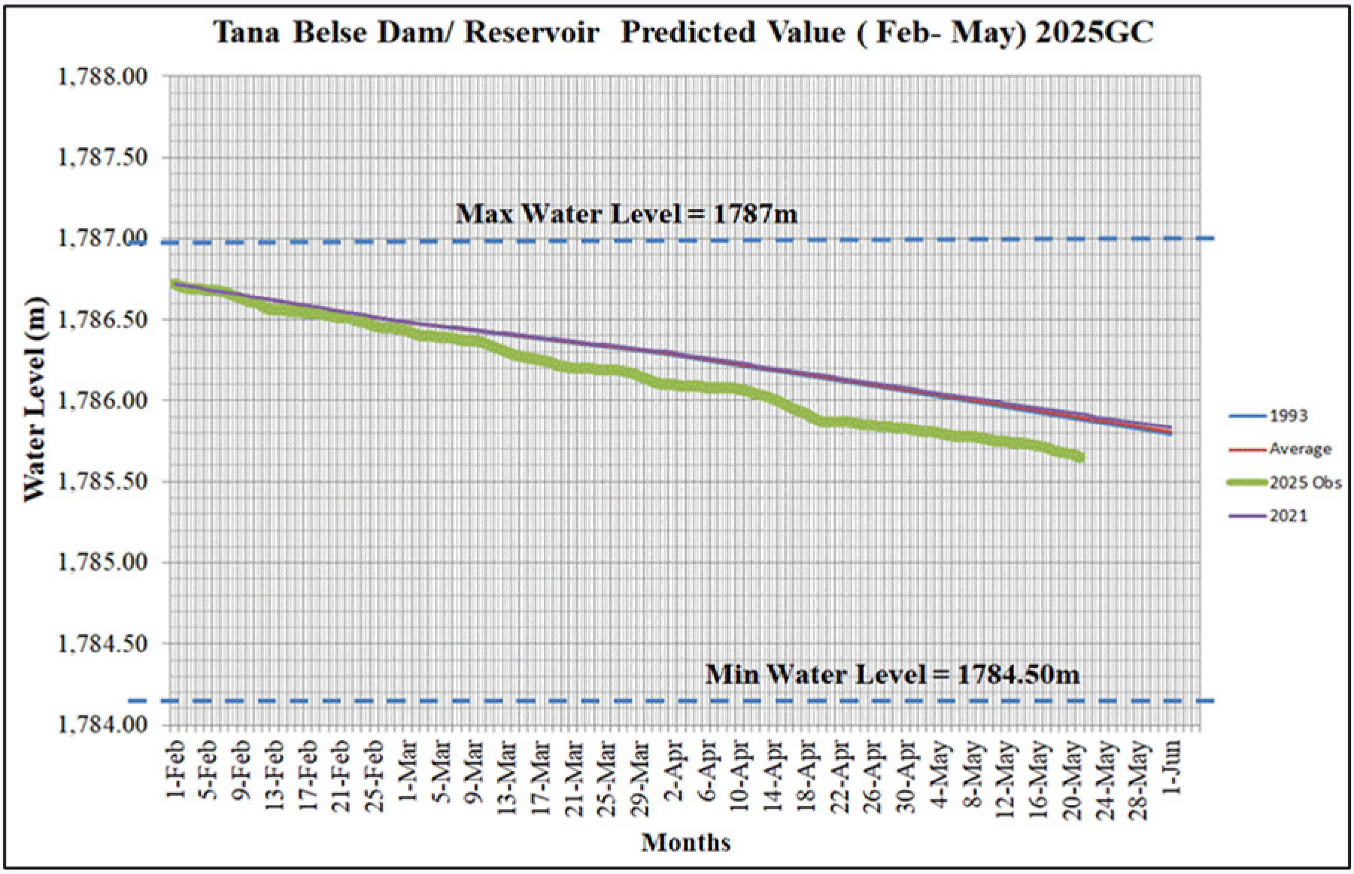

Figure 21: Observed water level at Tana Belse Dam compared with analogue year for MAM 2025 season in Ethiopia.

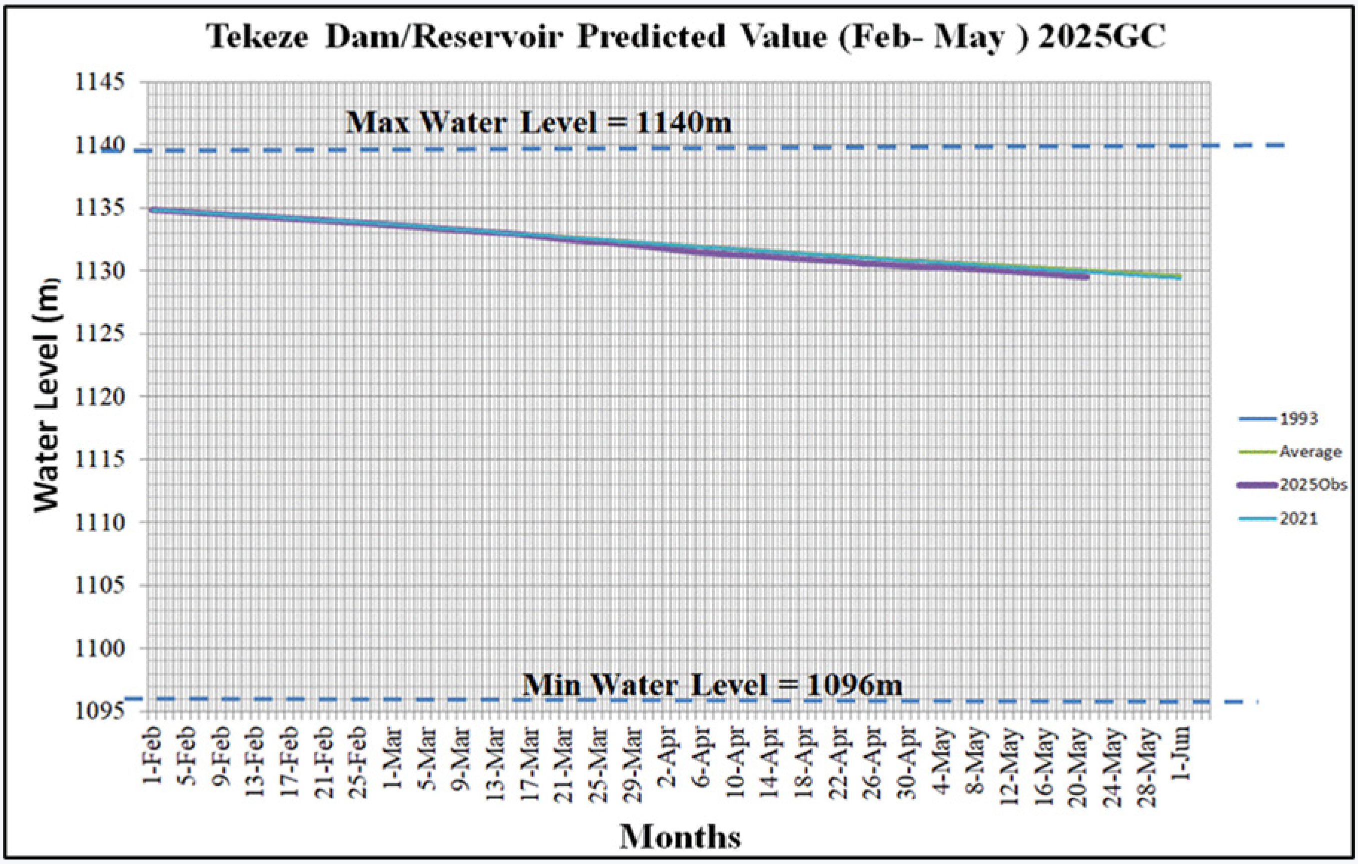

Figure 22: Observed water level at Tekeze Dam compared with analogue year for MAM 2025 season in Ethiopia

At the beginning of MAM both Tana Belse and Tekeze dam had water levels in 1786.43m and 1133.7m respectively. These levels were 0.57m and 6.3m below the maximum water levels, hence signified sufficient water storage in the reservoir.

Historical water levels of Lake Tana derived from MODIS indicated that the lake level was on the decline since December 2024, mostly driven by evaporation and consumption (Figure 23).

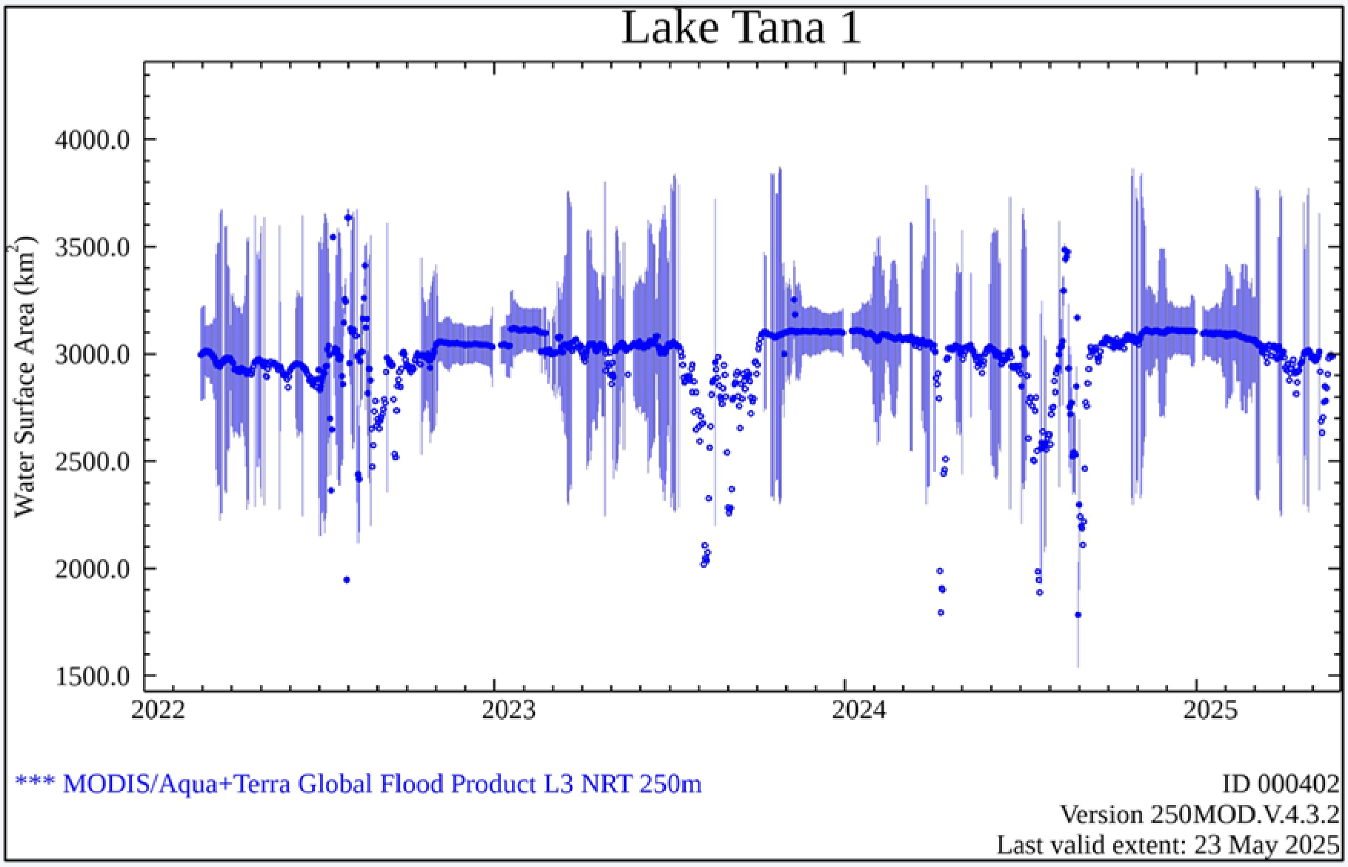

Figure 23: Historical water surface area of Lake Tana covering the MAM 2025 season (Source: NASA MEaSUREs (MODIS)).

Analysis on discharge of Baro River at Gumbela indicates that the peak discharge of about 1,000 cubic meters per second (cms) occurs between the last week of August and first week of September annually (Figure 24).

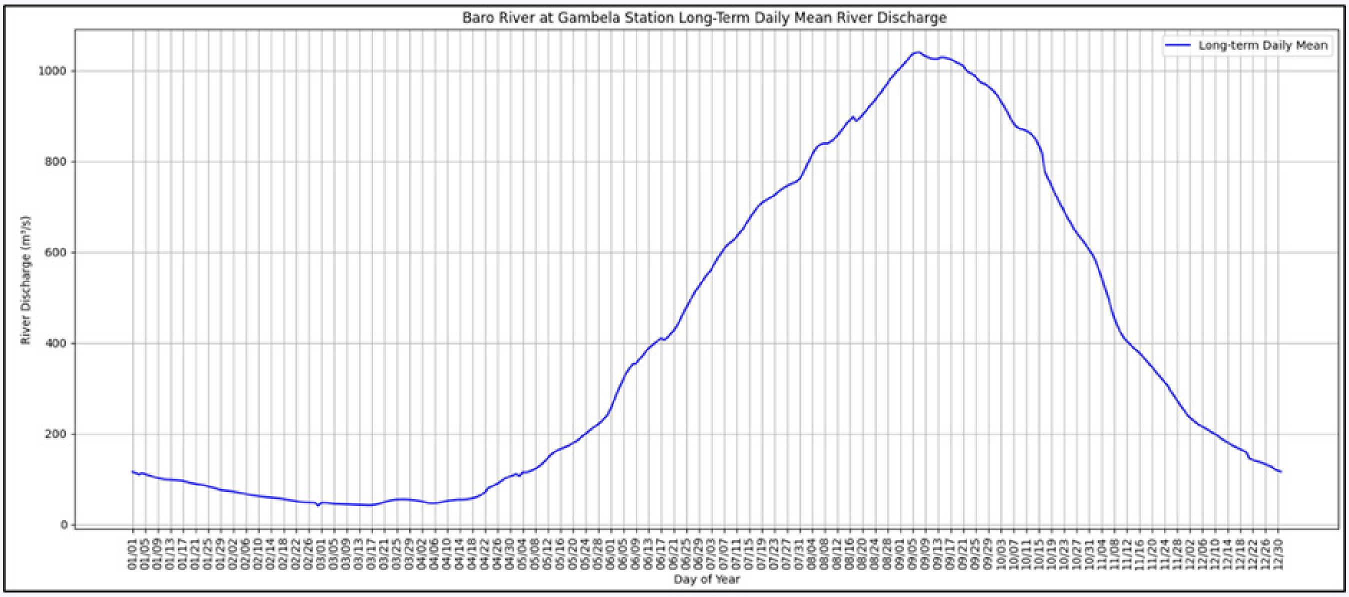

Figure 24: Long term daily means discharge for Baro River at Gumbela hydrological station with peak flow in August and September

5.3.2 Climate and Hydrological Outlook for JJAS 2025 and Implications

The June–July–August–September (JJAS) season—known locally as the Kiremt season—is the most significant rainfall period for Ethiopia, especially for its agriculture-dependent economy and water resource management. The JJAS contributes 50–80% of annual rainfall in highland and western Ethiopia and supports rainfed agriculture, which accounts for more than 95% of Ethiopia's crop production including teff, maize, sorghum, barley, wheat, and pulses.

The JJAS season also replenishes rivers, lakes, and groundwater, hence supporting Hydropower production (e.g., at the Grand Ethiopian Renaissance Dam on the Blue Nile), Urban water supplies, dry season irrigated agriculture. The season also supports livestock and pastoralism through regeneration of pastures and water points, particularly in highland and western lowland regions with indirect benefits to agro-pastoral and pastoral livelihoods by improving livestock condition and productivity.

EMA has not released downscaled and released climate outlook for the JJAS season in Ethiopia. However, indications from the recently released climate Outlook by ICPAC at the 70th GHACOF on 20th May 2025 indicated an increased likelihood of above-normal rainfall over the highlands of Ethiopia with about 60% chance and near-normal in much of the remaining parts with 35% chances. Equally the outlook also indicated that there are high chances of drier-than-normal conditions over parts of some parts of eastern and southern Ethiopia. Warmer-than-usual temperatures are expected across the country with varying degrees, which may exacerbate the impacts of heavy rainfall.

During the JJAS period river and lake are expected to experience high flows and levels due to the anticipated rainfall in some parts and reduced flow and levels due to enhanced evaporation over the southern and some parts of the eastern region. Hydrological simulations of the ICPAC climate outlook over the Nile Basin indicate that Lake Tana which is currently experiencing negative net flow - losses exceeds inflows, is expected to steadily increase and gain equilibrium in the last week of June and increase to a peak of about 400m3/s by mid-August. However, this phenomenon will not last as it declines back to negative values at the end of September (Figure 25)..

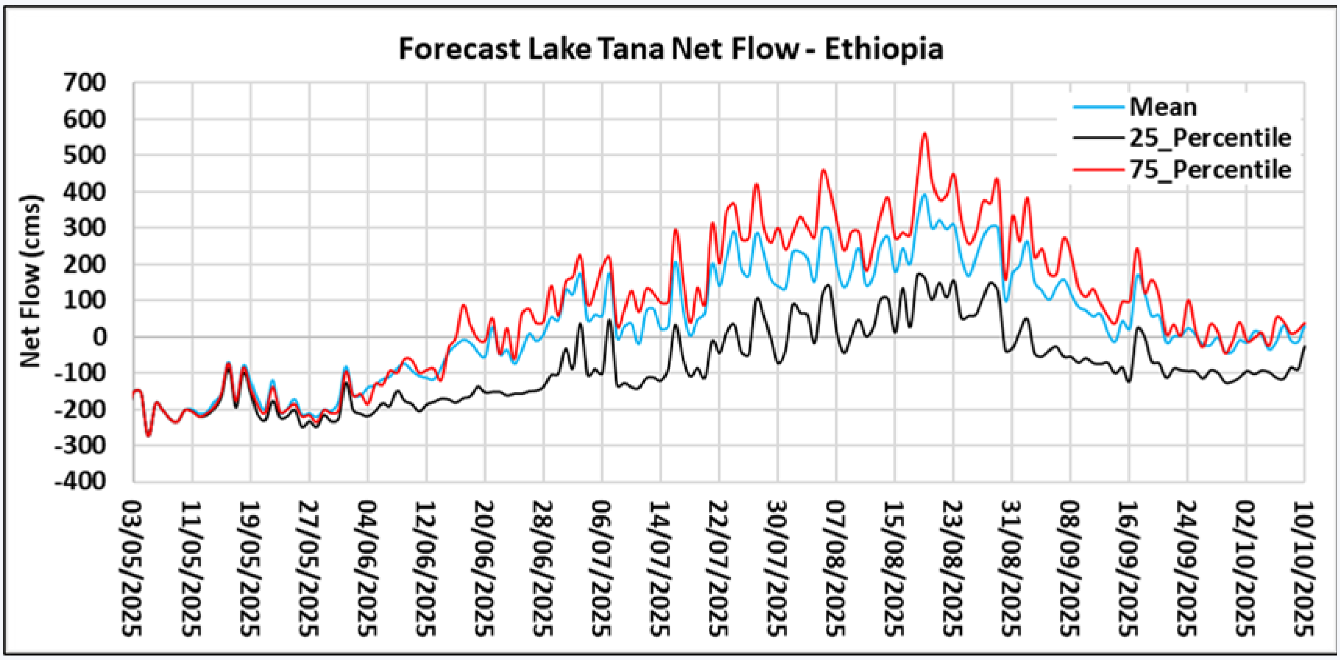

Figure 25: Long term daily means discharge for Baro River at Gambela hydrological station with peak

Simulation, bias correction and short-term forecasting of river discharge at Gambela station in Baro River revealed very low flows with an increasing trend in the discharge from June (Figure 26).

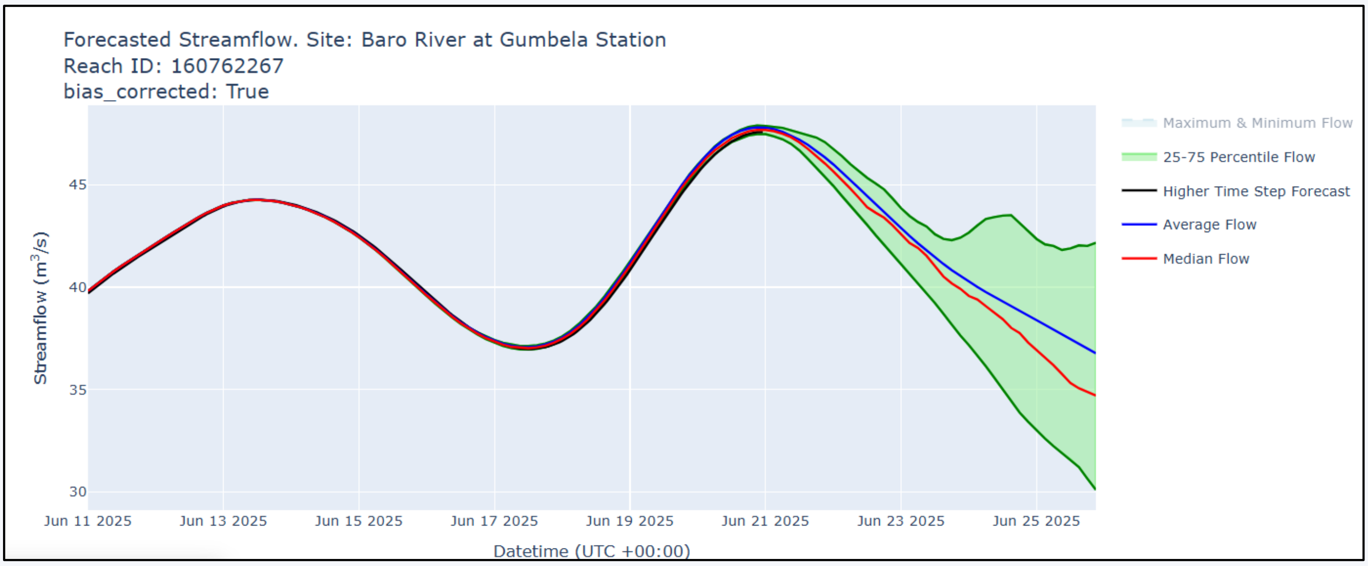

Figure 26: Long term daily means discharge for Baro River at Gumbela hydrological station with peak

The short-term forecast is very critical for effective management of reservoir operations and assists in drought and flood planning for hydropower generation planning, supports irrigation and water supply management and adaptation to changing hydrological conditions.

Implications of the JJAS Climate and Hydrological Outlook

Flooding and Infrastructure Damage

- Urban Flooding- Heavy rains may overwhelm drainage systems in urban areas, leading to flooding and infrastructure damage.
- River Flooding- Increased streamflow is anticipated in river catchments, raising the risk of flooding along the Blue Nile, Atbara, Gambella and Lake Tana regions.
- ● Flash floods and riverine floods, particularly in low-lying and flood-prone areas (e.g., Gambella and parts of Oromia).

Agriculture and food security

- Crop Yield Variability: While the rains benefit land preparation and planting, excessive rainfall, in some areas, can lead to waterlogging, affecting crop yields.
- Soil Erosion: Intense rainfall may cause soil erosion, reduce soil fertility and impacting long-term agricultural productivity.
- Pasture Degradation: Excessive long-days rainfall can lead to pasture degradation, affecting livestock health and productivity.
- Water Scarcity: In some regions, despite heavy rainfall, water scarcity may persist due to poor water management and infrastructure.

Health

- Disease Outbreaks: Standing water from floods can create breeding grounds for mosquitoes and other vectors, increasing the risk of malaria and other waterborne diseases.

5.4.3 Recommendations and Advisories for Stakeholders in Ethiopia

i. Flood Preparedness -Strengthen flood forecasting and early warning systems to mitigate risks.

ii. Continues monitoring and forecasting of rivers flow, lakes and reservoirs levels with an adaptive information generation sharing and management.

iii. Infrastructure Resilience- Invest in resilient infrastructure to withstand extreme weather events.

iv. Public Health Campaigns- Implement public health campaigns to prevent disease outbreaks related to flooding.

v. Agricultural Support- Provide support to farmers to manage the impacts of excessive rainfall on crops and livestock.

vi. Community Engagement -Engage local communities in preparedness and response planning to enhance resilience.

vii. Multi-channel advisories for the dissemination of flood warnings and safety information using radio, SMS, community meetings, and water extension services.

viii. Provided timely advisories for irrigation managers, pastoral communities, and urban water utilities.

ix. Water managers work closely with Ethiopian Electric power (EEP) for proper management of dams and reservoirs holding sufficient water for the next season and releasing surplus water.

x. Downscale the regional outlook to country hydrological outlook to affirm the advisory and actions to specific locations.

The anticipated above-normal rainfall during the JJAS 2025 season underscores the need for proactive measures to mitigate potential adverse effects on Ethiopia's agriculture, infrastructure, and public health systems.lic health systems.

5.4 Kenya

Kenya falls within the Lake Victoria basin in the Horn of Africa region of East Africa with a land surface area of about 583,370 km2. The Lake Victoria basin represents 8.5% of the basin drainage area in Kenya and about 1.5% in the Nile River Basin (Figure 27). The major rivers in Kenya draining into Lake Victoria are Nzoia, Mara, Nyando, Sondu-Miriu and Gucha-Migori. Lake Victoria serves as a primary source of food and income for many people living along its shores due to its vast fisheries, it provides vital transportation routes between various towns along the shoreline as well as Kenya and neighboring countries. The lake also plays a significant role in regulating the local climate, making it a crucial part of the Kenyan economy and ecosystem.

Figure 27: Part of Kenya in Nile Basin

5.4.1 Performance of the MAM 2025 Season and Impacts

The Kenya Meteorological Department (KMD) climate outlook for March-April-May (MAM) 2025 indicated a likelihood of above average rainfall in the Lake Victoria basin. It was observed that many parts of the western Kenya received moderate to heavy rainfall in the months of March, April and May 2025. Although increased flows were recorded in the months of April and May across rivers Nzoia, Yala, Nyando, Mara Sondu and Gucha-Migori, only the Sondu reached the flood alert levels (Figure 28).

Floods were experienced in the lower Sondu at Nyakwere and Osodo areas as well as within the lower Awach Tende River at Nyangweso village in Homabay County and Luanda River near Kisumu City (Figure 29). The low-lying villages of Kanyagwal, Ombaka and Kabonyo along the Lake Victoria shorelines remained inundated despite the slight decline in Lake levels.

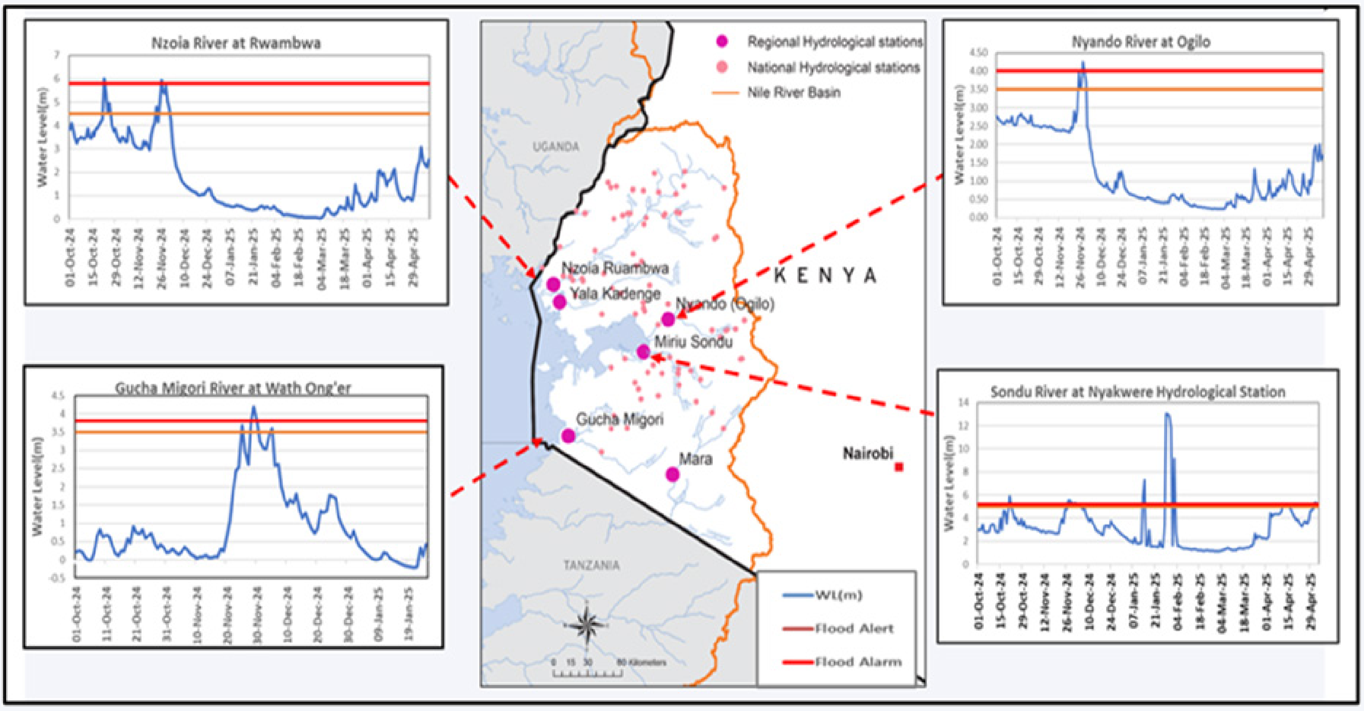

Figure 28: Observed River levels compared to flood levels in some tributaries in Lake Victoria Sub-basin.


Figure 29: Floods in Lower Sondu River at Osodo village

5.4.2 Climate and Hydrological Outlook for JJAS 2025 and Implications

The Kenya Meteorological Department (KMD) forecast for the JJAS season indicates a near normal to above normal rainfall in the western part of Kenya within the Lake Victoria basin.

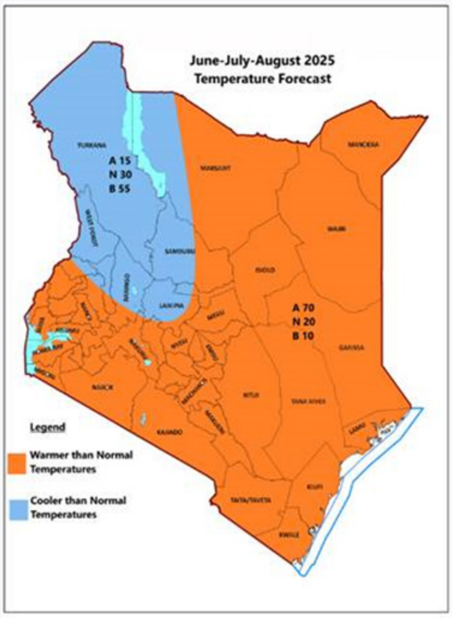

Figure 30: JJA 2025 rainfall forecast for Kenya

A 50% probability above normal is anticipated in the Nzoia and Yala River basins while for Nyando, Sondu, Gucha Migori and Mara River basins, a 35% probability of above normal rainfall is expected (Figure 30).

Consequently, it is expected that rivers within the Lake Victoria basin will maintain normal flows with a possibility of rising and overtopping the banks in the lower reaches.

The most vulnerable areas include lower Nyando downstream of Ahero town; shoreline streams such as Nyamasaria, Luanda and Ombeyi; Lower Sondu at Nyakwere; Lower Gucha Migori at Nyatike; Lower Yala downstream of Nyadorera market and the Yala Swamp; and Lower Nzoia around Ruambwa and Budalangi among others. Simulation and forecasting of Nzoia River flow at Ruambwa indicated a peak flow variation between 120m3/s to 190m3/s in the last week of September (Figure 31).

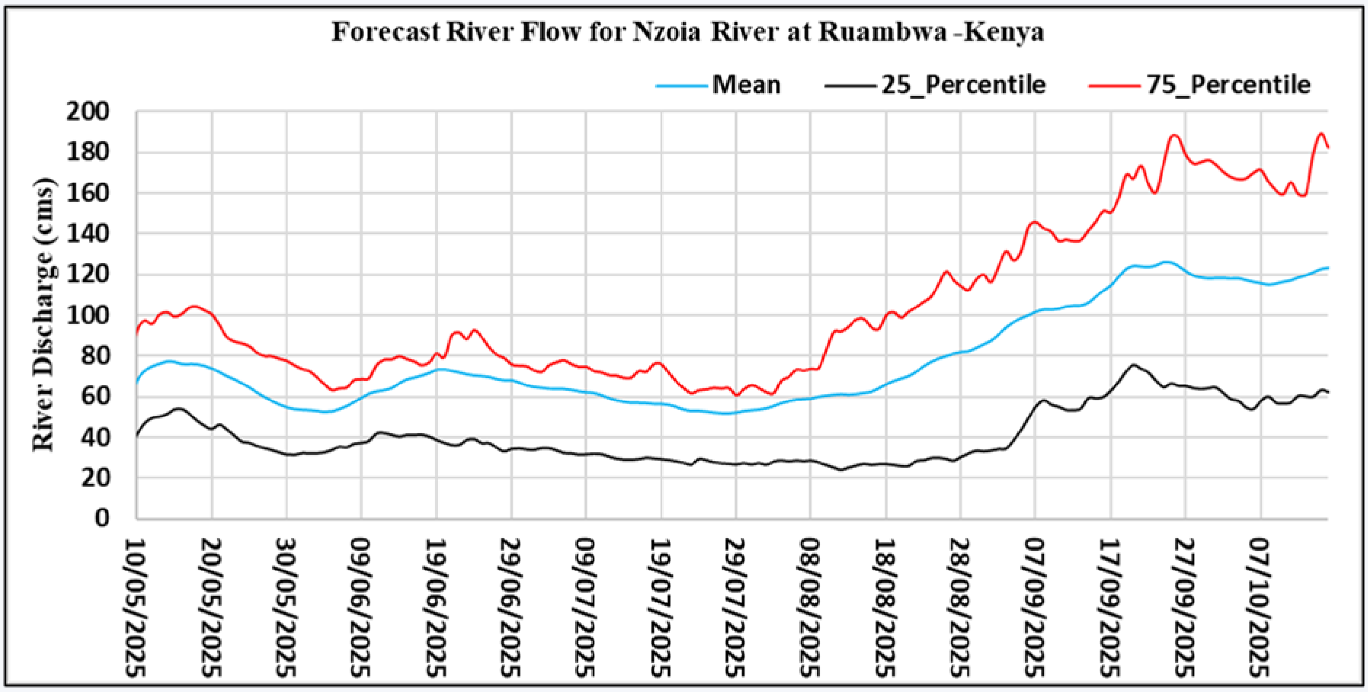

Figure 31: Nzoia River flow forecast at Ruambwa regional hydrological station for JJAS 2025 Season.

Incidences of flash floods may occur within the urban areas and towns while the river mouths and lake shoreline areas are likely to remain inundated.

Both positive and negative impacts are expected in Agriculture, Water Resources, Infrastructure and transport, Energy, Health and Tourism sectors:

- The JJAS is the harvesting season within the Lake Victoria basin in Kenya. It is also the time to prepare for the second planting season. Farming activities include both cash crops like tea, sugarcane and coffee as well as subsistence crops like maize, beans, sweet potatoes etc. With the anticipated wetter-than-normal-conditions, good crop yields are expected. Good pasture is also expected during this period.
- Available water resources for competing uses are anticipated as well as enhanced groundwater recharge. However, areas that are already waterlogged may experience an increase in inundation depths, thereby contaminating the open water sources and shallow wells thereby compromising the potability with increased likelihood of waterborne and water vector diseases.
- Optimum Hydroelectric Power generation at Sondu Miriu, Gogo and other small hydroelectric power plants within the basin.
- No significant impact on the transport sector. Widespread displacement of population by floods is also not anticipated

5.4.3 Climate and Hydrological Outlook for JJAS 2025 and Implications.

i. Prompt dissemination of the JJAS 2025 Hydrological Outlook to relevant (County/National) stakeholders.

ii. Continuous monitoring of river levels, flows and lake levels for regular review and updates of the forecast.

iii. Clear drainage systems in urban centres.

iv. Downscale the regional outlook to country hydrological outlook to affirm the advisory and actions to specific locations

5.5 Rwanda

Rwanda is in the most upstream part of the Nile Basin with a land surface area of about 26,338 km2 with about 76% in the Nile River Basin representing 0.6% of the Nile Basin drainage area. The Rwandan's hydrographic system is split into two basins divided by the Congo-Nile ridge, with water systems to the west of the ridge flowing into the Congo Basin, whereas those to the east of the ridge discharging into the Nile Basin (Figure 32). The country is increasingly experiencing the impacts of climate change. Rainfall has become increasingly intense, and the variability is predicted to increase by 5% to 10%.

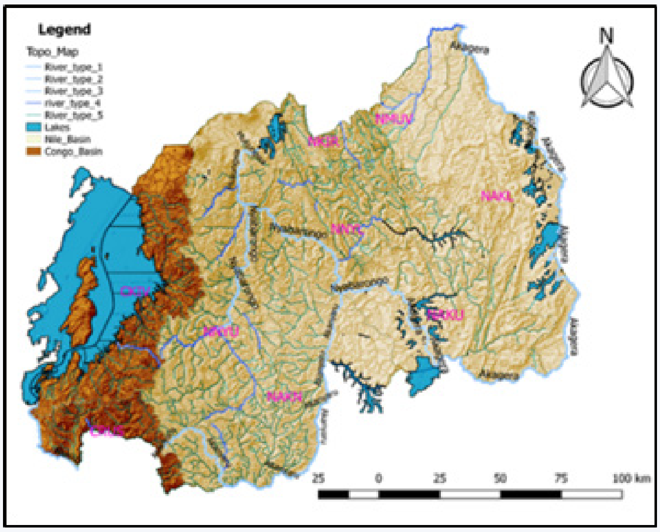

Figure 32: Map of Rwanda Nile Basin

Changes in temperature and precipitation and their distributions are the key drivers of climate and weather-related disasters that negatively affect Rwandans. Historically, droughts, floods, and landslides have resulted in infrastructure damage, loss of lives, livelihood and property, and increased soil erosion and water pollution

5.5.1 Performance of the MAM 2025 Season and Impacts

The Climate Outlook for the MAM 2025 season indicated slightly below the Long Term Mean rainfall. As MAM is the main rainy season, river levels and flows and lake water level were expected to increase and lead to riverine and flash floods especially in North-Western part of Rwanda. The predictions on the rise in water levels in rivers and lakes were confirmed with ground observation data at various monitoring stations across the country (Figures 33 and 34).

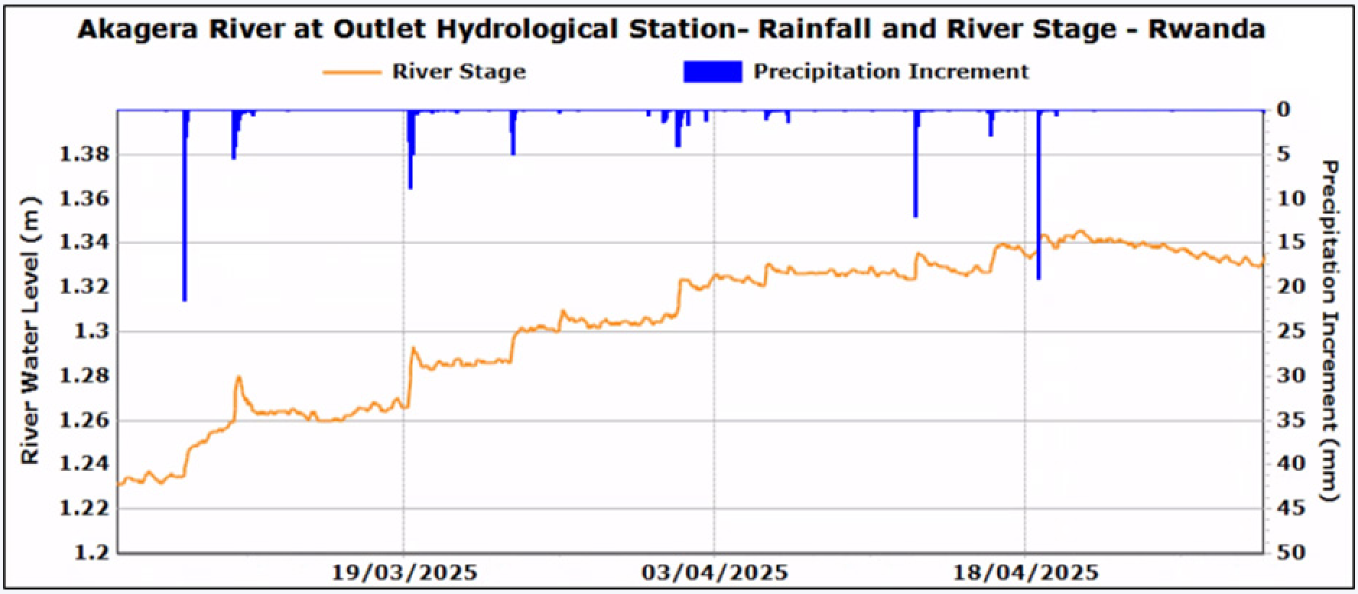

Figure 33: Observed river levels at Akgera River Outlet for the period of MAM 2025

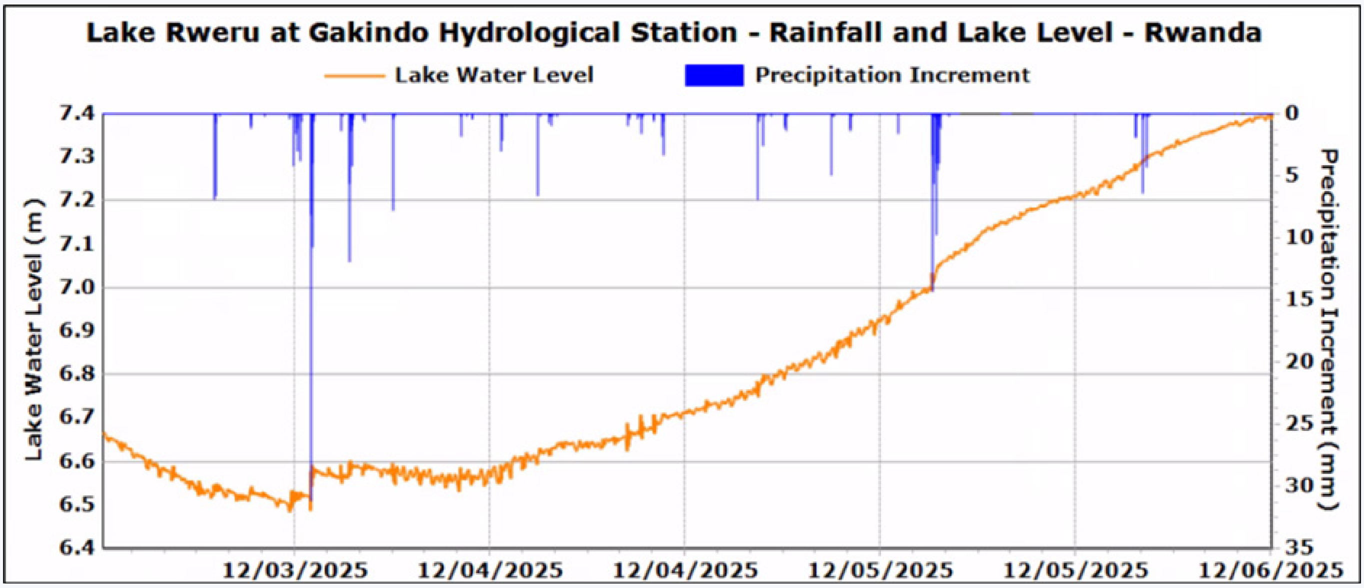

Figure 34: Observed Lake Rweru water level and rainfall at Gakindo Station for the period of MAM 2025

Incidences of flash floods were observed in small rivers and gullies due to high rainfall intensity in some areas of the North-West. Reported impacts (from March to 8th May) highlight the flood-related incidents as predicted by the MAM hydrological outlook. The leading impact was registered on the damage to croplands and households with recorded incidents of about 300 ha and 98 houses destroyed respectively (Figure 35)

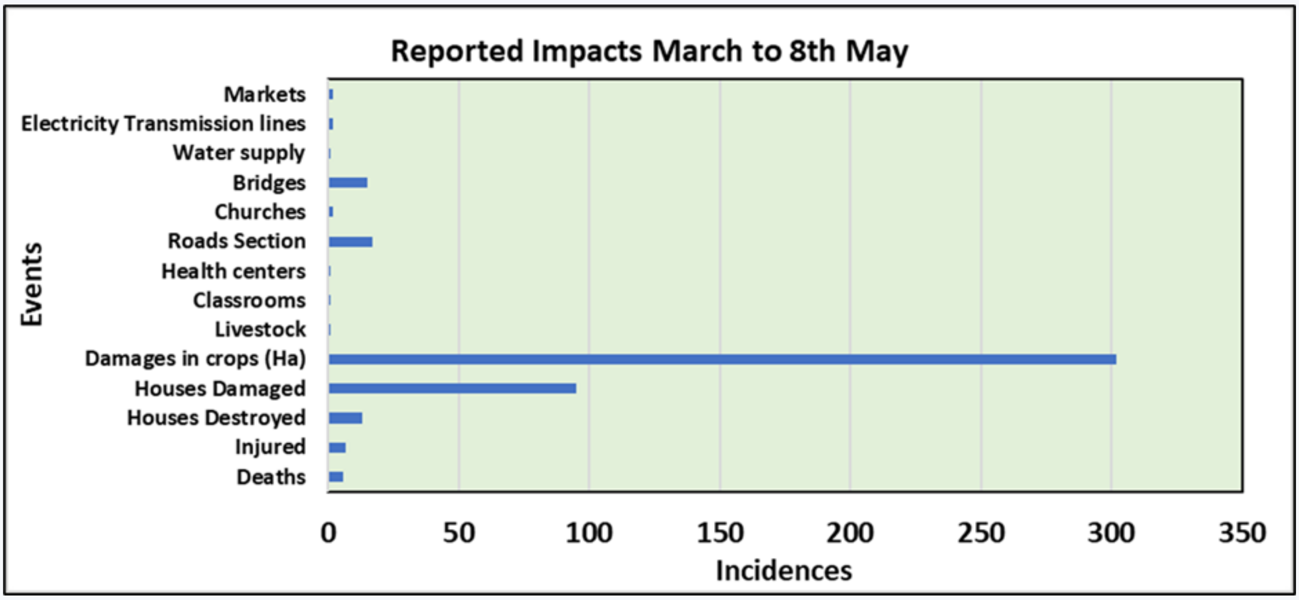

Figure 35: Reported events and incidents during March-May 2025

5.5.2 JJAS 2025 Season Outlook and Implications

JJAS is considered a main dry season in Rwanda. The seasonal forecast for June to September (JJAS) 2025 published by ICPAC indicated the main dry season with forecast of low rainfall in North-West of Rwanda. Consequently, river flows are expected to decrease which may lead to lakes and reservoir water level reduction.

Analysis on the observed historical daily flow of Akegera River at Kanzenze bridge indicated that the river flow varied between 42 and 100 cubic meters per second (cms) in June-September after the high flows ranging between 120m3/s to 160m3/s March - May (Figure 36). Short term forecast for the month of June indicated that the river expected to experience low flows ranging between 35cms and 78cms, slightly lower than the long term mean during the similar period (Figure 37) hence reduced inflow to Lake Rweru.

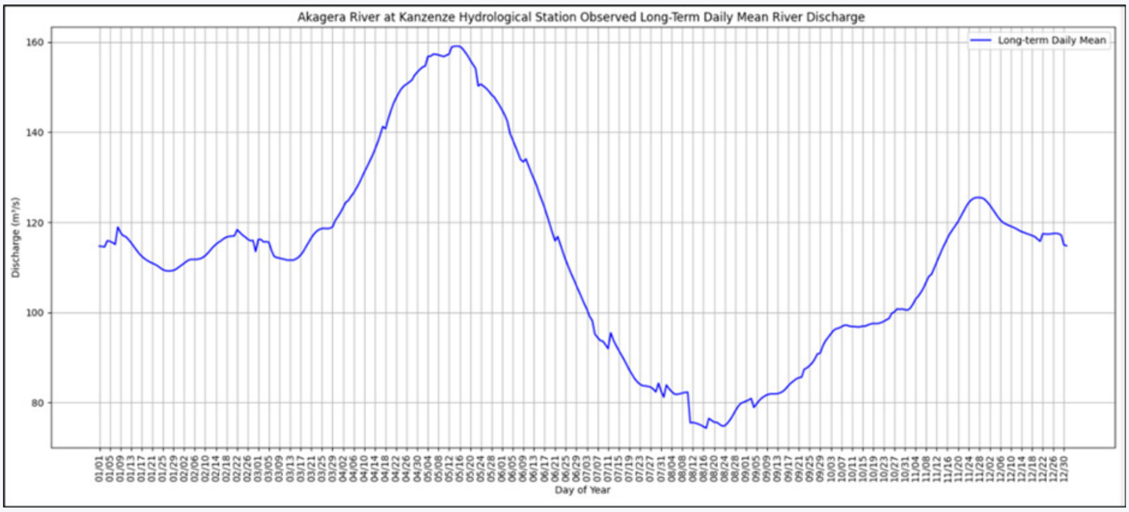

Figure 36: Long Term Mean of the observed daily flow of Akagera River at Kanzenze hydrological station.

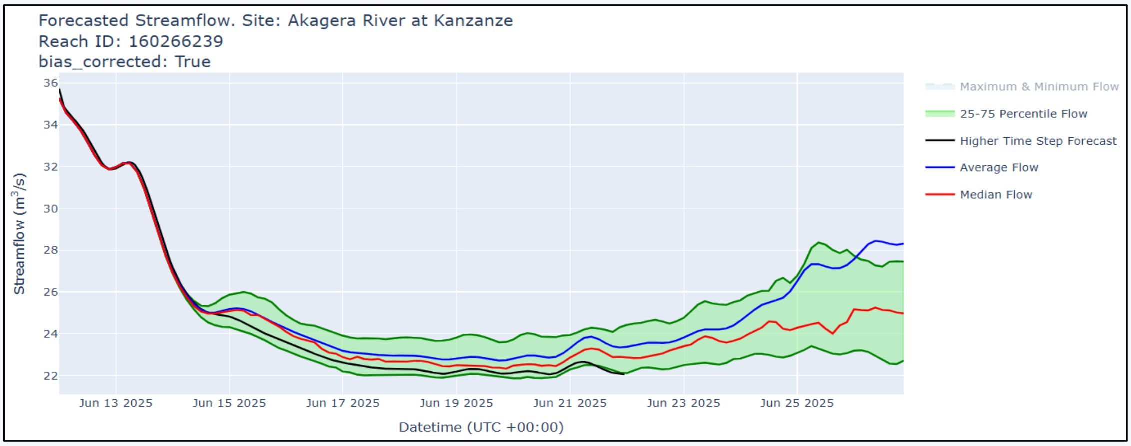

Figure 37: Short-term forecast of Akagera River flow at Kanzenze Hydrological Station for June.

5.5.3 March - May 2025 Outlook and Implications

The reduced flow from Akagera and inflow to Lake Rweru is expected to minimally impact the hydropower production and operations at Rusumo Hydropower Station as the lake levels will attenuate the flow downstream to Rusumo Hydropower. In addition, these changes will also be neutralized by the flows from Ruvuvu River from Burundi through Tanzania.

Other impacts include, reduction of agriculture production, reduction in most lake levels, reduced water availability for domestic water supply and reduced energy production for runoff hydropower plants.

5.5.4 Recommendations and Advisories

It is advised to focus on the following key aspects:.

i. Optimize dam operations through collaboration between the Rwanda Water Resources Board (RWB) and hydropower plants managers and water supply utility to adjust dam reservoir management to balance power production with water conservation measures.

ii. Rwanda Meteorology Agency and RWB to continue monitoring, forecasting and issue regular updates on river flow forecasts to inform intervention measures and strategies.

iii. Strengthen rural water access points through repair and use of boreholes and springs in anticipation of dry-season shortages.

iv. Monitor water quality since reduced flow may increase pollution concentration therefore enhance surveillance and treatment at water sources.

5.6 South Sudan

South Sudan is in the mid-stream part of the Nile Basin covering an area of about 644,329 km2 with about 98% in the Nile River Basin representing 20% of the basin drainage area. The country drainage system consists of four basins namely, White Nile, Bahr El Jebel, Sobat and Bahr El Ghazal (Figure 38). The Sudd wetland, located within Bahr-El Jebel and Bahr El Ghazel basins, is a regionally important hydrological feature in addition to the Machar Marshes in Sobat Sub basin. The country received annual rainfall of 500mm to 1800mm.

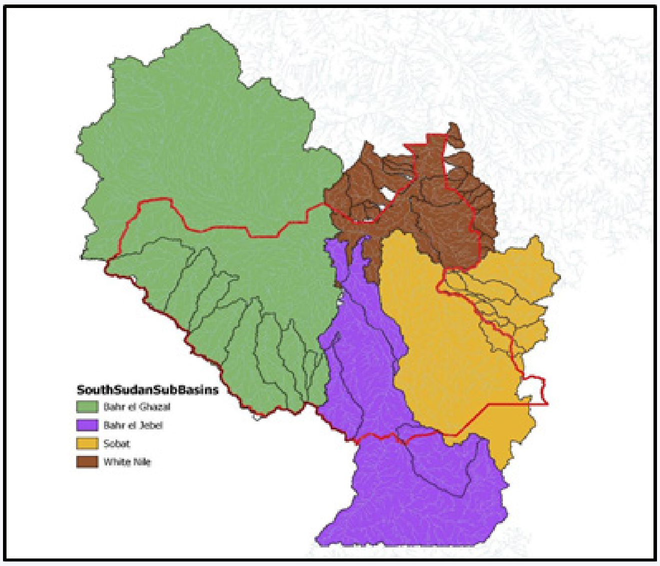

Figure 38: Map of South Sudan Nile Basin

Most rivers in South Sudan are transboundary in nature shared with neighbouring countries of Uganda, Sudan, Ethiopia and Kenya. These rivers are monitored by an eighth hydrometric station of which seven are either manual and/or automatic and one is manual. Five hydrological stations have been upgraded into fully functional regional stations under the NBI-Hydromet Project. Additionally, twenty (20) flood emergency gauge stations have been established under the Regional Climate Resilience Program, South Sudan Project to enhance the monitoring and generation of flood early warning information during the 2024 flood season.

5.6.1 Performance of the MAM 2025 Season and Impacts

During the March-May (MAM) 2025 season, South Sudan experienced significant climate anomalies, including an intense heatwave characterized by exceptionally high temperatures and below-average rainfall. The water levels at Mangalla during MAM 2025 exceeded the long-term maximum of 25-year return period and 0.37m higher than recorded in MAM 2024 (Figure 39)

The following impacts were recorded.

i. School Closures due to extreme heatwave conditions and flash floods, schools were forced to close, disrupting education.

ii. Flash floods claimed the lives of five family members, highlighting the severe humanitarian consequences of the extreme weather.

iii. Water harvesting systems in Eastern Equatoria dried up, exacerbating water shortages and affecting local communities' access to clean water.

5.6.2 June-September 2025 Outlook and Implications

The June-September (JJAS) 2025 seasonal forecast indicates that western, southwestern, and most of the countries are expected to receive normal to above-normal rainfall. Concurrently, temperature projections showed above-average warmth, signaling a likelihood of increased evapotranspiration and potential impacts on water availability. As JJAS constitutes the main rainy season, the hydrological status remains critical. Observations from monitored river systems reveal that water levels across most monitoring stations remain above the long-term maximum as shown in Bahr el Jebel River at Mangalla station. Compared to MAM 2024, water levels at Mangalla have increased by 0.37m, underscoring notable hydrological variability and the potential implications for flood management, agricultural activities, and water resource planning.

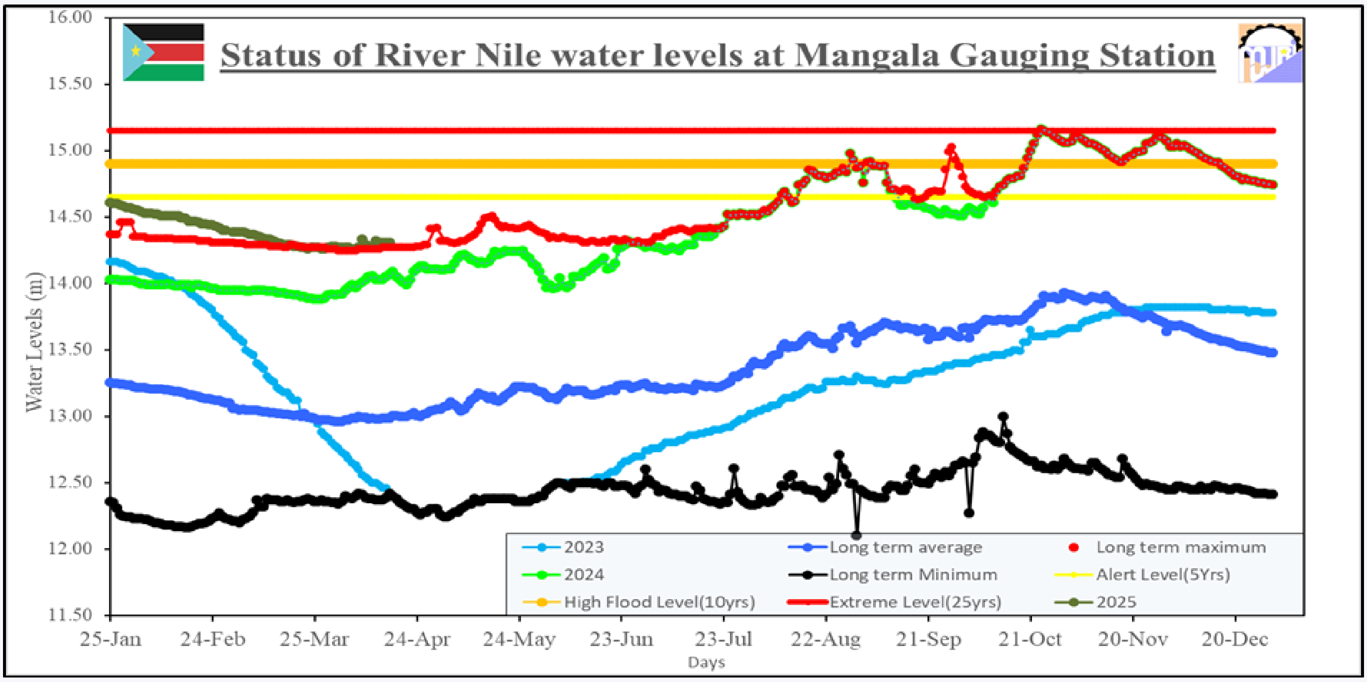

Figure 39: Observed water level in Bahr el Jebel River at Mangalla hydrological station

Additionally, the seasonal period from June to September, upstream water levels in Lake Victoria, Lake Kyoga and Lake Albert have remained stable, showing no significant increase beyond normal seasonal variations. Hydrological assessments indicate that inflow patterns have followed expected norms, with no abnormal surges or additional water accumulation observed.

Therefore, the following are the expected implications of the projected hydrological changes.

i. Increased river flow and flood risk as observation shows higher-than-normal water levels, combined with seasonal rainfall, may exacerbate flood risks in vulnerable areas, particularly downstream.

ii. Increased rainfall supports agricultural productivity, but localized flooding could damage farmlands in low-lying regions associated with loss of livelihoods.

iii. The cholera outbreak in Upper Nile, Bentiu, and Central Equatoria states continues to escalate, with a rising number of affected individuals. This might be exacerbated with projected increased temperature and likelihood of localized rainfall and flooding.

iv. Seasonal changes impact transportation and economy, worsening rural roads access while improving river transport, boosting fishing, and enhancing barge navigation.

5.6.3 Recommendations and Advisories

i. Involves a multi-channel approach to improved efficiency and outreach for dissemination of flood warnings information through radio broadcasts, mobile alerts, and local community networks, ensuring timely communication and preparedness.

ii. Clearance and maintenance of urban and rural drainage networks to prevent water accumulation in vulnerable areas, to mitigate the impacts of flash floods and reduce infrastructure damage.

iii. Continuous in monitoring of river and lake water levels from existing monitoring networks, for providing timely updates for flood forecasting and risk assessment to enhance early warning information generation and dissemination.

iv. Strengthen reservoirs storages, haffirs, and underground recharge systems to stabilize water supply and improve long-term resource sustainability, ensuring resilience against climatic variability.

v. Upgrade and maintenance of dykes and flood mitigation infrastructures in high-risk zones to minimize vulnerabilities and enhance community safety against extreme weather events.

vi. Enhanced collaboration among National Meteorological and Hydrological Services (NMHSs), to establish a collaborative framework to deliver forecast accuracy and timely, for supporting decision-making, and strengthening disaster preparedness.

5.7 Sudan

The Nile Basin, expanding approximately 1.32 million square kilometers within Sudan, accounts for nearly 70% of the country's land area and 43% of the entire Nile Basin drainage area. This region includes the Blue Nile, White Nile, and Atbara River. The Blue Nile and White Nile merge at Khartoum, forming the Nile River, which flows for 1,755 kilometers until it reaches the High Aswan Dam in Egypt (Figure 40). The Nile network in Sudan is marked by seasonal variations and significant contributions from tributaries, particularly the Sobat, Dinder, and Rahad rivers.

Figure 40: Map of Sudan Nile Basin

The Nile serves as Sudan's agricultural lifeline, supplying vital irrigation water for crops such as cotton, wheat, and sorghum. Irrigated agriculture along the Nile is more dependable and profitable compared to rainfed agriculture, which is becoming increasingly unreliable due to climate change. Hydropower, generated by several dams including the Merowe Dam, is a major source of electricity, with the Nile's flow being essential for consistent power generation. Additionally, the Nile replenishes groundwater aquifers, such as the Nubian Sandstone Aquifer. Moreover, the Nile serves as a vital transportation artery, enabling the movement of goods and people. Its navigable stretches between Khartoum and Juba are crucial for trade and connectivity.

5.7.1 Performance of the MAM 2025 Season and Impacts

In Sudan, the MAM Season period represents the transition from the dry season (boreal winter) to the early stages of the rainy season, particularly in the southern and south-central parts of the country. The levels and flows in the Blue Nile remained low with minimal increase as observed from Khartoum hydrological station (Figure 41). The White Nile remains at a relatively stable flow as it is fed by the Equatorial Lakes region significantly moderated by Suud Wetlands. Atbara River also experienced minimal flow but expected to increase in flow and levels in June to September in response to projected rains in the Ethiopian Highlands expected from June through July and August 2025.

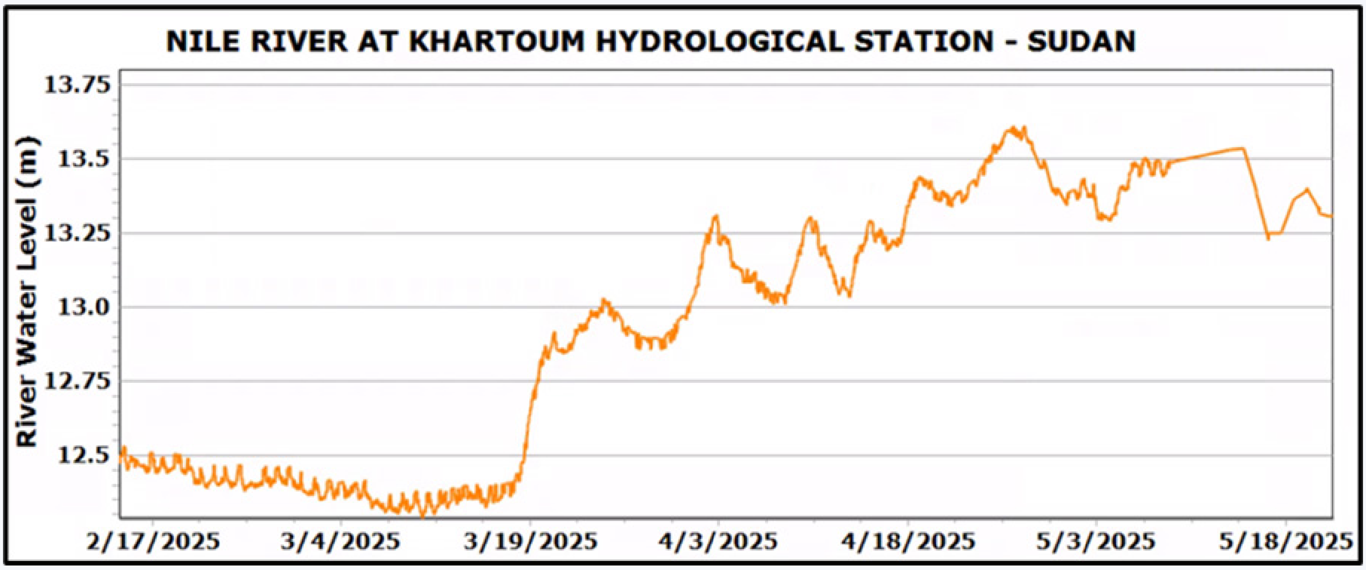

Figure 41: Observed River water level on the Blue Nile River at Khartoum hydrological station for MAM Season.

Analysis of the surface water extent of Jebel Aulia reservoir indicated a conservative value with a declining trend in MAM season (Figure 42).

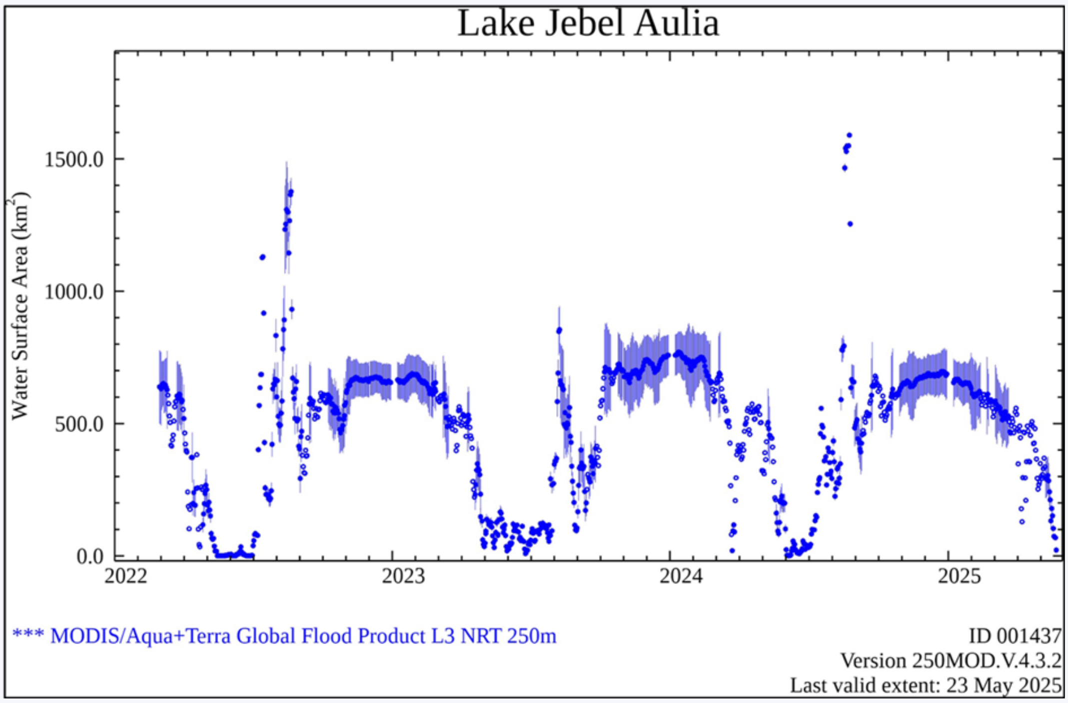

Figure 42: Satellite derived from the Lake Surface water area for Jebel Aulia. (Source: NASA MEaSUREs (MODIS))

5.7.2 June-September Outlook 2025 Season and Implications

According to the ICPAC seasonal climate outlook issued for the Greater Horn of Africa, above-normal rainfall is expected in most parts of Sudan during the June–September period. This pattern is anticipated to be like previous years such as 1998 and 2010 where above-average rainfall were recorded. The southern and central part of the country areas are likely to receive increased rainfall, which may lead to localized flooding while the northern part usually drier but occasional light rainfall events might be experienced during the JJAS season. The western and coastal parts are also expected to experience wetter-than-normal conditions.

Simulations of the above climatic condition indicated an increased river flows and reservoir levels where the peak flow is expected in August and September at Khartoum. Figure 43 show the simulated forecast of river in-flows to jebel Aulia and Rossaries reservoirs indicating peak flow variation of 2,000 - 3,500cm in the fourth week of September and 1,100-1,200 in the second week of last week of August respectively.

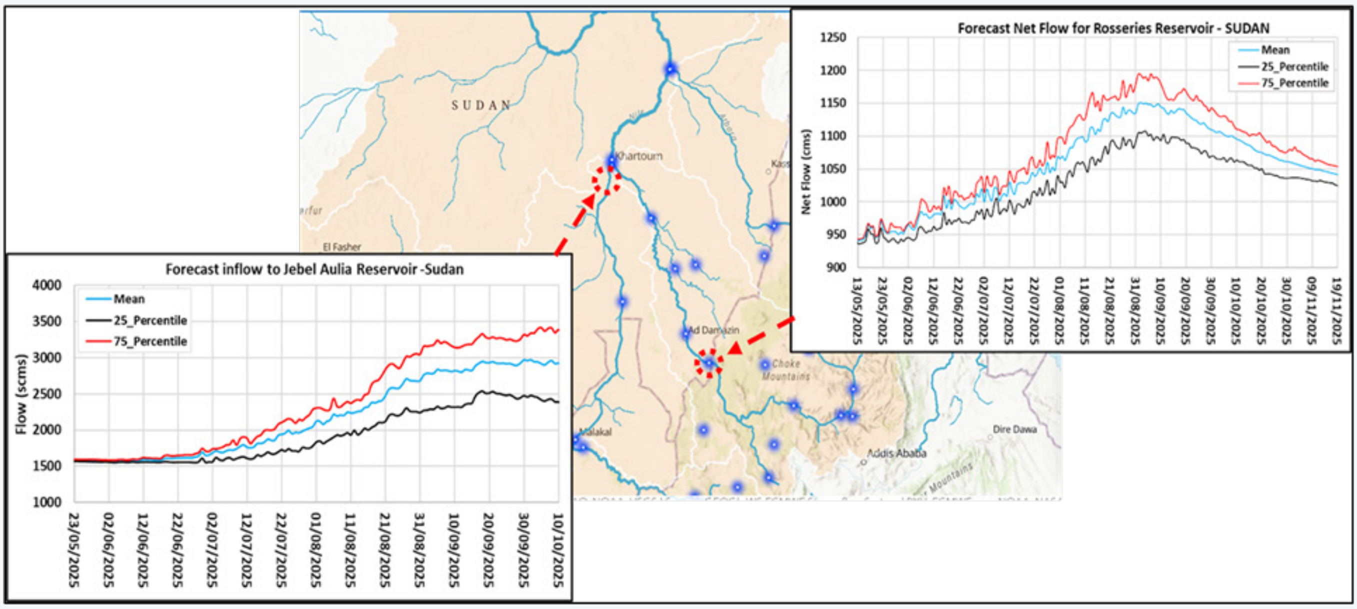

Figure 43: Simulated forecast river inflow to Jebel Aulia and Rosseries reservoirs during the JJAS 2024.

5.7.3 Recommendations and Advisories

Based on the June–September 2025 Climate and Hydrological Outlook for Sudan, which forecasts above-normal rainfall and higher-than-average temperatures, the country faces both opportunities (e.g., improved water availability) and risks (e.g., flooding, heat stress).

With the Above-average rainfall especially in southern, central, and western regions and high likelihood of flooding in river basins (Blue Nile, White Nile, Atbara) as well as the projected warmer-than-normal conditions countrywide, the following are sector-specific and actionable recommendations and advisories as well as regional risks ad priority actions (Table 1).

1. Activate National Flood Emergency Committees and update flood contingency plans.
2. Strengthen community-based early warning systems with updated alerts from the Sudan Meteorological Authority (SMA).
3. Map and prepare emergency plans for flood-prone areas (e.g., Khartoum, Al Jazirah, Blue Nile, White Nile - downstream of Jebel Aulia dam and South Darfur).
4. High river discharge may lead to overflow of Nile and tributaries hence potential dam safety concerns and inundation downstream should be undertaken especially in the downstream of Jebel Aulia and Rossaries reservoirs to inform evacuation and recovery plans
5. Adjust hydropower reservoir operations to balance flood control and power generation
6. Ensure daily/weekly updates from the Sudan Meteorological Authority (SMA) and Ministry of Irrigation and Water Resources to ensure the translation of forecasts and alerts into local languages for better reach.

Table 1: regions, risks and priority action for JJAS 2025 for Sudan

No.	Region	Key Risks	Priority Actions
1	Khartoum State	Urban flooding, infrastructure	Drain clearing, emergency response prep
2	Blue Nile	Riverine flooding	Evacuation plan, disease control
3	North Darfur	Flash floods, displacement	IDP protection, mobile health services
4	Al Jazirah	Agricultural flooding	Field drainage, pest management
5	White Nile - Jebel Aulia	Downstream flooding	Ensure adherence to dam safety guidelines and adapt to safe releases

5.8 Tanzania

Tanzania lies in the upstream part of the Nile Basin, covering approximately 945,100 km², of which about 12% falls within the Nile River Basin. This area represents around 2.7% of the entire Nile Basin drainage area. The Lake Victoria Basin within Tanzania supports a population of about 6 million people and is divided into five catchments: Kagera, Mara, Simiyu, Magogo-Moame, and Isanga (see Figure 44). The main rivers in these catchments include the Kagera, Simiyu, Mbarageti, Grumeti, Duma, Mara, Ngono, Magogo-Moame, Isanga, and Mori.

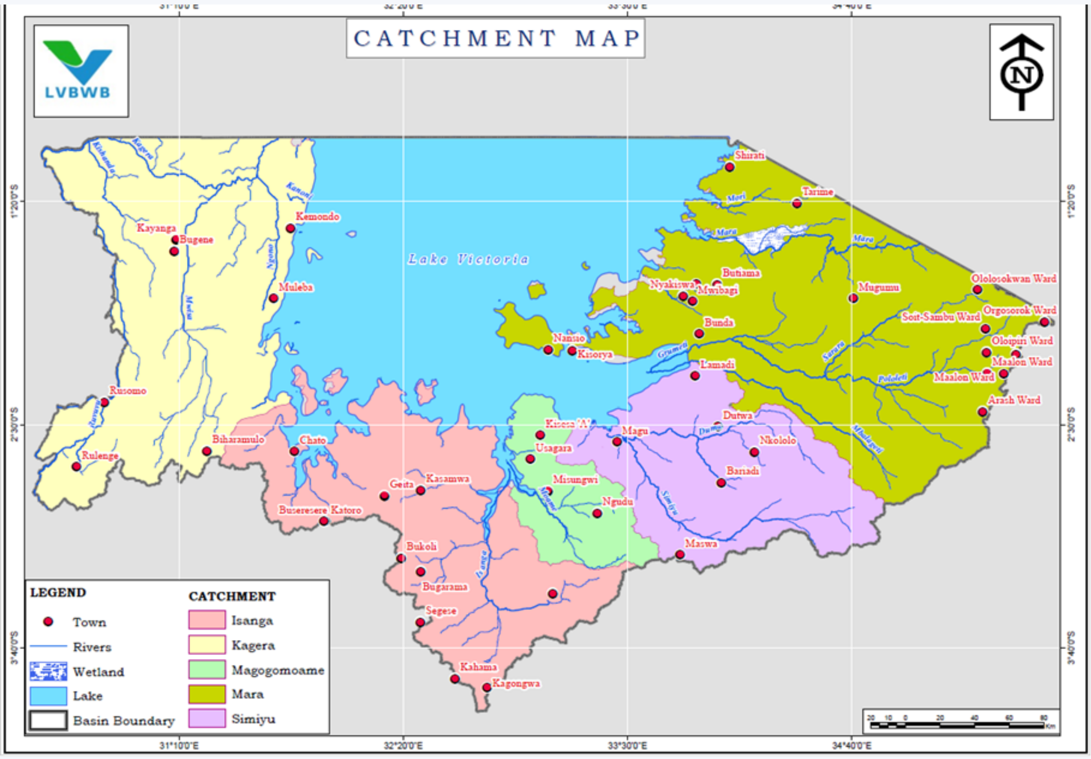

Figure 44: Five catchments of Lake Victoria Basin Water Board in the Nile Basin- Tanzania

5.8.1 Performance of MAM 2025 Season

In the season of March to May 2025, the basin received normal to below normal rainfall conditions as forecasted by the Tanzania Meteorological Agency (TMA). The observation and analysis indicated accurate and good performance except for the month of March where the forecasted rainfall and the performance differ significantly (Figures 45 and 46).

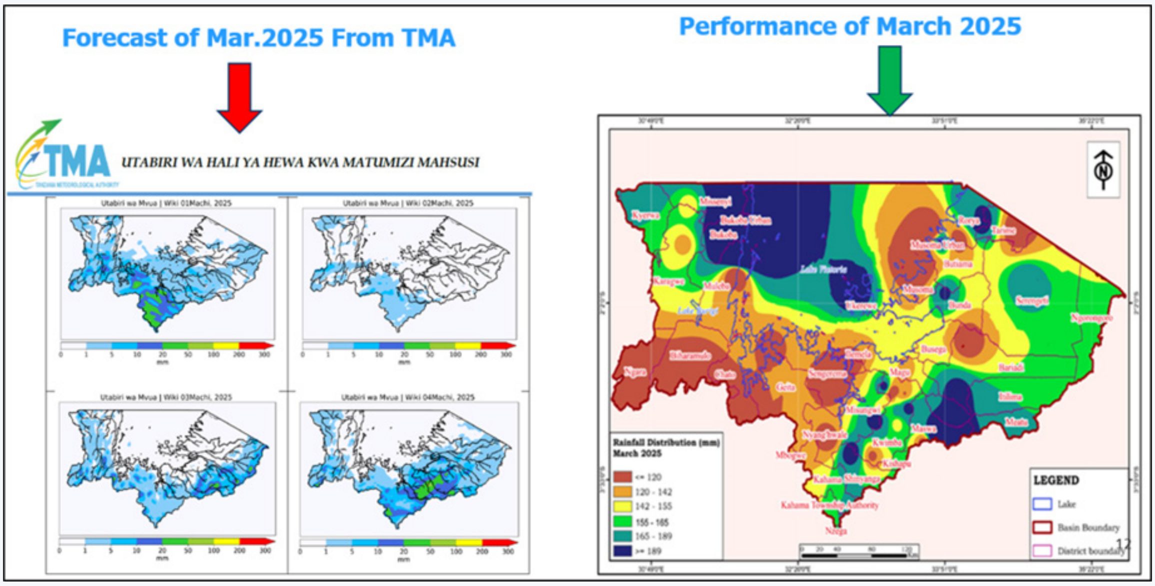

Figure 45: Comparing the forecast and observed March rainfall for Lake Victoria Basin -Tanzania

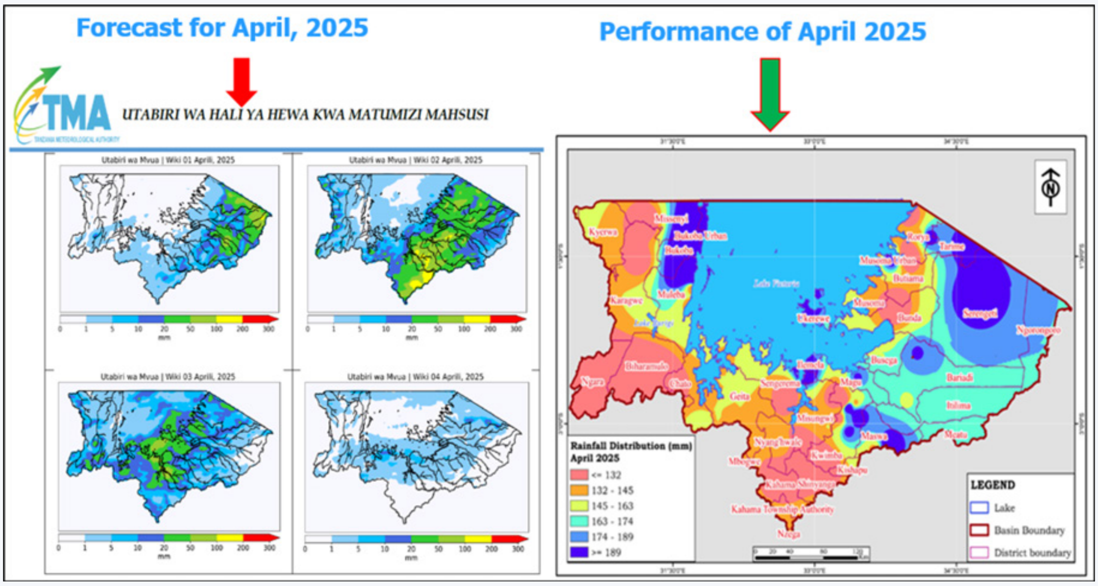

Figure 46: Comparing the forecast and observed April rainfall for Lake Victoria Basin -Tanzania.

The information from both regional and national monitoring stations MAM 2025 indicated that river inflows were lower compared to the inflows recorded in MAM 2024. This was attributed to the fact that in 2024 the basin received rainfall above Normal in 2024 (Figure 47).

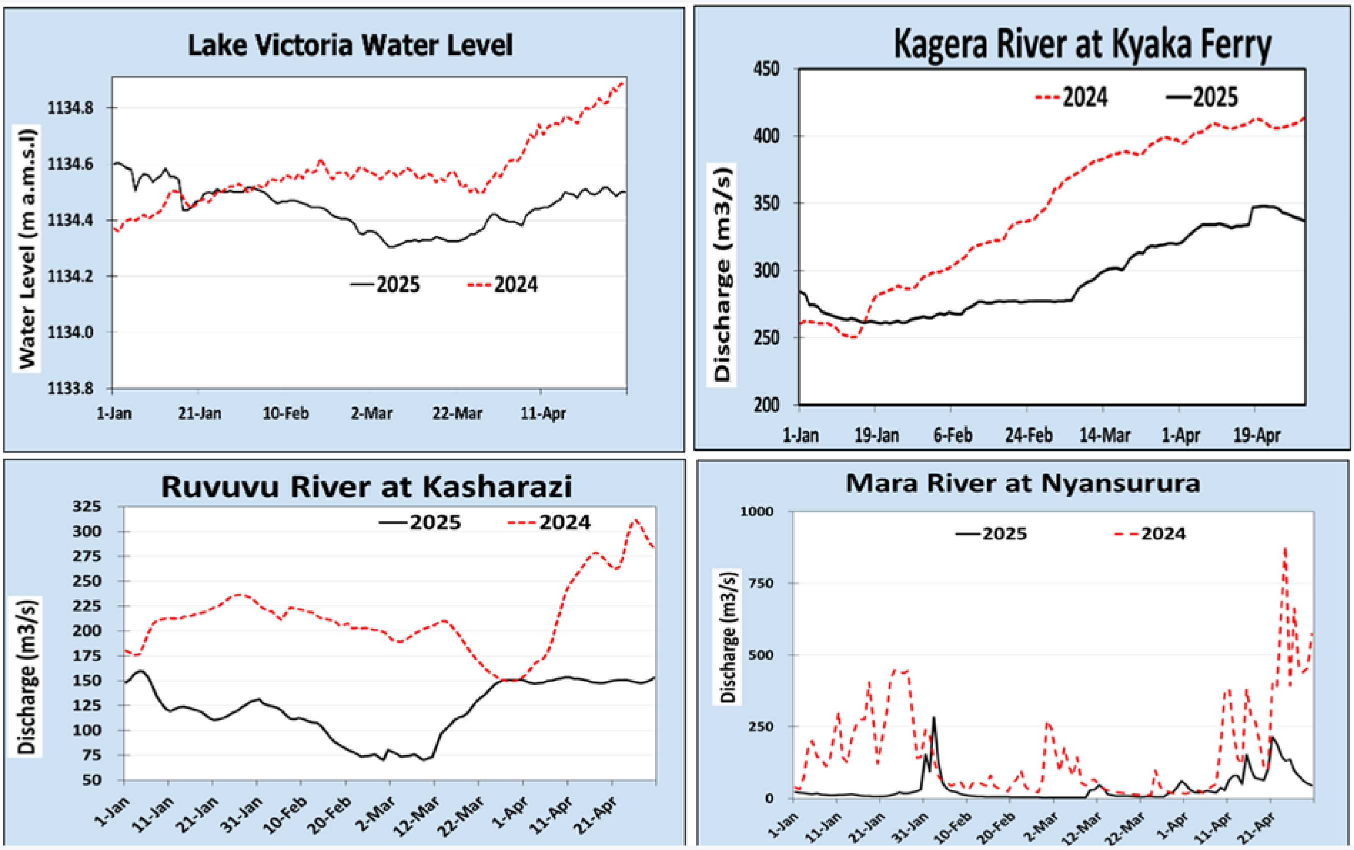

Figure 47: The trends of Lake Victoria river inflows and lake water levels for MAM 2025.

Recorded impacts include interrupted transport services in Mwanza region especially at Mkuyuni area where the bridge was flooded following downpours of two hours from 09:30 am to 11:30am on April 8, 2025 affecting traffic flow. The figure 47 below describes the flood effect.

Figure 48: Flooding in Mwanza during the MAM 2025 rainfall Season

5.8.2 June-September 2025 Outlook and Implications

The June to September 2025 seasonal forecast from ICPAC's GHACOF indicated a dry season for the entire country. This was expected as the JJAS season is always the period where many areas in the country experience the dry season. The dry season conditions will affect the decrease in river flows and lake water levels in many regions.

Simulation of the ICPAC climate outlook through hydrological modelling revealed a drier period with reduced flows and lake level. Forecast river flow for Kagera River - one of the main rivers draining into Lake Victoria- at the outlet at Kyaka hydrological station indicated low variation throughout the JJAS 2025 period (Figure 49), a situation similar to many rivers in the basin such as Mara and Simiyu.

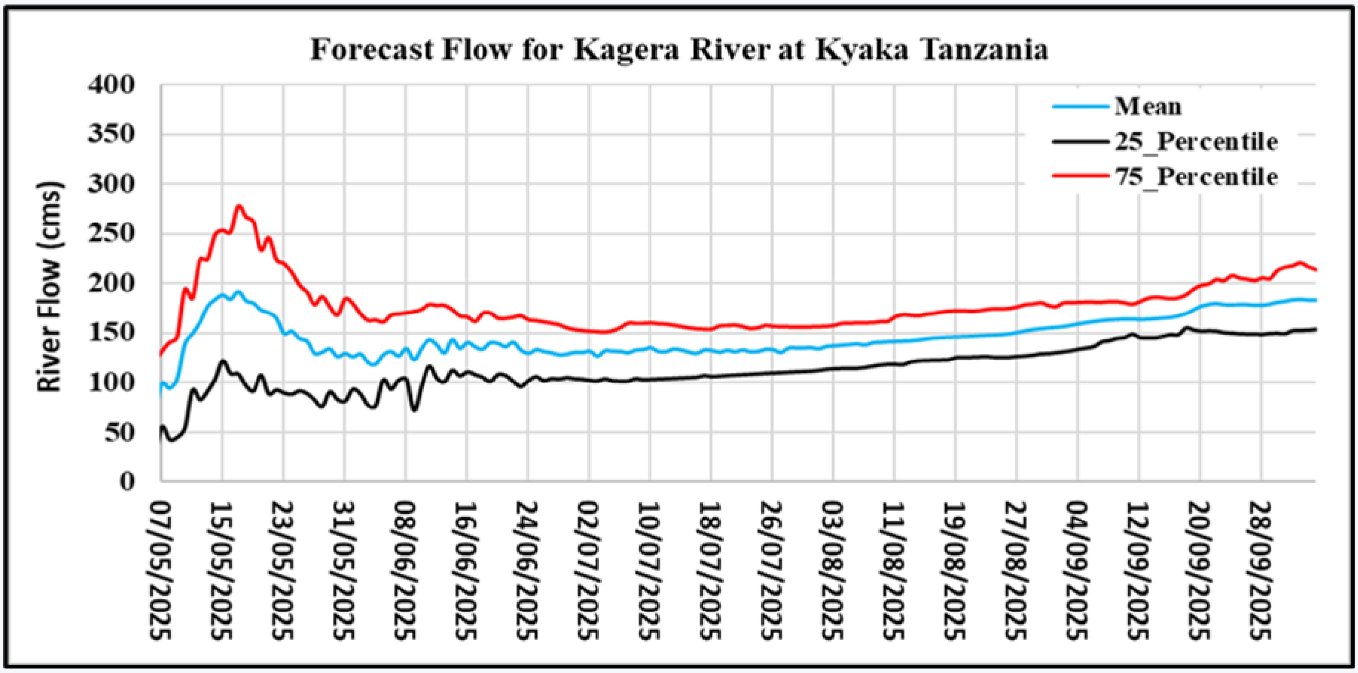

Figure 49: Forecast river flow for Kagera River outlet at Kyaka station for JJAS 2025.

5.8.3 JRecommendations and advisory

i. Increase awareness to the community for efficient utilization of the obtained resources such food, energy and water for the coming dry season especially; Maswa district in Simiyu region and Southern part of the Basin

ii. Continuous monitoring and forecasting of climate variables by TMA and river flow and lake levels to refine and update information to guide various decisions in this part of the basin.

iii. Also increased awareness creation to the communities who are most to be affected due to this dry condition such as livestock keepers that are most likely to be affected by loss of pasture, and water to feed their livestock.

5.8 Uganda

Uganda is a landlocked country located within Eastern Africa and an upstream part of the Nile Basin covering an area of about 235,880 km2 with about 98% in the Nile River Basin representing 7.4% of the Nile Basin drainage area. The country plays host to four Nile sub-basins, namely, Bahr El Jebel, Victoria Nile, Lake Victoria and Lake Albert. Uganda is subdivided into eight major drainage basins: Lake Victoria, Lake Albert, Lake Kyoga, Lake Edward, Victoria Nile, Albert Nile, Aswa and Kidepo (Figure 50).

Figure 50: Map of drainage area in Uganda

5.9.1 Performance of MAM 2025 Season and Impacts

Lakes Victoria and Kyoga basin received near to above normal rainfall as forecasted in the MAM season. No flooding was recorded on the shorelines of Lake Kyoga as the maximum water level was 0.41m below the maximum of 2024. The areas around Mt. Rwenzori received higher than forecasted rainfall resulting in flooding due to the rivers bursting off their banks leading to loss of 3 people and destroying properties from 13 villages in mid-March 2025 in Rwenzori regions.

In the period March to May, Lakes Victoria and Kyoga water levels rose in response to enhanced rainfall over their basins, though they did not reach their maximum water levels of 1136.72m and 1035.91m respectively. For this season, the maximum outflow from Lake Albert registered at Laropi station before the South Sudan border was 3,104m3/s due to the enhanced rainfall of the basins of Victoria and Kyoga (Figure 51). Observed record for Lake Albert indicated a steady decline and drop by about 0.8m -from 625.30m to 624.50m- during the MAM period (Figure 52). Comparison between the forecasted and observed Lake Victoria water levels revealed minimal variance up 0.15m (Figure 53).

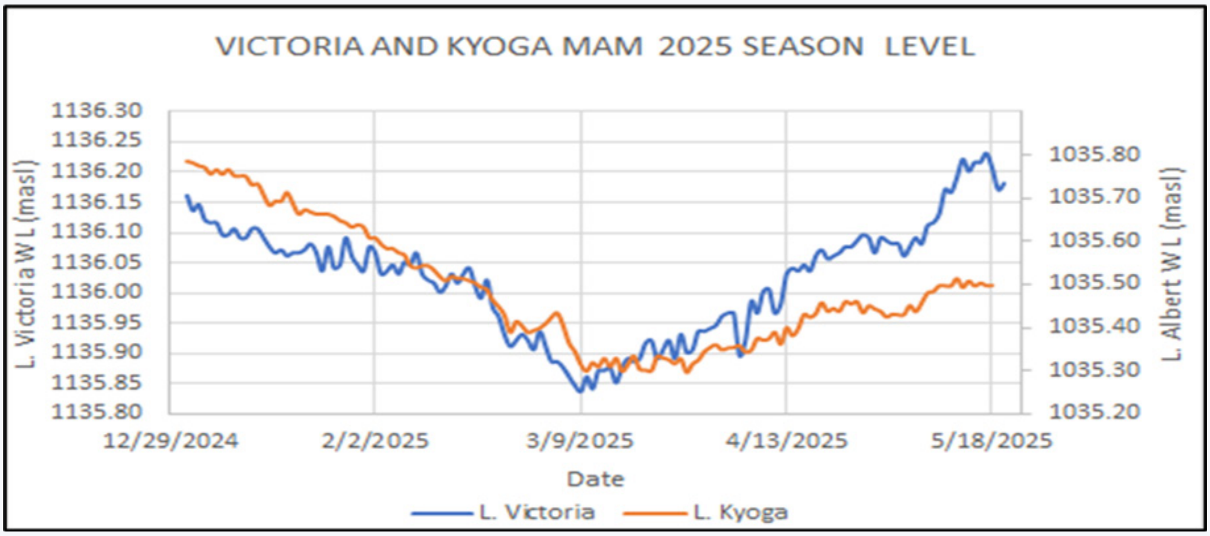

Figure 51: Observed lake levels for Lake Victoria and Lake Kyoga during MAM 2025 Season

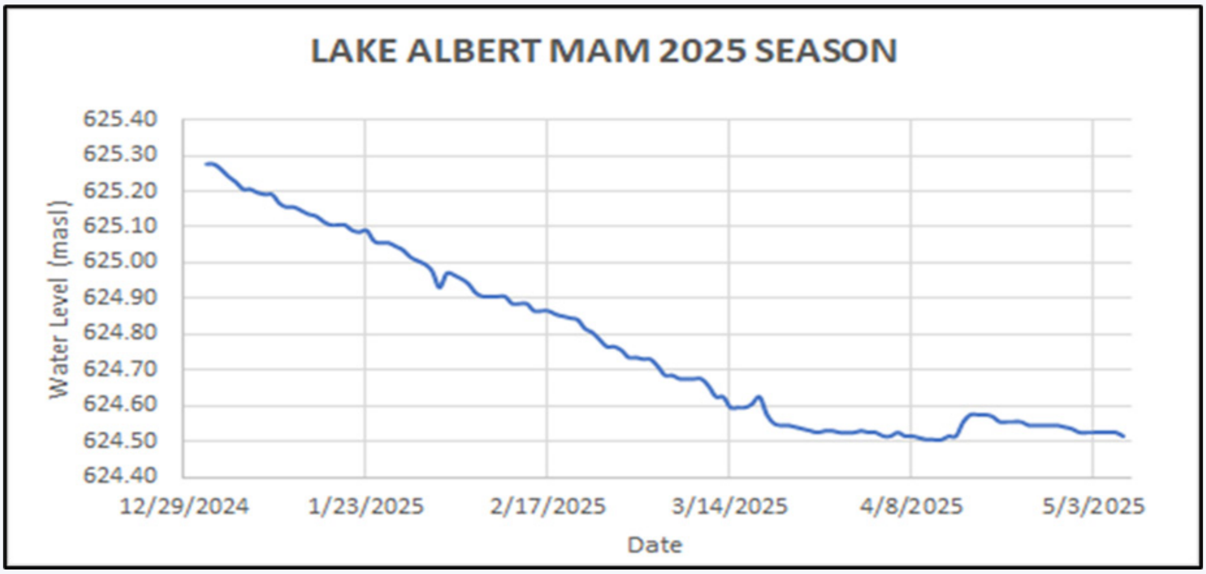

Figure 52: Observed lake levels for Lake Albert during MAM 2025 Season.

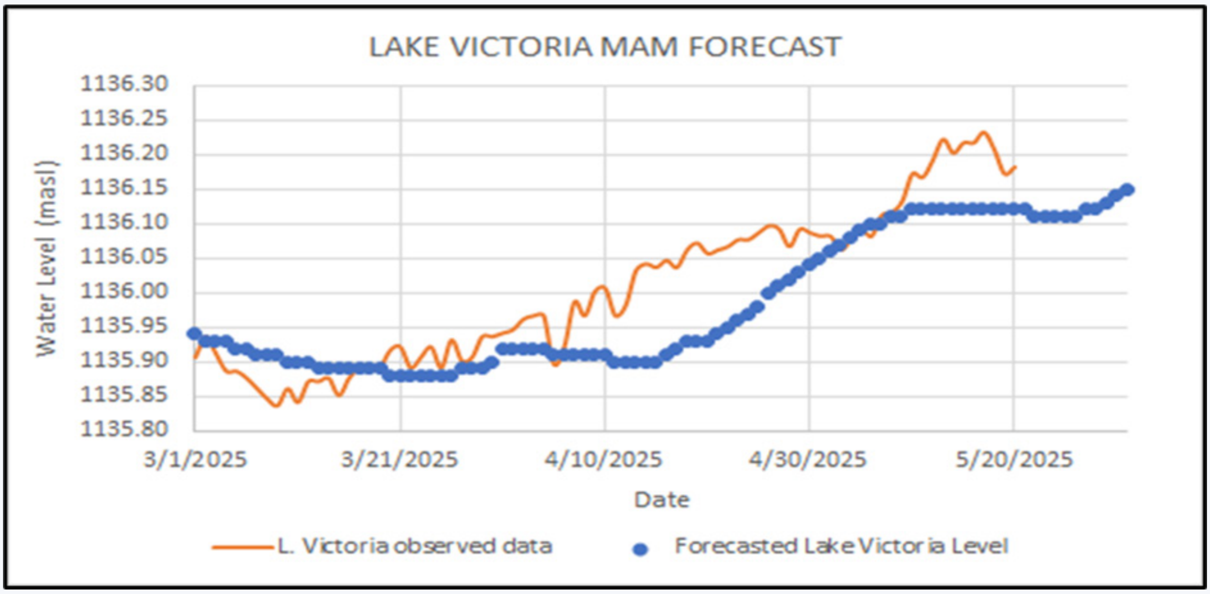

Figure 53: Comparison between forecasted Lake Victoria levels and the observed lake levels for MAM season performance using the Nile optimization tool.

Observed impacts of MAM 2025 include Flash floods around R. Nyamwamba lead to loss of lives (humans and animals) and destruction of properties. During this incident, 3 people lost their lives and 13 villages were affected around mid-March 2025. Roads were cut off and several properties destroyed within the suburbs of Kampala city due to flash floods (Figure 54). The cattle corridor experienced a significant impact due to the expected near-normal rainfall, which suppressed rainfall formation and delayed the onset of the rainy season. This delay led to extended dry and hot conditions, affecting both livestock and crop production in some regions.

Figure 54: Flash floods reported for River Nyamwamba and Kampala suburbs

5.9.2 June-September 2025 Outlook and Implications

The eastern part of Uganda, Lake Kyoga basin and Lake Victoria portion of the basin in Kenya and Tanzania are forecasted to receive near normal to above normal rainfall. The Lake Victoria basin catchment drained by river Kagera, however, is expected to receive below normal rainfall. Higher levels of Lake Victoria and Albert are expected to be sustained during this period while Lake Kyoga water levels will rise and may increase beyond the maximum recorded in December 2020. The extent of flooded shoreline around Lake Kyoga is expected to expand and submerge more villages and infrastructure.

Figure 55 shows the JJAS forecasted levels for Lakes Victoria and Kyoga using the Nile Optimization Tool, indicating a decreasing trend for Lake Victoria indicating contrasting trends. Lake Victoria is expected to be on a declining trend from 1136.15m above mean sea level in June to 1135.90m above mean sea level in September (Figure 56). In a similar period lake Kyoga is projected to increase from 1,035.62m to 1,036.23m above mean sea level, a phenomenon associated with localized rainfall projected with 55% chance of above normal in the region.

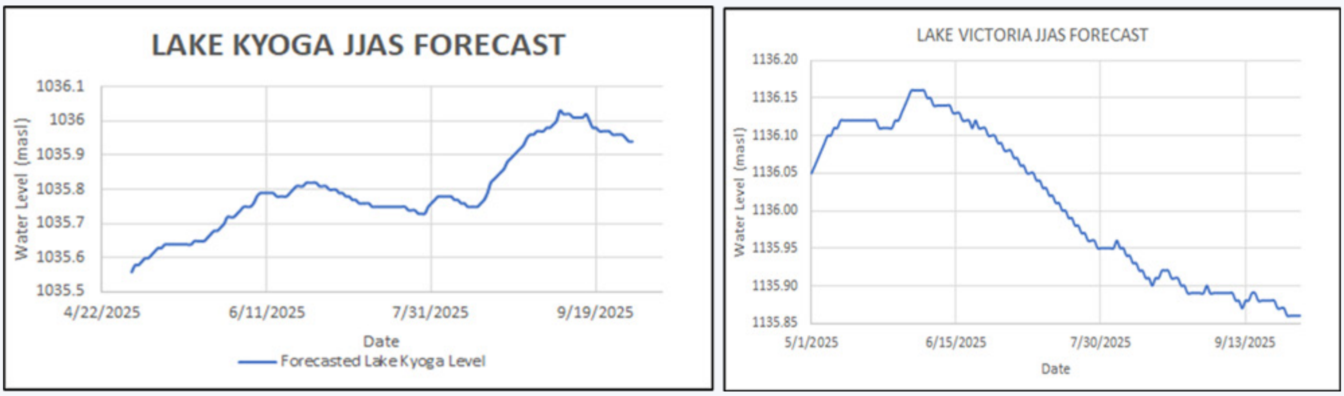

Figure 55: Forecasted lake levels for Lake Victoria and Lake Albert for JJAS 2025 season

The UEGCL ODSS-HP allows for the possibility of setting different release scenarios from Lake Victoria and forecasting their impact on both the Lake Victoria and Lake Kyoga levels for nine months ahead. Two release scenarios were simulated, with the agreed curve and another assuming a 2200 m3/s release. The 2200m3/s release has a drawdown effect on Lake Victoria with the lake level expected to drop by about 60 mm by end of September 2025 compared to following the agreed curve (Figure 56).

This release scenario, however, would lead to an early onset of the rise of Lake Kyoga levels, (Figure 57). Furthermore, compared to following the agreed curve release scenario from Lake Victoria, the Lake Kyoga Level would be expected to rise by an additional 1200mm by the end of September.

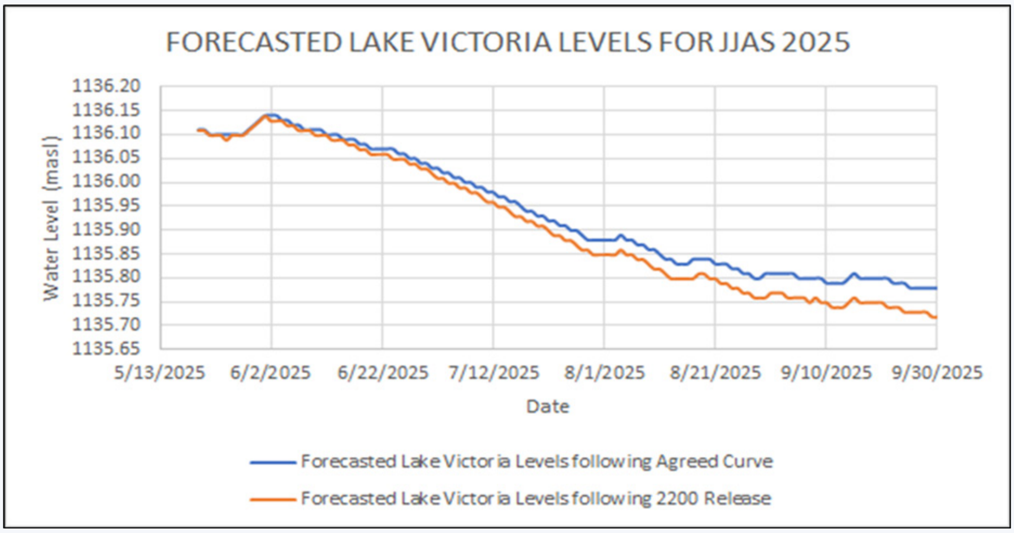

Figure 56: Forecasted Lake Victoria water levels with both agreed curve and release for JJAS 2025 season.

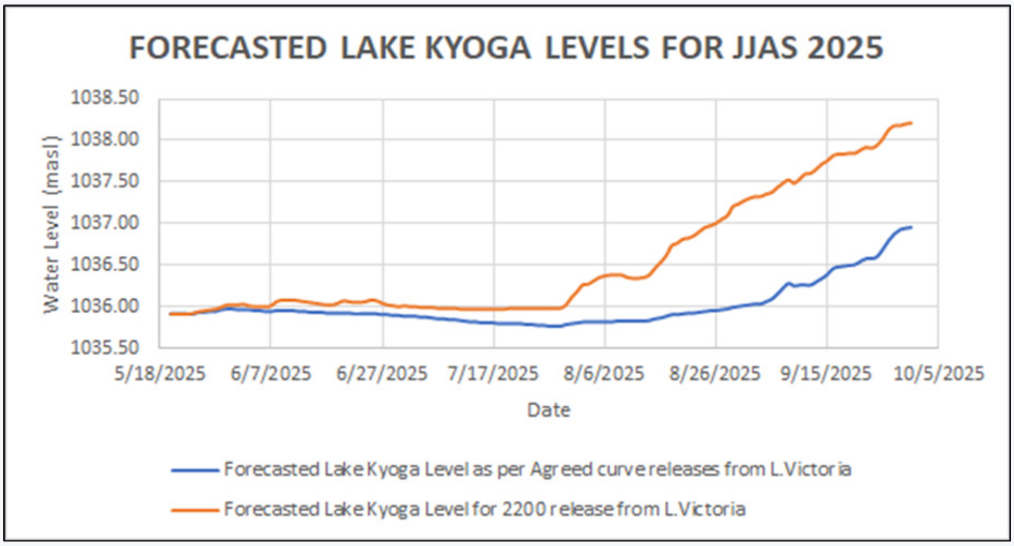

Figure 57: Forecasted Lake Kyoga water level with both agreed curve and release for JJAS 2025 season

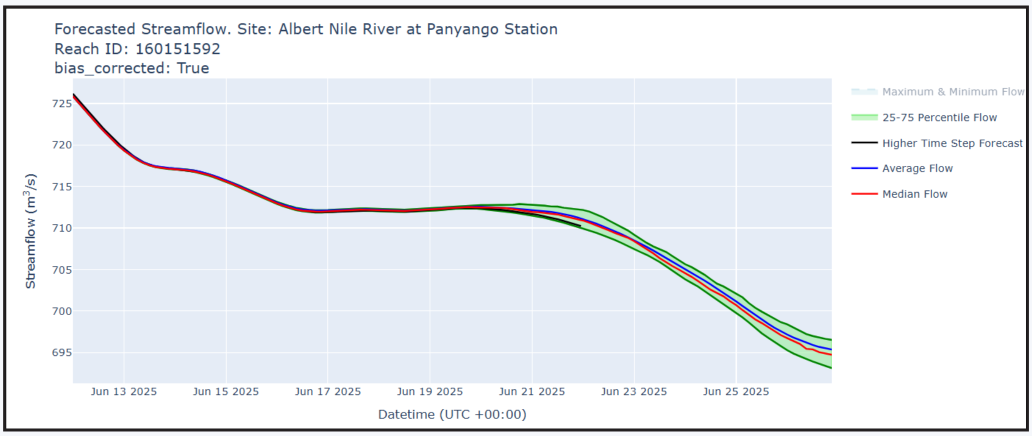

Figure 58: Short-term forecast of Albert Nile River flow at Panyango Hydrological Station for June

5.9.3 Recommendation and Advisory

i. Continued monitoring of water levels to manage the outflow from the lake and floods

ii. Sensitization of people living along riparian land /fragile landscapes/ecosystems such as Mt. Elgon prone to landslides,

iii. Monitoring and removal of floating islands in Lake Victoria.

iv. Leverage on the establish channels to share warning/notification to downstream country South Sudan

v. Improved dissemination of the forecasted information to the communities and stakeholders in the form of bulletins, community baraza.

6.0 BASIN WIDE IMPLICATION AND ADVISORY

6.1 Increased likelihood of above normal rainfall

The climate outlook for the June–September 2025 period indicates above-normal rainfall across several regions within the Nile Basin. This pattern is expected to enhance water availability but also raises concerns about potential flooding and related risks. The following regions and sub-basin are projected to receive above normal rainfall hence wetter than normal condition.

a. Sudan - This includes central and north-western within the Main Nile Sub-basin: These areas are anticipated to receive above-average rainfall, with about 60% likelihood which could lead to increased river flows and potential flooding- mostly flash flood.

b. Ethiopia -This includes western and central highlands such as Gambela, Gore, Gilo, Gelila and Ajwara within Bora-Akobo-Sobat and Blue Nile Sub-Basins where forecasts suggest above-normal rainfall with a likelihood of 55%, which is crucial for the Blue Nile's contribution to the Nile River flows. However, the risks of riverine flooding, flash floods and landslide are enhanced in these regions.

c. South Sudan -Southern and eastern part of the country including Pibor, Nasir, Sobat, Dorein and Bongak regions within Baro Akobo Sobat Sub-Basin which are likely to experience above-normal rainfall, increasing the risk of flooding, especially in low-lying areas.

d. Uganda – Eastern and northeastern covering the regions of Victoria Nile Sub-Basin: Kotido, Mbale and Soroti are projected to receive above-normal rainfall hence expected, to enhance flow into Lake Kyoga and the White Nile. The likelihood of riverine, flash flood and landslide occurrences is much greater during this season.

e. Kenya – Western near Lake Victoria and Mt. Elgon areas are forecasted to receive above-normal rainfall, potentially influencing the flow into Lake Victoria through Nzoia River. However, this could lead to flooding in the downstream reaches of Nzoia and Budalangi area of Lake Victoria Sub-Basin.

The benefits and opportunities that come with above normal rainfall such enhanced water availability and food production might cancel out with the negative impact if not well planned and managed. The above projections could lead to increased riverine flooding as well as flash flood and landslide occurrence, particularly in low-lying and flood-and landslide prone areas. Agricultural Disruption due to excessive rainfall may damage crops, delay planting, and lead to soil erosion and create food insecurity in the affected areas. The heavy rains might overwhelm drainage systems, urban flooding leading to infrastructure damage and displacement of people. In addition, chances of standing water enhance the spread of water-borne diseases and increase mosquito breeding, leading to a rise in malaria and other vector-borne diseases.

6.1.1 Recommendations and Advisories

Therefore, the following five recommendations and advisories are issued to guide strategic response and interventions in the projected areas to be impacted;

1. Strengthen flood forecasting and early warning systems; reinforce flood defenses in vulnerable areas to enhance flood preparedness and risk reductions.
2. Provide farmers with information on flood-tolerant crop varieties and promote soil conservation practices to prevent loss of fertile soils.
3. Inspect and maintain spillway and flood outlet hydraulic structures.
4. Inspect and maintain drainage systems and flood barriers in both rural and urban centers to prevent infrastructure damage and protection of the vulnerable communities.
5. Distribute mosquito nets, promote sanitation, and ensure access to clean water to prevent disease outbreaks in flood prone areas.
6. Educating communities on flood risks and preparedness measures establish and trigger emergency and evacuation plans where necessary for no regret interventions.
7. Enhancing water level monitoring and review forecasting and update is necessary for adaptive response and management. In this regard, more real-time and forecast information on hydrological conditions are available the Nile Basin Hydrological Monitoring System, Nile Basin Flash Flood Forecasting System and Eastern Nile Flood Forecasting System with 48 and 72 hours lead time might provide sufficient information on the probability of occurrence of localized flash flood and riverine flooding.
8. Dam and reservoir managers to ensure informed planning and storage operations adhering to the conditions of emergency and safe flood evacuations.

6.2 Increased Likelihood of below normal Conditions

Based on the seasonal climate forecasts for the June–September 2025 period, some regions within the Nile Basin are expected to experience above-normal rainfall, particularly in the central and northern parts of the basin. However, certain areas may still face below-normal rainfall conditions, which could impact water availability and agricultural activities. The following regions are projected to experience below normal rainfall with the likelihood of drier than normal conditions.

1. Ethiopia - Southern and southeastern Ethiopia are projected to experience reduced rainfall which could affect river flows and pastures.
2. South Sudan- Southern part, particularly in areas bordering Uganda and the Democratic Republic of the Congo where drought conditions may lead to reduced river flows and increased competition for water resources.
3. Uganda -Western Uganda, especially in areas bordering the Democratic Republic of the Congo and Albert Nile. Implications: Below-normal rainfall could affect the flow into Lake Al-

bert, subsequently impacting the White Nile.

4. Sudan -Northwestern northeastern and western parts are projected to experience below-normal rainfall which could impact the flow into the Nile River.

The potential impacts of below-normal Rainfall include reduced River Flows due to lower rainfall can lead to decreased water levels in rivers and lakes, affecting water availability for downstream countries, Agricultural Stress as drought conditions may harm crops, leading to food insecurity, low hydropower production as lower water levels can impact the operation of hydropower plants, leading to energy shortages. In addition, water Scarcity might be experiencing due increased competition for limited water resources may lead to conflicts and challenges in water management

6.2.1 Recommendations and Advisories

Therefore, the following recommendations and advisories are issued to guide strategic response and interventions in the projected areas to be impacted;

1. Strengthen meteorological and hydrological monitoring systems to provide updates and guide early warnings of drought conditions.

1. Strengthen dissemination mechanisms at national level so that communities receive timely early warning information.

2. Promote water-saving techniques in agriculture and domestic use to stretch available resources.

3. Develop and implement alternative water sources, such as rainwater harvesting and groundwater recharge.

4. Encourage the cultivation of drought-resistant crop varieties to withstand reduced rainfall.

5. Enhance cooperation among Nile Basin countries to manage shared water resources effectively during periods of reduced rainfall.

7.0 ACKNOWLEDGMENT

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Group Photo for Nile Basin Regional Expert Working Group on Hydrology – Regional Hydrological Outlook and Advisory.

Group Chair, Engineer Eng. Sowed Sewagudde, Commissioner in charge of International and Transboundary Water Affairs Ministry of Water and Environment Uganda making his opening Remarks

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