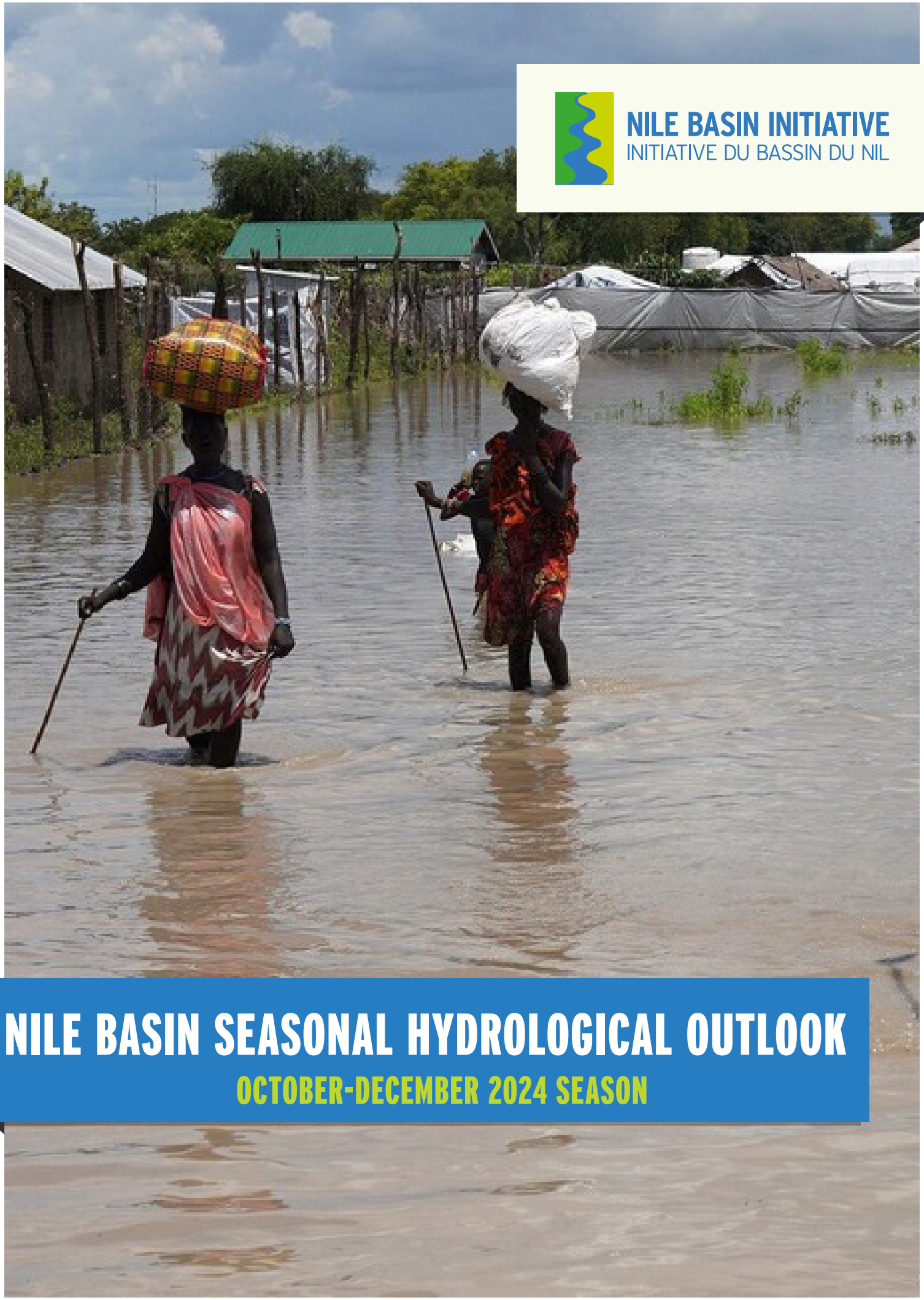

NILE BASIN INITIATIVE
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NILE BASIN SEASONAL HYDROLOGICAL OUTLOOK

OCTOBER-DECEMBER 2024 SEASON

1. INTRODUCTION

The Nile River Basin provides an invaluable source of livelihoods to over 300 million people in the eleven riparian countries of Burundi, Democratic Republic of Congo, Egypt, Eritrea, Ethiopia, Kenya, Rwanda, South Sudan, Sudan, Tanzania, and Uganda. It 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 and Albert, the Blue Nile and the 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. Increase in temperature affects the rates of evaporation and evapotranspiration influencing the water balance of the basin.

Downstream countries such as Egypt and Sudan receive little and sometime no rain at all throughout the year and the upstream parts of the basin experience elevated rainfall from March to May and October to December while the highlands of Ethiopia experience heavy rainfall from June to September. The historical flow records of the Main Nile River clearly highlight the significance of the natural variability of the upper basin and therefore a need for efficient management of the water resources in the downstream regions. Given the centrality of the freshwater resources to economic and social development of the Nile basin region, it is important to have a good understanding and accurately monitor and predict these changes to support planning, management and disaster risk reduction strategies in the basin.

The observed historical records indicate that the basin has had its fair share of droughts and floods events alternating spatially and temporally with significant impacts on the lives and livelihoods of many people and the environment as well as public infrastructure. These changes pose significant risks to the environment, economies, and societies in the basin. Early warning systems and information play a crucial role in mitigating these risks by providing timely information that allows vulnerable communities to prepare and respond effectively hence reducing their risk to hydrological disasters.

The regional experts on hydrology have analysed the recent climate outlook for October-November-December (OND) 2024 season released by the Intergovernmental Authority on Development (IGAD) Climate Prediction and Applications Centre (ICPAC) at the 68th Greater Horn of Africa Climate Outlook Forum (GHACOF 68) and its implications on the basin hydrology. The Climate Outlook predicted increased likelihood of drier conditions in the eastern Horn of Africa and wetter-than-normal conditions predicted for western parts of the region. The highest probabilities for wetter than usual conditions were predicted in the central to western Kenya and Uganda, western Tanzania, Burundi, Rwanda and the southern part of South Sudan.

This report is the regional expert analysis, detailing the implications of the released climate outlook for OND 2024 on the Nile Basin hydrology and anticipated impacts on water resources, agriculture and food security. Other sectors analysed include energy, infrastructure, transport, lives and livelihoods in the basin. It also provides specific recommendations and advisories to guide Member States in the planning and strategic response for risk reduction to any disaster related to hydrological extremes in the basin.

2. PERFORMANCE OF THE JUNE-SEPTEMBER 2024 SEASON

The June -September (JJAS) season is an important period in the Nile Basin hydrology particularly in the Eastern Nile (EN) region, where elevated rainfall in the Ethiopian highlands contributes approximately 80% of the basin's total flow. In contrast, the Nile Equatorial Lakes (NEL) region typically experiences drier conditions, leading to reduced rainfall, lower river flows and declining lake water levels during this period. The evaluation of the performance of the previous outlook is critical in the review and improvement of the accuracy of the subsequent outlook. This section details the performance of the June -September climate and hydrological outlook as observed in the hindcast and identifies specific areas where the predictions were accurate and areas that could be improved to enhanced reliability and accuracy of the hydrological predictions.

2.1 Climate

The JJAS season contributes more than 40% of the annual rainfall in the northern and western parts of Greater Horn of Africa (GHA) and more than 90% in parts of the northeast covering the highlands of Ethiopia within the Nile Basin.

The 67th GHACOF regional climate outlook for JJAS 2024 released by ICPAC in May 2024, indicated a high likelihood of above-normal rainfall (wetter conditions) over most parts of the GHA Figure 1). Moderate to high rainfall amounts between 500-1000 mm were observed in northwestern and western parts of Ethiopia, in the western parts of South Sudan, and in parts of western and central Kenya.

Moderate rainfall between 100 - 500 mm was observed in the southern parts of Sudan, in western and southwestern Eritrea, in western, northern and central parts of Ethiopia, in several parts of South Sudan and Uganda, in parts of western and central Kenya.

Light rainfall between 10 - 100 mm was observed in western, central to eastern Sudan and in northeastern, eastern and southeastern Ethiopia, in southwestern Uganda, in several parts of Rwanda and Burundi, in northern, eastern and southeastern Kenya, and in northern, northeastern, eastern and southern Tanzania. No significant rainfall was observed in northern parts of Sudan, and in central and western Tanzania. However, incidences of heavy rainfall and flash floods were witnessed in the region of Marowe Sudan and its western part (Figure 2) for the period of June-August 2024.

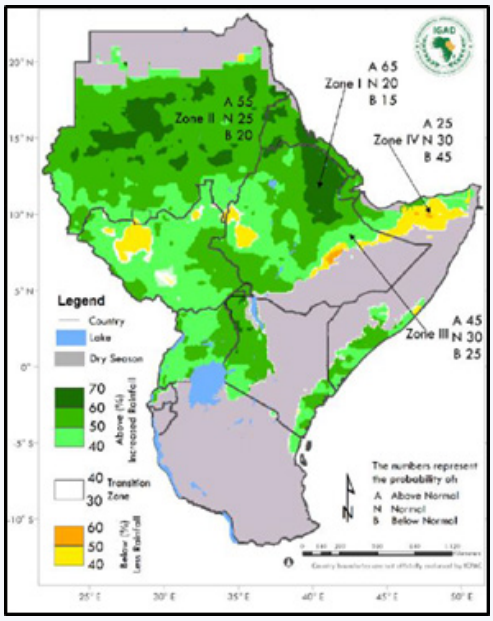

Figure 1: ICPAC JJAS climate for GHA.

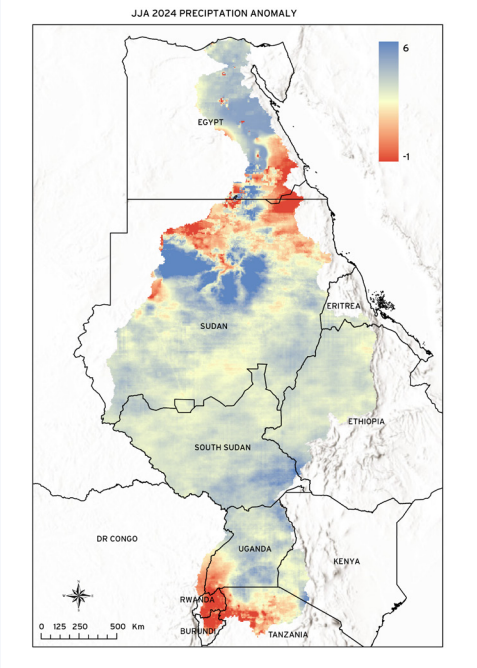

Figure 2: Nile Basin JJA 2024 Rainfall Anomaly

2.2 Hydrology

The JJAS 2024 Climate prediction indicated near-normal to above-normal rainfall in the Lake Victoria Basin. The water levels in the major rivers flowing into the Lake Victoria (Kagera, Mara, Nzoia, Nyando, Sio, Katonga) were predicted to subside but remain higher than the dry season averages for JJAS 2024 period. The Eastern Nile part of the basin was predicted to experience increased river flow and higher lake water levels due to projected above normal rainfall in the highlands of Ethiopia with the likelihood of enhanced flooding in some reaches of Baro Akobo Sobat, Blue Nile and Tekeze-Atbara rivers.

These hydrological phenomena were confirmed by data and information from the recently established Nile Basin Regional Hydrological Monitoring System and country specific hydrological information. Reduced levels and flows were recorded in the tributaries of Lake Victoria (Ruvuvu, Kagera, Mara, Nyando, Nzoia). Comparatively, the observed above normal flows and lake levels recorded in the Blue Nile, Baro Akobo Sobat and Tekeze-Atbara regions due to the above normal rainfall experienced in the region during the JJAS season (Figure 3).

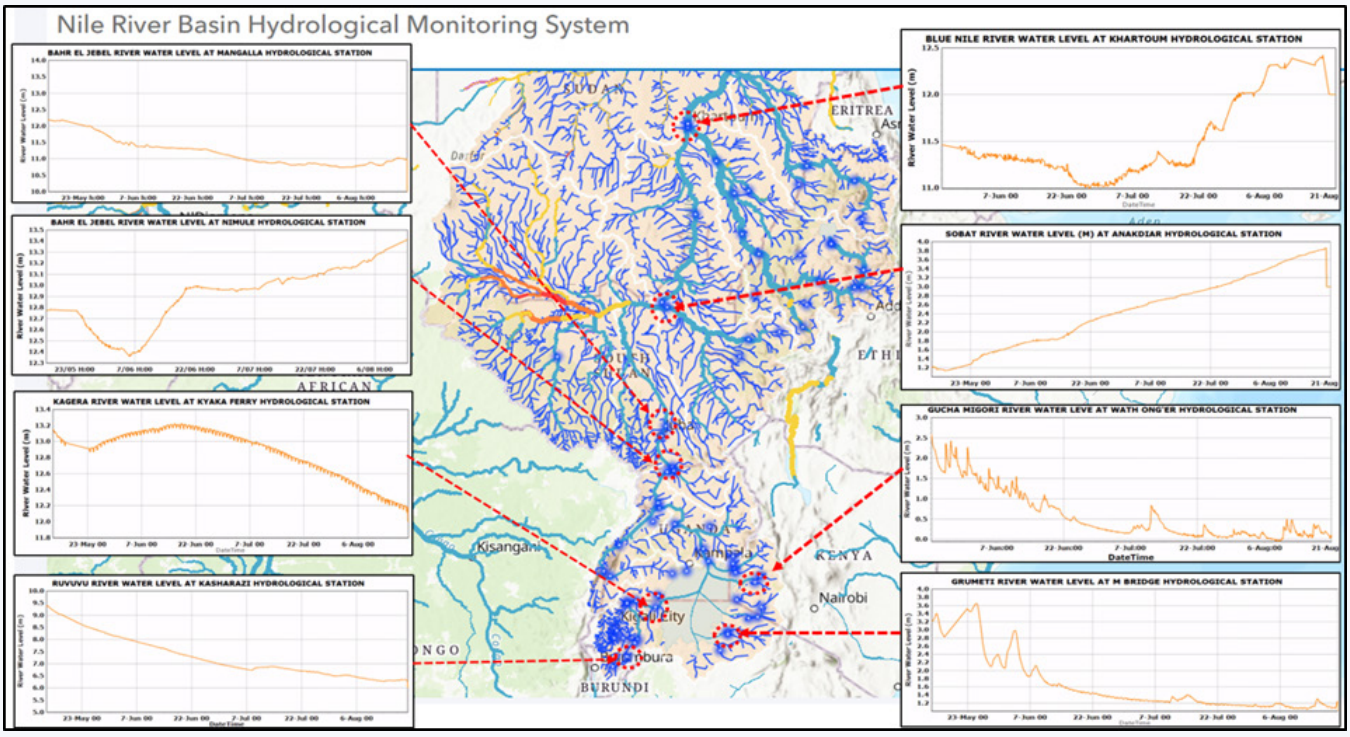

Figure 3: Reduced water levels and flows of NEL rivers and increased inflow of EN Rivers

The water levels of the Nile Equatorial Lakes (Lake Victoria, Edward, Albert and Kyoga) are highly sensitive to even moderate changes in rainfall over the lakes and their tributaries. Previous studies and historical data and information show that average rainfall and evaporation over the lakes are the main drivers of the lake water balance with both factors nearly balancing out on an annual basis. However, while the evaporation rates over the lakes remains relatively stable throughout the year, increase in rainfall gives can lead to a disproportionate surplus in water levels and greatly increases the tributary flows which are themselves relatively more variable than the rainfall itself, hence amplifying the impact on the lakes' water levels. In the JJAS 2024 season, the lakes in the NEL region were expected to have sustained high-water levels. However, observed data and analysed information shows a slight decrease of water levels in Lake Victoria due to decreased net inflow in this dry season

and increased releases from the lake (Figure 4). The high releases from Lake Victoria might have significantly contributed to increased water levels in Lake Kyoga and Lake Albert.

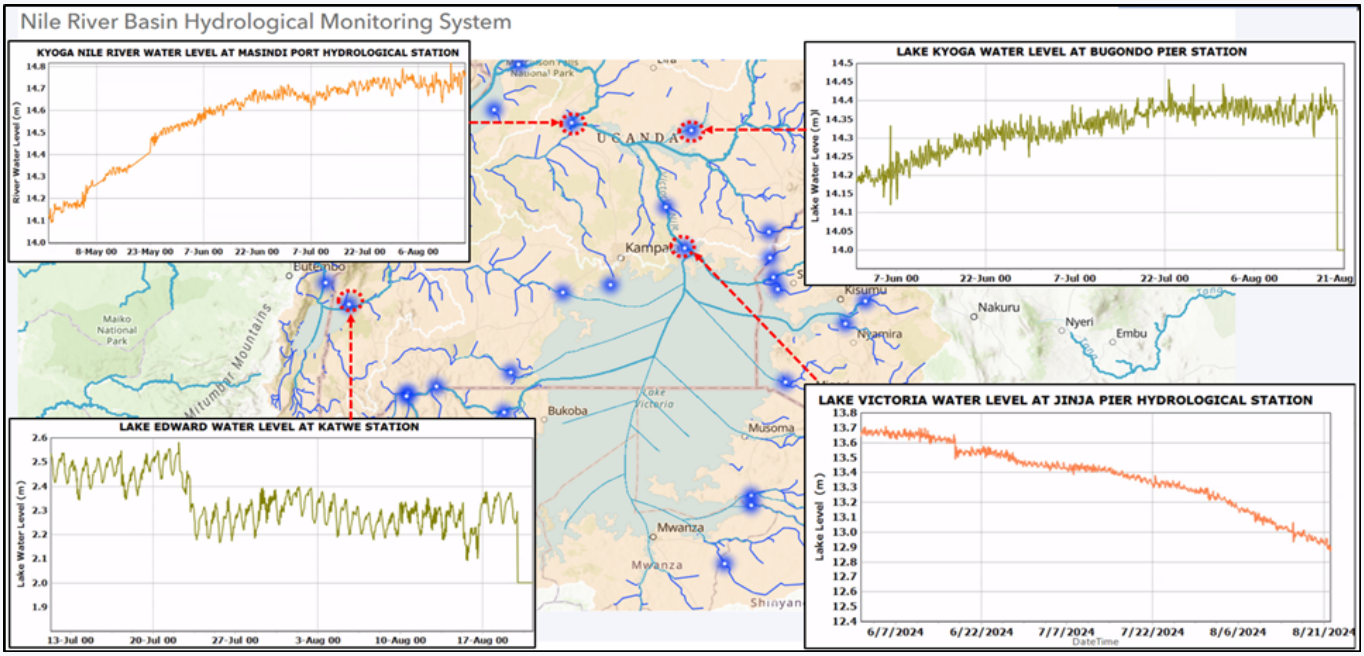

Figure 4: Impact of rivers flows in lake levels- decreasing in L. Victoria (Jinja Pier Monitoring Station) and increasing L. Kyoga (Bugondo Pier Monitoring Station).

Incidences of riverine flooding were predicted to occur during the JJAS season in some areas in South Sudan, along Bahr Jebel River in Nimule, Juba, Mangalla, areas of Bor and Malakal. Areas around Malakal were also predicted to experience some flooding due to the increased flow from Baro Akobo Sobat and the impact of back water effect as result of combine non-functioning Jebel Aulia dam occasioned by the civil unrest in Sudan and increased flows from the Blue Nile due to the elevated rainfall experienced in the highlands of Ethiopia. As predicted incidences of floodingl, displacement of people, loss of lives and livelihood and destruction of public infrastructure were recorded in South Sudan, some parts of Sudan, Uganda, western Kenya and Ethiopia. In South Sudan the most affected parts included Unity, Jonglei, Warrap, and Northern Bahr El Ghazal States. In these areas thousands of people were displaced, several hectares of crops farms were destroyed, livestock diseases occurrence increased, and property and infrastructure of unknown value were damaged.

In JJAS, experts warned of the state of the Jebel Aulia Dam in the White Nile as maintenance has not taken place since the civil war broke out. The failure of the dam operations leading forced storage and raising the water level of the White Nile due to the back water hence increasing the risk of flooding in the riparian areas. Also, the experts noted any failure by the dam due to the forced storage would be catastrophic to lives and livelihood for the people in Khartoum and the downstream centres. The back flow from the non-operational of the dam significantly contributed to the flooding reported the upstream of the dam to as far back as Malakal.

The Nile Basin Flash Flood Early Warning System (NB-FFEWS), a new tool developed to provide flash flood early warning information to support and enhance preparedness, predicted incidences of flash floods occurrence in some areas of Bahr El Ghazal in South Sudan and around Merowe Dam in Sudan as well as in western Kenya in July and August period.

The Eastern Nile Flood Forecasting and Early Warning System accurately predicted, and incidences of flooding were observed in the regions of

Lake Tana, Baro Akobo Sobat and Tekeza-Atbara in JJAS 2024 season (Figure 5). It was observed that while some parts of the predicted areas experienced flooding and above normal water level in the monitored reiver stations, the severity were not hit in other areas.

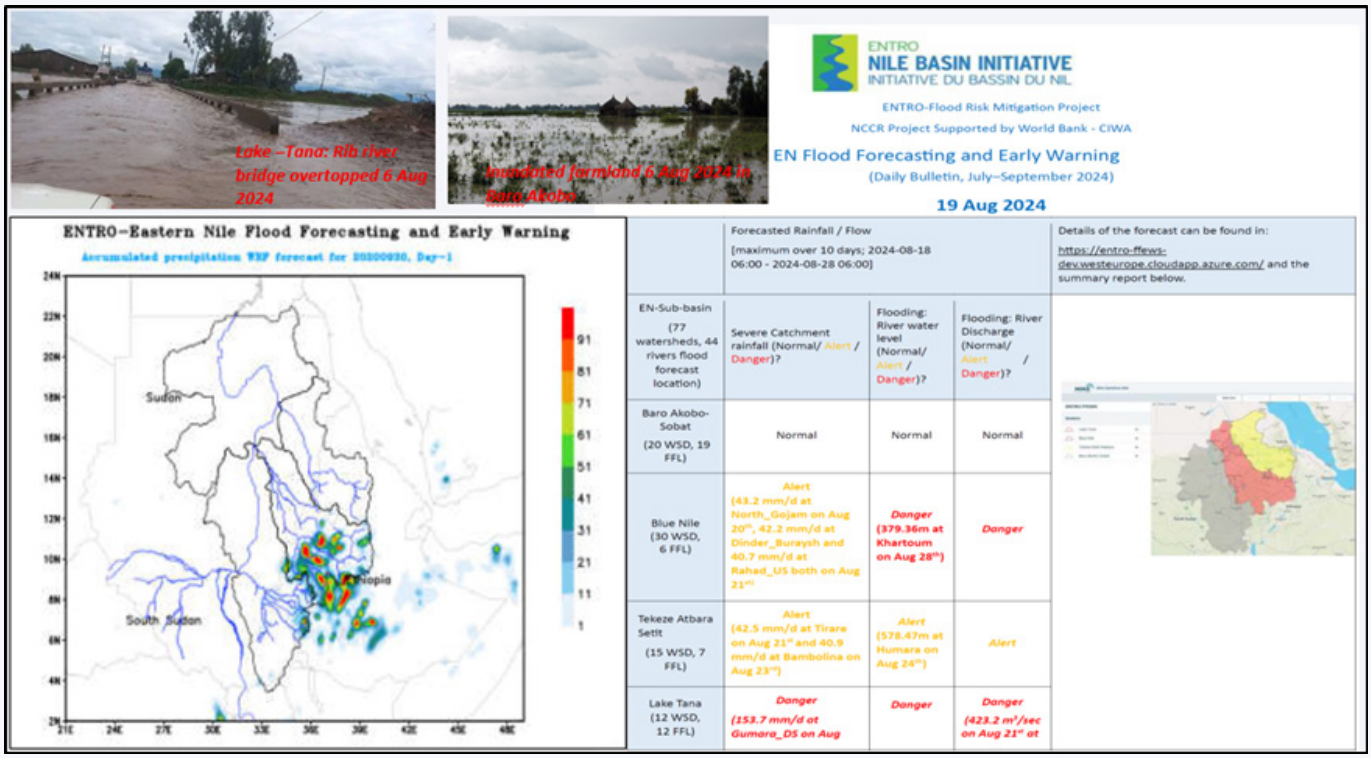

Figure 5: Flood forecast and observed impact by Eastern Flood Forecasting and early Warning System in JJAS season.

3.0 OCTOBER – DECEMBER 2024 OUTLOOK

The October to December (OND) season is an important rainy season in the Nile River Basin. The season is usually marked by a short rainy period in the NEL region with significant impact on the hydrology of the basin. The Eastern Nile region commences return to normal flow in September as result of post peak rainfalls experienced in the highlands of Ethiopia. Both the NEL and the EN regions are sensitive to changes in the climate. However, the flows in the Main Nile River is largely controlled by climate changes in the Ethiopian highlands since the change in the runoff in the Equatorial Lakes area is always dampened by the marshes in northern South Sudan - the Sudd area and southern Sudan. This phenomenon is spatially significant in the hydrology of the basin and its impacts on the projected changes due to the meteorological forcings.

3.1 Climate Outlook

TThe current Seasonal Outlook released at the 68th GHACOF indicates increased likelihood of drier conditions in the in the EN region and wetter-than-normal conditions in the NEL region. Therefore, reduced rainfall and elevated evapotranspiration is expected in the EN region while increased rainfall is predicted for NEL region. The basin is predicted to be warmer than normal in most part of the basin especially the areas of Lake Tana and Tekeze Setit Atbara region. Above normal rainfall is predicted in western Kenya, northern Uganda, southeastern and upper eastern part of South Sudan (Figure 6). Some parts of southern Ethiopia are expected to experience drier conditions, potentially exacerbating water shortages and impacting agricultural productivity. Conversely, western parts of Ethiopia are likely to receive increased rainfall.

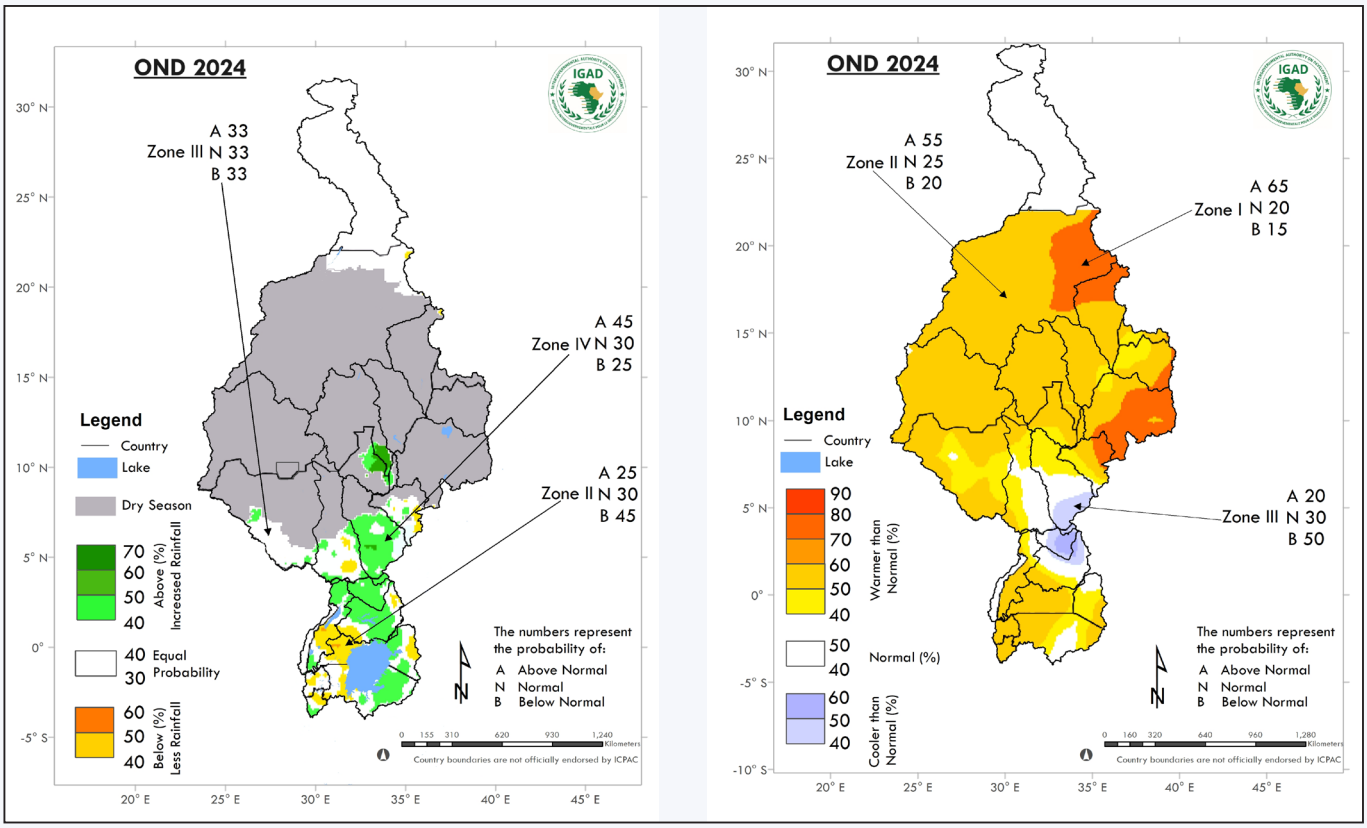

Figure 6: Predicted Climate Outlook for OND 2024: Rainfall and Temperature for the Nile River Basin.

3.2 HYDROLOGICAL OUTLOOK

Based on the Climate Outlook for the OND 2024 season, simulations and forecasts were conducted and output analysed to assess the projected impacts on river flows and lake levels during the review period. The hydrological outlook was generated using model simulations from the MIKE Operations model, provided by ICPAC and the Operational Decision Support System for Hydropower (ODSS-HP) model from the Uganda Electricity Generation Company Limited (UEGCL). The final outlook was derived through expert analysis and interpretation of the model outputs.

3.2.1 Impacts on river water levels and flows

The rivers flowing into Lake Victoria (Kagera, Nzoia, Mara, Nyando, Gucha-Migori, Sondu-Miriu and Yala) are expected to experience increased flow of above normal with peak flow rate around the second and third week of November with Kagera River remaining on high flows of above normal until December (Figure 7). The total inflow to Lake Victoria from its tributaries is expected to peak in December and decline in January (Figure 8).

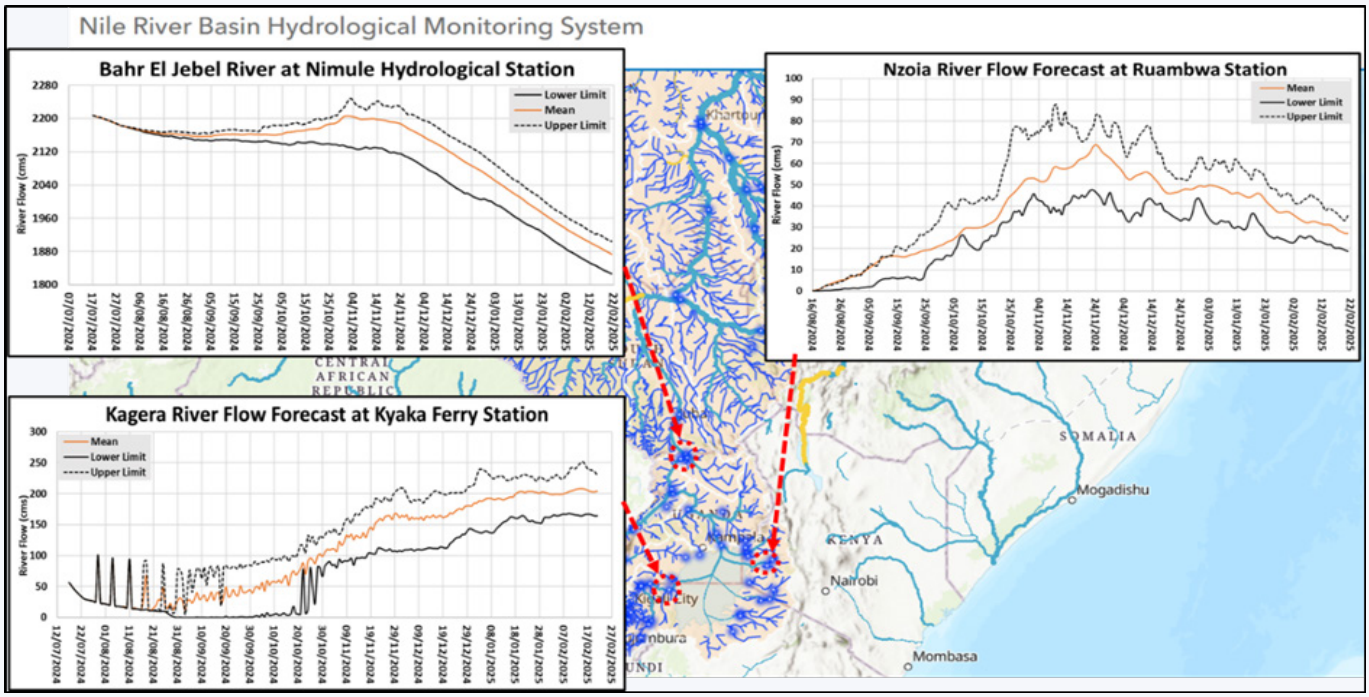

Figure 7: Forecast River flows to Lake Victoria (Kagera River and Nzoia River) and Outflow of the NEL through Bahr El Jebel River at Nimule Station to White Nile for OND Season.

3.2.2 Impacts on the Lakes

The flows and levels simulations indicated that the total inflow into Lake Victoria is expected to rise from August and peak at about 1,000 m3/s in the last week of November and steadily reduce through December to January (Figure 8). It is also predicted that the net flow of Lake Victoria is expected to increase from the current deficit sustained by high rate of evaporation and releases to normalize in the second week of October and peak in the third week of December (Figure 9). The lake net flow for both Lakes Kyoga and Albert are most likely to be on the decline throughout the OND season as outflow from Lakes Victoria and Edward might not be able to normalise the loss due to enhanced evaporation over the lakes (Figure 10 and Figure 11).

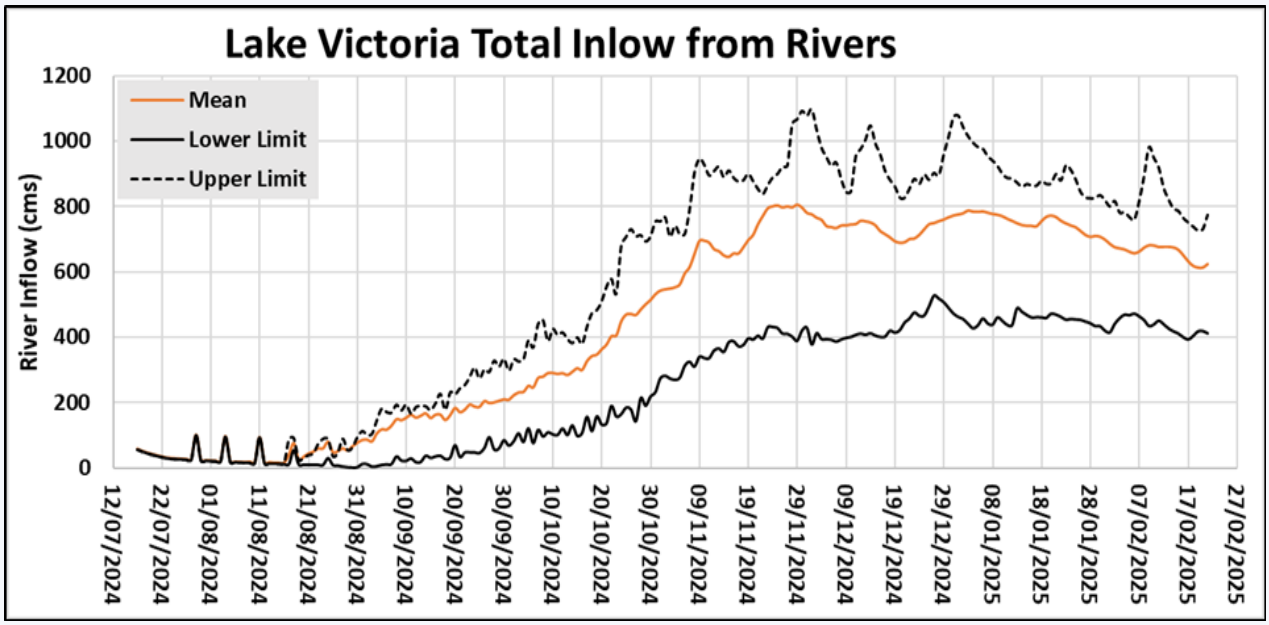

Figure 8: Forecast of Total Inflow into the Lake Victoria from Rivers during the OND 2024 Season.

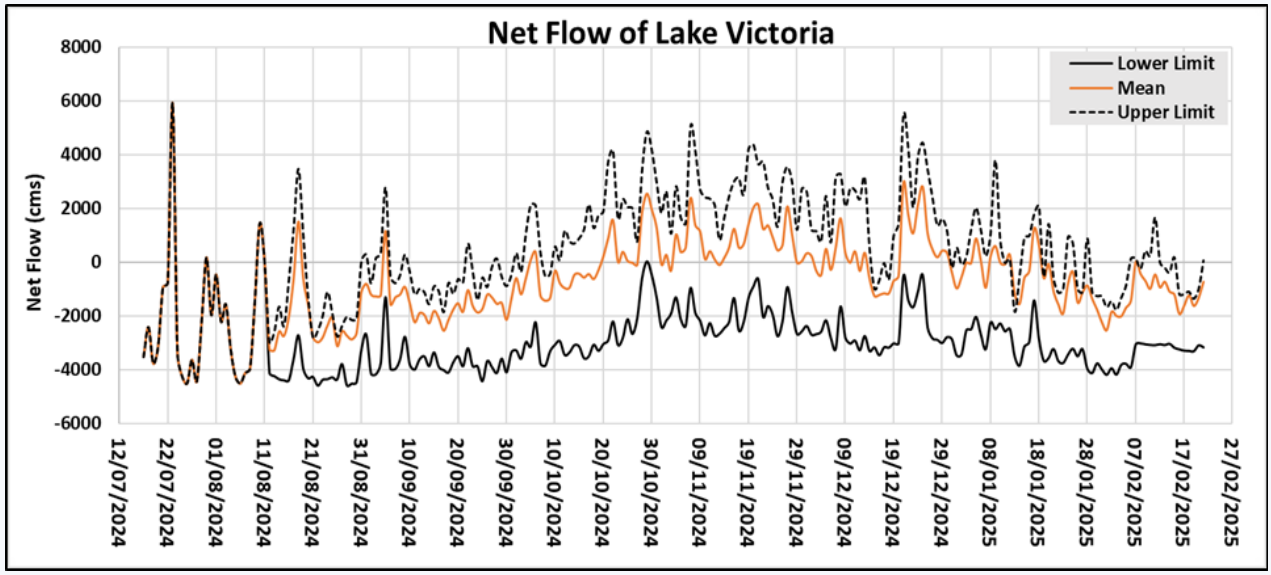

Figure 9: Forecast of Lake Victoria Net flow for the OND 2024 Season.

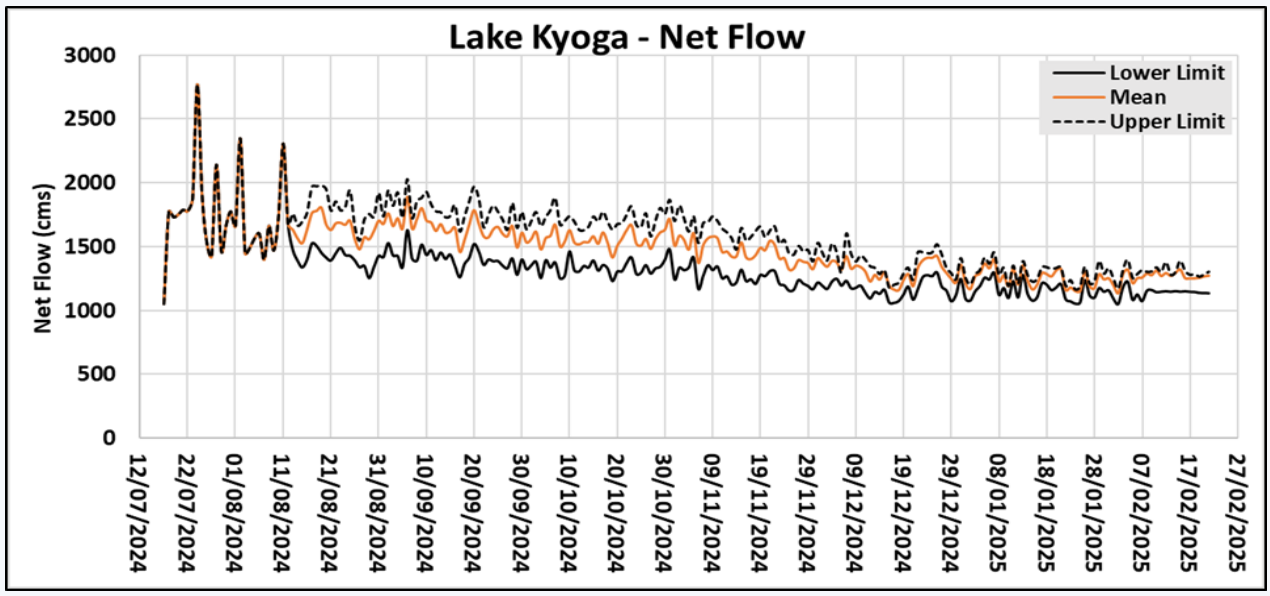

Figure 10: Forecast of Net flow for Lake Kyoga for the OND 2024 Season.

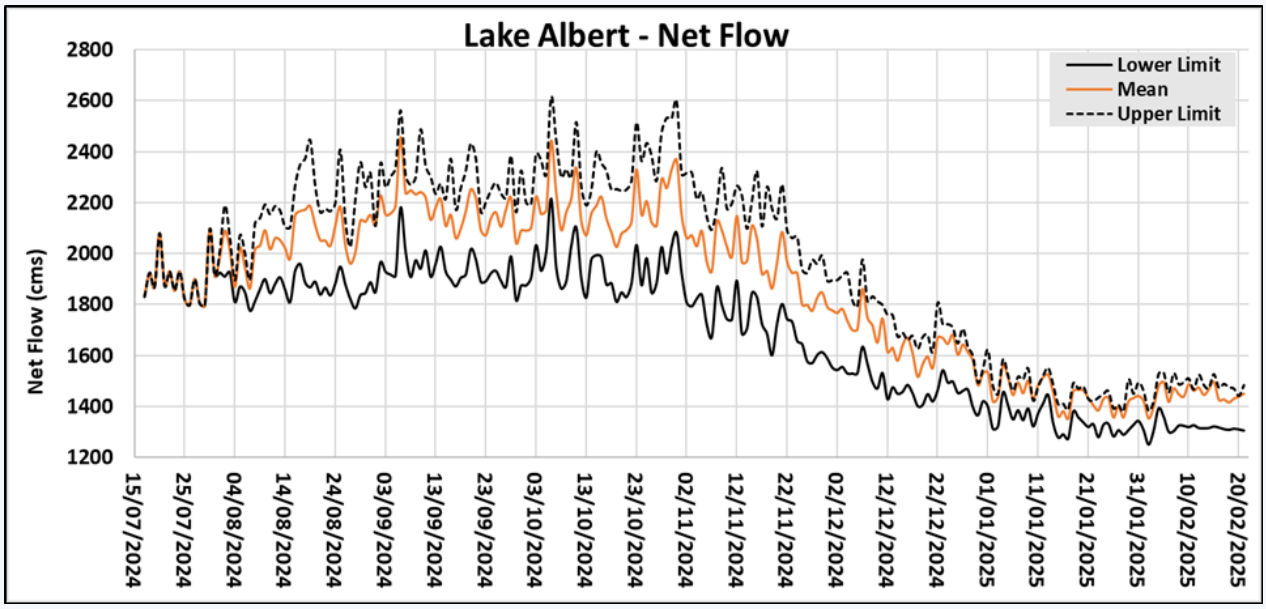

Figure 11: Forecast of Net flow for Lake Albert for the OND 2024 Season.

The concept of Analogue Year (AY) component has widely been used to describe the pattern of meteorological and hydrological occurrences as a means of improving the prediction of hydrological

hydrological processes. Therefore, the predicted lake levels were compared with historical patterns of the OND period for the Lakes Victoria and Kyoga. This analysis did not establish any autocorrelation with observed lake levels record. However, it was observed that the predicted lake levels for Lake Victoria will be above the long-term mean (LTM), above 2019, 2021, 2022 and 2023 records but remain below the 2020 record OND season (Figure 12).

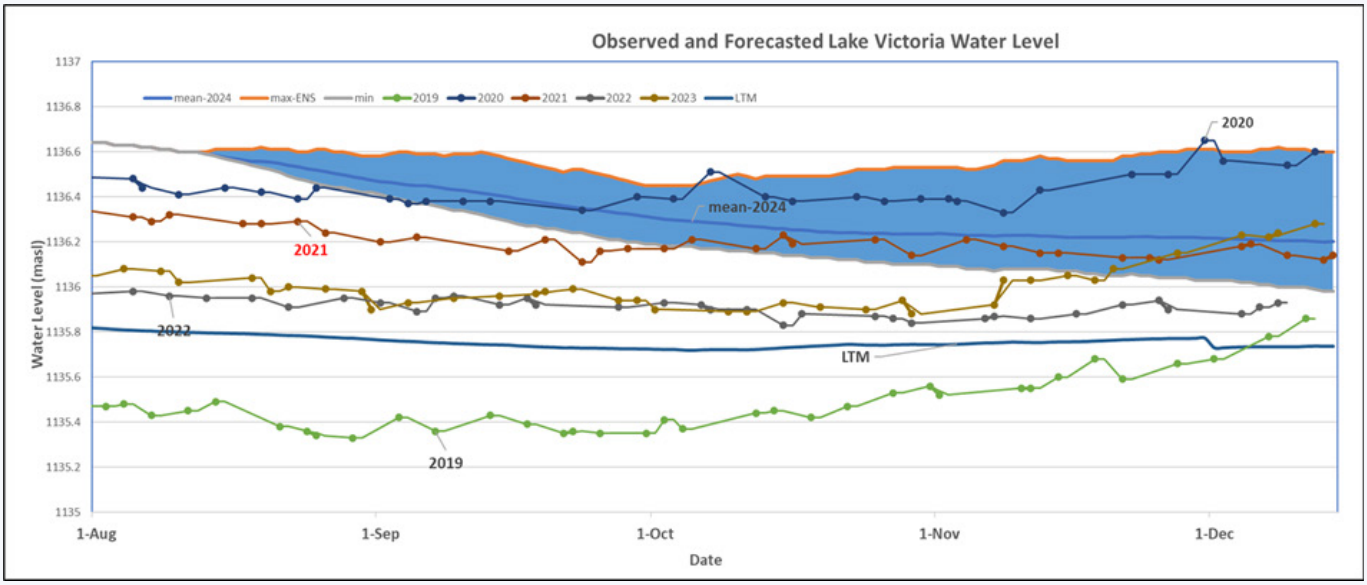

Figure 12: Analogue Year (AY) -comparison of historical and forecasted lake levels for Lake Victoria in the OND 2024 Season.

The forecasted Lake Albert water levels for OND 2024 season are expected to remain fairly constant but above the observed records of 2019, 2022 and 2023 and below the lake level records of 2020 and 2021 OND season (Figure 13) with the about 0.7m drop from mid-November to January while Lake Victoria and Kyoga water levels are expected to be on a downward trend with minimal variation (Figure 14).

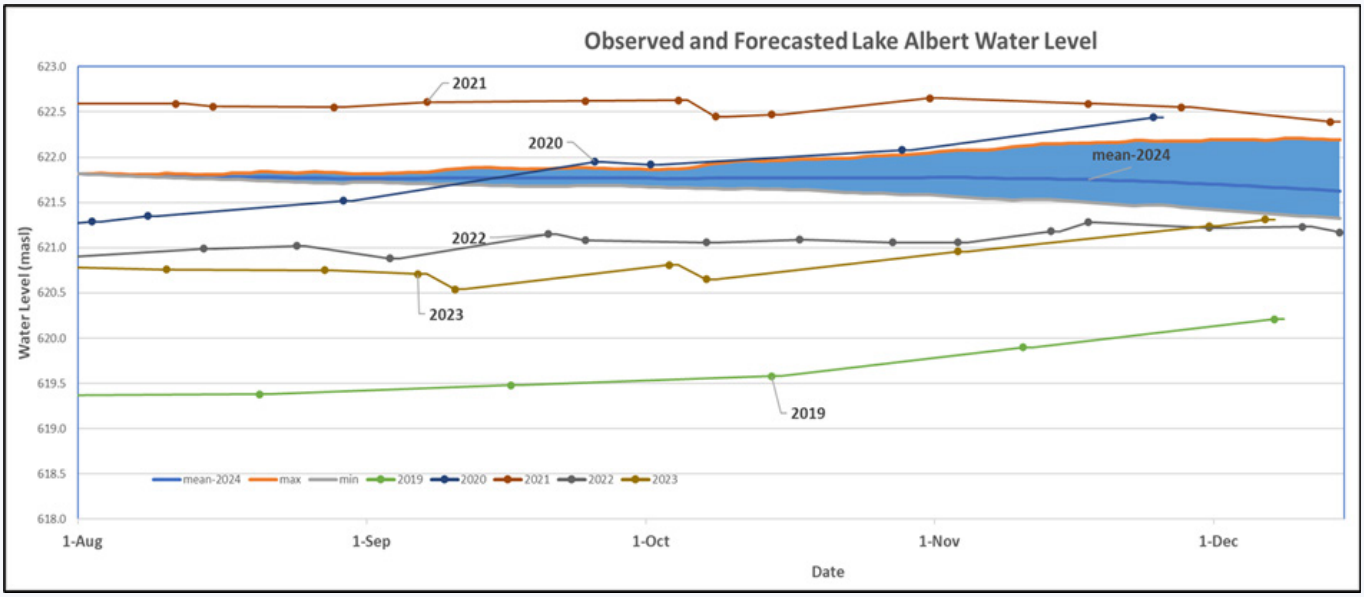

Figure 13: Analogue Year (AY) -comparison of historical and forecasted lake levels for Lake Albert in the OND 2024 season.

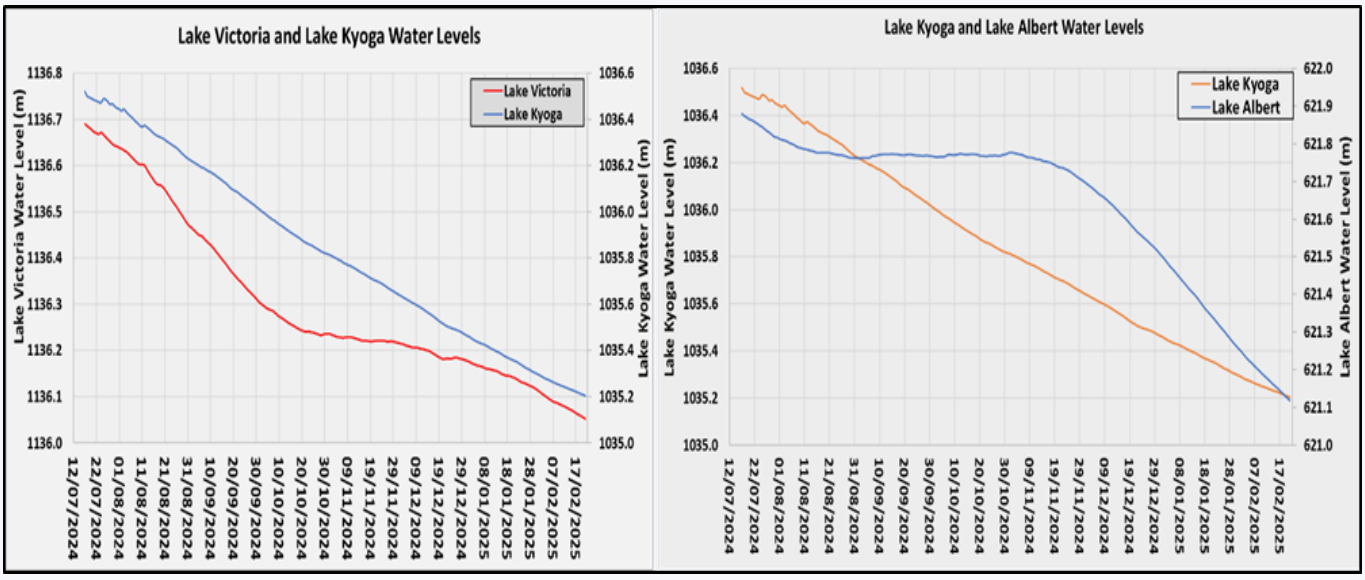

Figure 14: Comparison of the forecasted Lake Victoria, Lake Kyoga and Lake Albert water levels for OND 2024 season.

4.0 COUNTRY OUTLOOK AND IMPLICATIONS

The Nile River Basin is transboundary in nature with eleven riparian states sharing the same water resources. This section provides a summary of implications and interventions for each country based on the OND 2024 Regional Outlook.

4.1 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. 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 river such as Ruvironza Ruzizi and Ruvubu rivers. and Cohoha and some parts of the small streams and river such as Ruvironza Ruzizi and Ruvubu rivers.

4.1.1 Performance of the June -September 2024 Seasonal and Impacts

According to the Geographical Institute of Burundi (IGEBU), the country was expected to be dry in the JJAS 2024 season. The monitoring stations record no or negligible rainfall in Burundi for the period. The observations from both national and regional hydrological monitoring system shows reduced river flows and lake levels for the same JJAS season (Figure 15).

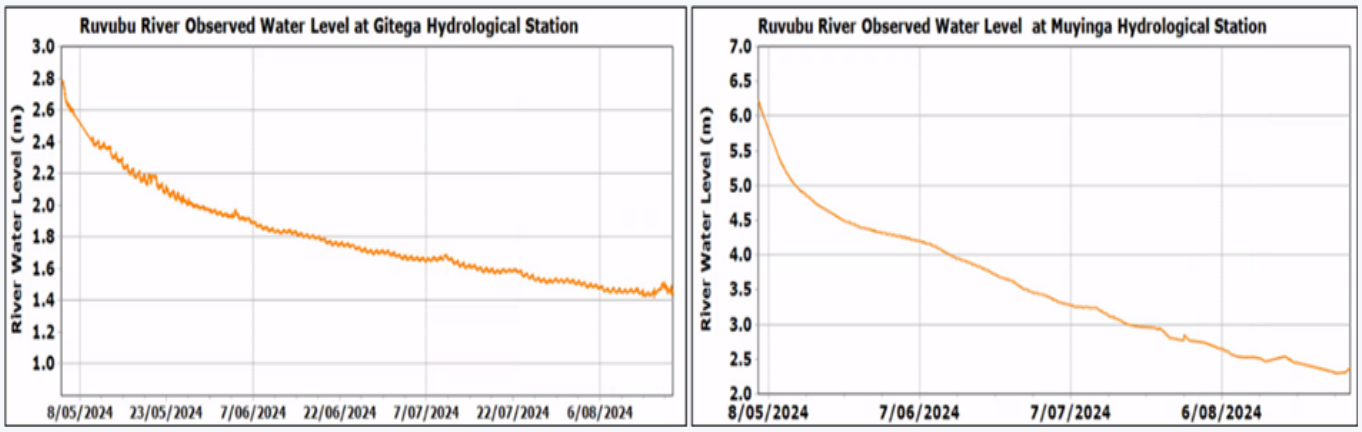

Figure 15: Water levels of Ruvubu River at Gitega and at Muyinga Hydrological Stations in Burundi.

4.1.2 October -December Outlook and Implications

The Climate Outlook for the OND season predicts that Burundi is most will experience near normal to below normal rainfall. This signifies anticipated reduced harvest hence food insecurity in areas with below normal rainfall. Some flooding might be experienced in the lower reaches of Rusizi River affecting the areas of Cibitoke, Nyamitanga and Vugizo as well as the lakeshore of Lake Tanganyika. The lower reaches of Ruvubu and Ruvyironza rivers are likely to experience flooding especially reaches of Buyenzi, Kirimiro and Bweru marshes. Given below normal to near normal condition expected in OND 2024 season, the following key points and actions are necessary for consideration.

i. Early land preparation and sowing at the onset of the predicted short rainfall season.

ii. Increase in soil erosion and landslides in high-risk prone areas (Mirwa region) hence caution should be taken, and communities be adequately informed and advised accordingly.

iii. Proliferation of Pests and diseases for crops are expected hence considerable effort will be

needed to avert crop failure and food insecurity in the country.

iv. Expected incidences flash flooding and riverine flooding in the lower riches of Rusizi river might result in displacement of people, loss of lives and livelihood, damage to property and public infrastructure. Therefore, dissemination of early warning information and creating awareness among the the affected populations is key to reducing the risk and vulnerability.

4.2 DR Congo

The Democratic Republic of the Congo is a country in Central Africa with a land surface area of 2.3 million square kilometre. The Country is drain mainly by Congo river. About 1% of the country drains Nile River constituting about 0.7% of the Nile basin area. Despite the small part of 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 with Uganda are vital for both countries. However, limited data and information were available to generate meaningful analysis and information on the outlook of the Nile DR Congo.

4.3 Ehiopia

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 square kilometres 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 rivers draining to the Nile River (Figure 16). 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 emanates 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.

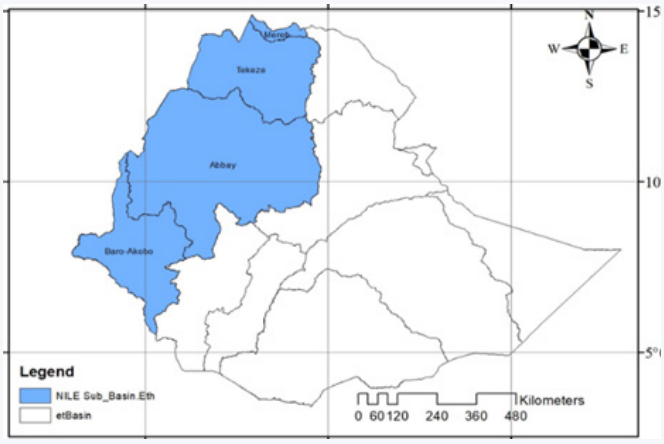

Figure 16: Ethiopia Nile Basin area

4.3.1 Performance of the June -September 2024 Seasonal and Impacts

The JJAS 2024 Seasonal Climate Forecast and Ethiopian Meteorological Institute seasonal forecast indicated that most parts of Blue Nile, Baro Akobo and Tekeze basins would experience wetter than the normal condition. A late onset of the rain season compared to JJAS/2023 was observed. There was below normal rainfall recorded in some parts of central Ethiopia. Due to the increased rainfall in the highlands, there was flooding in the sub-basins of TSA, Blue Nile, Lake Tana and BAS exacerbated by the wet antecedent moisture conditions and reservoir overspills (Figure 17).

In Ethiopia, flash flood events were forecasted and observed in some parts of the Blue Nile, Atbara and Baro Akobo Sobat sub basins in the administrative units of Amhara - South Gonder, during the JJA season. In addition, flooding and damages were observed in some parts of the Blue Nile and

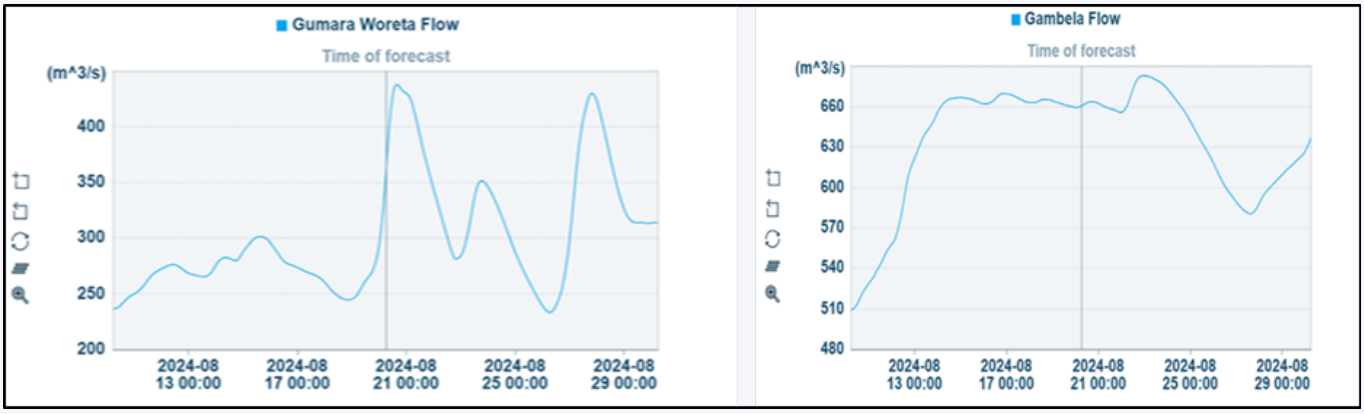

Figure 17: Variations in Gumera River and peak flow at Gambela Rivers as forecasted on 21st August 2024.

Baro Akobo in the areas of Gambella, south Gonder zone, Fogera, Liban Kem Kem and Dera. People were displaced, crops damaged and some roads rendered impassible due to the heavy rainfall experienced. In Gambella region, there was more than 16,000 people displaced from four woredas and in the Gofa zone of Ethiopia's southern region landslides claimed nearly 260 lives and displaced over 15,000 people (Figure 18).

Other impacts included water sources contamination in flooded areas increasing instances of water borne diseases. Infrastructure, transport, lives and livelihoods were impacted by the floods in south Gondar. About seven education institutions and two health centres were under inundation for several days in Gondar. In Gambella region, roads, and dykes that were constructed last year were damaged. Power outage and blackout were experienced due to heavy rainfall and strong winds damaging low voltage transmission and distribution lines.

Figure 18: Extent of damages by landslide in Gambella and Gondar areas of Ethiopia.

4.3.2 October -December Outlook and Implications

Although the Ethiopia National Meteorology Agency of Ethiopia provides weather forecast and early warnings on the adverse effects of weather and climate, the OND Outlook has not been released However, ICPAC's OND 2024 Climate Outlook, predicts that most parts of eastern and southern Ethiopia are expected to receive near normal to below normal rainfall. The rest of country will experience a drier than normal OND season.

Given below normal to near normal condition expected in OND 2024 season, the following key points and actions are necessary for consideration.

i. Take advantage of the near normal condition to encourage rainwater harvesting technics in September as rainy season diminishes to enhance storage and water availability for demand.

ii. Efficient water usage and water conservation mechanism to minimize wastage and enhance productivity throughout the season should be promoted.

iii. Adaptive dam and reservoir operation rules and procedure for optimal storage and utilization efficiency should be emphasized.

iv. Expected incidences flash flooding and riverine flooding with displacement of people, loss of lives and livelihood, damage to property and public infrastructure as some of the anticipated impacts. Therefore, early warning information and creating awareness in the affected areas is key to reducing the risk and vulnerability.

v. Institutionalize continuous monitoring of rivers and lakes for adaptive response based on the climate forecast information provided by the Ethiopia National Meteorology Agency and flood information from Eastern Nile Flood Forecasting and Early Warning Information System as well as relevant agencies within the Ministry of Water and Energy.

vi. Create awareness among stakeholders and the vulnerable communities for appropriate action.

4.4 KENYA

Kenya is country located in the Horn of Africa region of East Africa with a land surface area of about 583,370 km2 with about 8% in the Nile River Basin representing 1.5% of the basin drainage area in Kenya. The major rivers in Kenya draining into the Nile River basin through Lake Victoria are Nzoia, Mara, Nyando, Sondu-Miriu and Gucha-Migory all draining. The lake supports a significant population of the citizen and source of revenue to the national government.

The Kenya Meteorological Department (KMD) is an institution mandated with the national weather services. The climate outlook for June-July-August (JJA) 2024 provided by KMD indicated a likelihood of above average rainfall in the Lake Victoria basin (Figure 19). It was observed that many parts of the western Kenya received moderate to heavy rainfall in the months of June, July and August 2024.

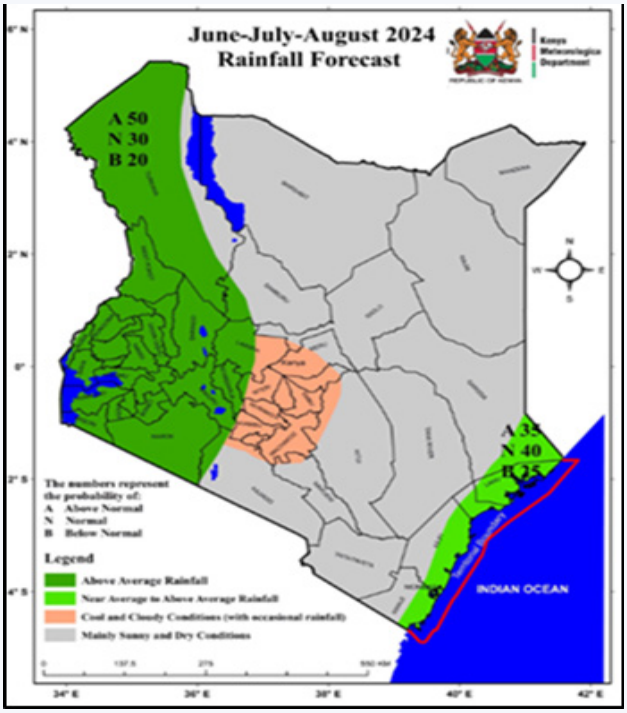

Figure 19: Rainfall forecast for Kenya for the period of JJA 2024 (Source KMD).

4.4.1 Performance of the June -September 2024 Season and Impacts

It was also expected that the western Kenya rivers would have sustained normal flow with isolated floods likely to be experienced in the low-lying areas of Nzoia and Nyando rivers. However, the records and observed river trends for the season showed an increased trend in Nzoia, Nyando and Sondu Rivers recorded increased flow in the month of July and August with reduction in September. However, Gucha-Migori and Sondu-Miriu rivers experienced receding water levels due to elevated abstraction for Lower Kuja Irrigation schemes whose intake is located upstream of Wath Ong'er station and Sondu-Miriu Hydropower operations respectively. Some areas within the shoreline of Lake Victoria remained inundated due to the sustained high lake levels (Figure 20).

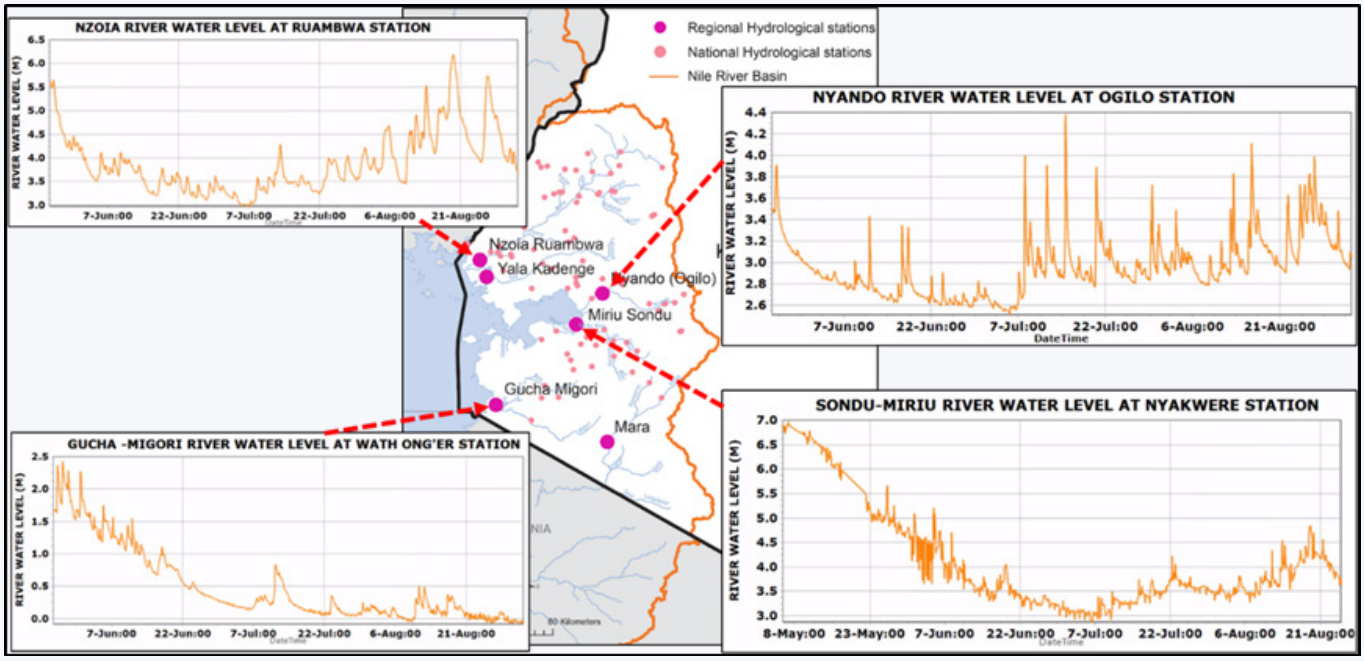

Figure 20: Observed River water levels in Nzoia, Nyando, Sondu and Gucha-Migori Rivers during JJA

4.4.2 October -December Outlook and Implications

The ICPAC Climate forecast indicates that the western and northwestern parts of the Kenya are likely to experience above-normal rainfall in the OND 2024 season, increased flows are expected in most Rivers within the Kenyan side of Lake Victoria basin with a likelihood of flooding in the lower Nzoia, Nyando, Sondu, Gucha Migori and Mara Rivers. It is also expected that the shoreline areas will remain inundation due to sustained high lake levels. Therefore, the following implications and response strategies are proposed.

i. It is anticipated that the OND season will have both positive and negative impacts on agriculture. The expected above normal rains will lead to good crop yield and harvest as well as sufficient pasture if well taken advantage of. On the other hand, destruction of crops is expected due to floods and water logging in some areas.

ii. Sustained availability of water resources is anticipated within the basin. Floods are expected in the low-lying areas of Nzoia, Nyando, Sondu, Gucha-Migori and Mara as well as the shoreline areas. Flash floods may occur in the urban areas as well as the lower reaches areas of Ahero, Kano, Budalangi, Nyatike and Logumi.

iii. The expected impact on infrastructure, lives and livelihood attributed to floods include destruction of roads and bridges, displacement of people/ livestock, disruption of schools and

other social amenities. The monitoring stations could also be destroyed by the floods and water supply intakes submerged.

iv. Widespread and long-running inundation which is caused by overflow leading to breaking of the riverbanks and heavy backflow from Lake Victoria.

v. Repair of flood dykes in the areas of the in the areas of Budalangi, Nyatike and Kano is necessary to contain the riverbank overtopping.

vi. Continoues monitoring of river water level and leveraging on the travel time to provide for early warning information should be institutionalize.

vii. Creating awareness and establishing river-alliance through the communication linkage between the upstream and downstream communities to enhances early warning is key for flood disaster risk reduction especially in Nzoia and Nyando rivers.

4.5 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 ridge discharging into the Nile Basin (Figure 21). 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%.

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

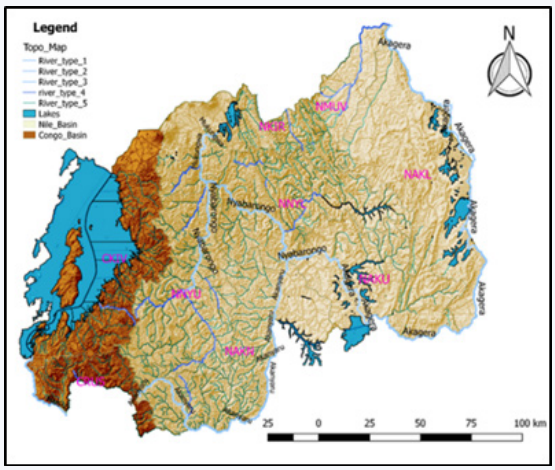

Figure 21: Main hydrographic basins of Rwanda

4.5.1 Performance of the June -September 2024 Season and Impacts

The JJAS is the main dry season in Rwanda. As it was forecasted JJAS 2024 Climate Outlook, the country received below normal rainfall. Reducing river flows were observed during the JJAS season, and there were no recorded impacts of flood incidents (Figure 22). This confirms the NEL Hydrological Outlook for June-September.

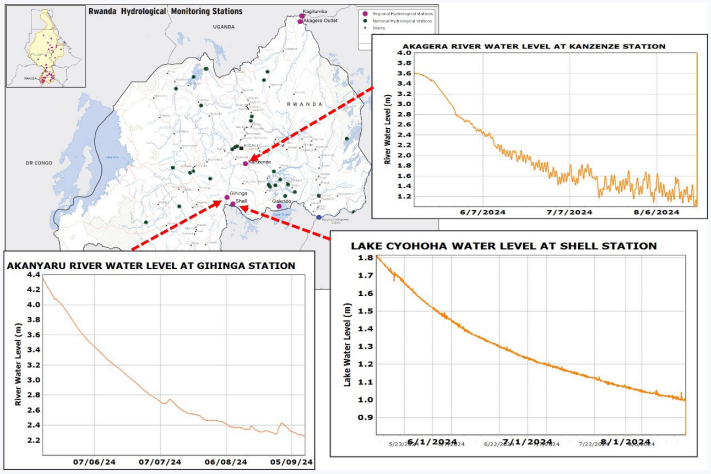

Figure 22: Reduction in water levels in rivers and lakes for the JJAS 2024 season.

4.5.2 October -December 2024 Season Outlook and Implications

OND is considered a short rainy season in Rwanda. The seasonal forecast for September to December (SOND) 2024 published by the Rwanda Meteorology Agency (Meteo-Rwanda) indicated likelihood of normal rainfall which is within the range of thirty years record. However, on the ICPAC Climate Outlook for October-December 2024 indicates that Rwanda is one of the countries which will experience wetter-than-usual conditions. Consequently, river flows and water level are expected to increase which may lead to riverine and flash floods in various areas, especially in Western, Northern, and Southern Provinces of the country.

Therefore, the following strategies are proposed to reduce the risk of flood related disasters

i. The Ministry in charge Emergency Management should put up a contingency plan for floods and landslides preparedness. These are actions that aim to reduce and limit the impacts from these disasters.

ii. Rwanda Water Resources Board (RWB) should continue monitoring and forecasting river flows for improved early warning information to the vulnerable communities.

iii. The country should enhance early warning and early action protocol and allocate some resources in anticipation of flood and landslide related disasters.

iv. Ensure that urban drainages are cleared to provide quick and safe evacuation of high runoff from the impervious areas in the urban centres.

v. Create awareness on early warning information to enhance personal safety among the vulnerable communities. This includes establishing linkages and communication channel between upstream and downstream communities as means for community based early warning information sharing.

vi. Encourage the reservoir operators to undertake safe releases in September to create room for more detained storage anticipated in October and November period.

vii. Hydropower stations that directly depend on the river runoff rivers are encouraged to take advantage of the increased river flows to enhance more energy security.

4.6 SOUTH SUDAN

South Sudan is in the mid-stream part of the Nile Basin covering an area of about 620,625 km2 with about 96% in the Nile River Basin representing 20% of the basin drainage area. The country drainage system constitutes of four basins namely, White Nile, Bahr El Jebel, Sobat and Bahr El Ghazal. The Sudd wetland, located within Bahr-El Jebel and Bahr El Ghazel basins, is a regional important hydrological feature in addition to the Macher Marshes in Sobat Sub 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 five fully functional regional stations established by the NBI.

These rivers are monitored by five regional stations established by NBI in the country which are fully functional for river flow information. The inflow from Uganda to South Sudan is through Bahr El Jebel and is gauged at Nimule while inflow from Ethiopia through Sobat River is gauged at Ankdiar hydrological station. Flow from Bahr-El-Ghazal basin to the Sudd region is gauged at Wau hydrological station. The outflow from South Sudan to Sudan is gauged at Malakal hydrological station.

4.6.1 Performance of the June -September 2024 Season and Impacts

The JJAS 2024 Outlook predicted wetter than normal conditions over much of the northern Greater Horn of Africa covering much of South Sudan. The JJAS is a rainy season for most areas in South Sudan. As predicted, heavy rains were observed over the country causing both riverine and flash floods in several areas. Increased inflow from Uganda through the Albert Nile River and from Ethiopia through Baro Akobo Sobat River (Figure 23) contributed to the observed above normal flows in Nile River in South Sudan.

Flash flood events were forecasted in the Bahr El Ghazal sub-basin in the administrative units of Jonglei Fangak, Eastern Equatoria Kapoeta North, Renk and Eastern Equatoria Lafon during the JJA season. According to South Sudan Flood Task Force report of August 2024, about eighteen counties in seven states experienced flooding of varying degree.

About 300,000 people and up to 50,000 households were affected by floods in August 2024. The flood extent increased by about 13,000 km² between 11th to 15th July 2024. States that reported floods include Central Equatoria, Jonglei, Warrap, Unity, Upper Nile, Northern Bahr-El-Ghazal and Western Bahr-El-Ghazal.

The flooding caused dyke breaks in Mayendit, Old Fangak and Panyijar counties. Water points in Unity State and river gauge stations at Mangala were submerged. Flash floods caused damages in Renk county of Upper Nile state in August 2024.

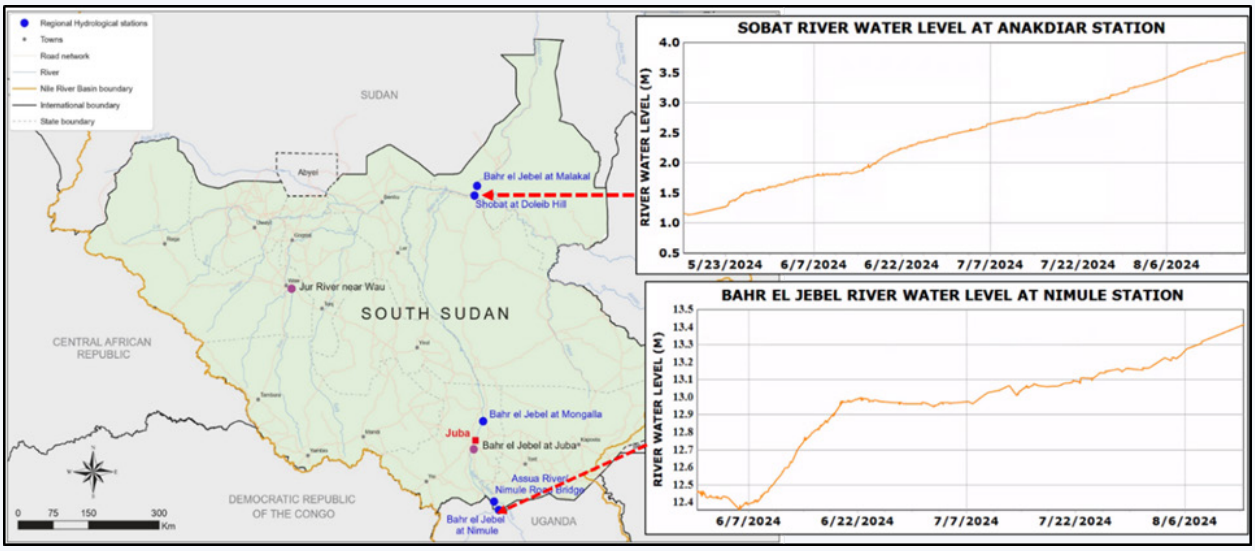

Figure 23: Observed River water levels for Bahr El Jebel and Sobat rivers for JJAS 2024 Season.

4.6.2 October -December 2024 Outlook and Implications

The OND 2024 Climate Outlook has predicted wetter-than-normal conditions in most parts of South Sudan, Uganda and Gambella of Ethiopia. This is an indication of high likelihood that the current JJAS flooding might continue to OND period due to the increased flow expected from Uganda and Ethiopia combined with above normal rainfall conditions anticipated in the country. In addition, the already high-water levels in most rivers with major monitoring stations in Nimule, Juba, Mangala, Wau, Bor, Malakal and Anakdiar have reached flood levels. Figure 24 shows the forecasted and historical observed water level at Mangalla hydrological station. The water level exceeded the alert level in mid-August and has remained consistently high.

Therefore, the following strategies are proposed to reduce the risk of flood related disasters:

i. The Ministry of Water Resources and Irrigation is encouraged to undertake continuous monitoring and provide regular updates.

ii. Continuous dissemination of Early Warning Messages and intensifying flood awareness to communities in flood prone areas should be strengthened.

iii. Relevant authorities should intensify the implementation of flood mitigation and response activities as indicated in the Flood Preparedness and Response Plan 2024 including prepositioning of food and non-food items.

iv. They should consider relocating people to high grounds, constructed rehabilitate dykes and vaccinate livestock.

v. Encourage hydrological data sharing with riparian countries such as Uganda and Ethiopia especially on dam operations and releases.

vi. Support smaller scale and locally led infrastructure projects, such as the construction and rehabilitation of dykes and raised roads.

vii. Provide urgent short-, medium- and long-term investment for sustainable infrastructure to meet crisis-affected people's acute needs for food, basic services, shelter and protection from encroaching flood waters.

viii. For long term, make river infrastructure investment decisions such as monitoring systems and reservoirs/storage within the of broader political, cultural, economic and environmental concerns.

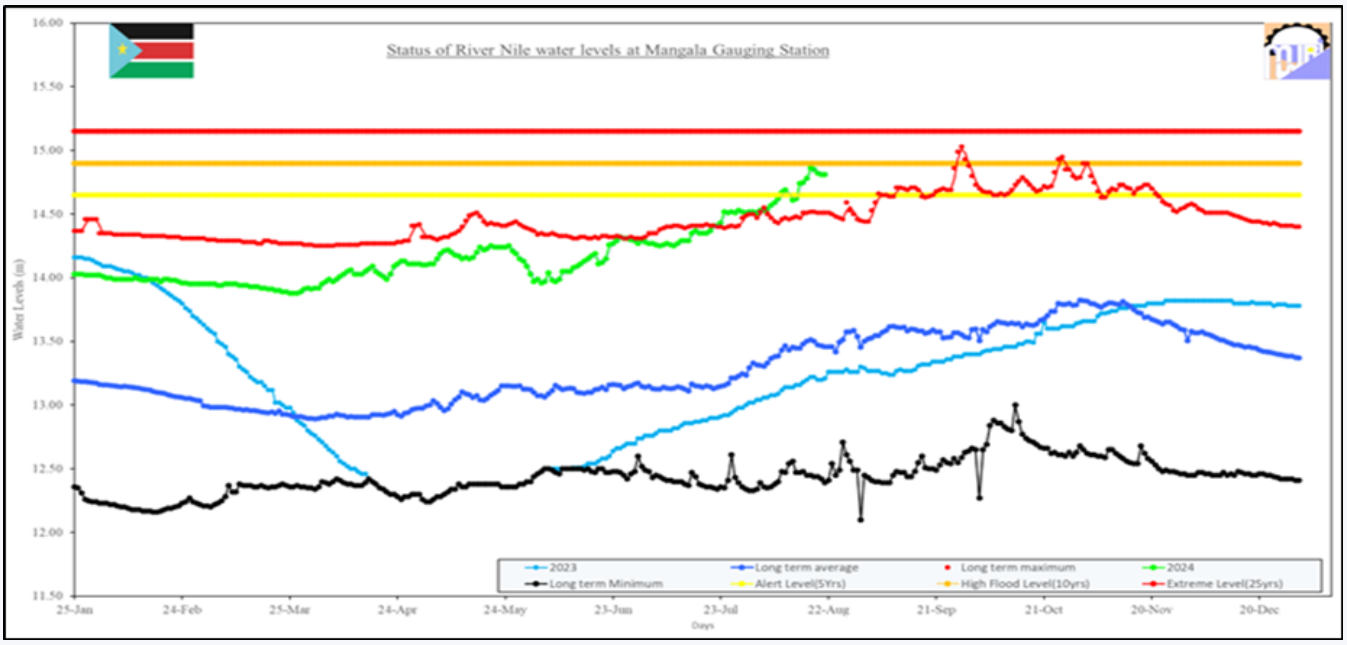

Figure 24: Bahr El Jebel River forecasted and historical water levels at Mangalla hydrological Station

4.7 Sudan

Sudan is in the mid-stream part of the Nile Basin covering an area of about 1,396,230 km2 with about 74% in the Nile River Basin representing 44% of the Nile basin drainage area. The Blue Nile, which rises in the Ethiopian Plateau, contributes much of the floodwaters of the Main Nile. After the confluence of the White and Blue Niles at Khartoum, the river flows in a great northward-curving joined by Atbara River, also from the northern Ethiopia joins the Nile River and then flows to Egypt (Figure 25).

Figure 25: Sudan's drainage system

4.7.1 Performance of Jun-September 2024 Season Impacts

The JJAS 2024 Climate Outlook predicted above-average rainfall over Sudan, as well as over the equatorial lakes region which is the major sources of White Nile River and the Ethiopian highlands as the major sources of Blue Nile and Tekeze Atbara Rivers. Vast areas in Sudan witnessed very high rainfall accompanied by flash flooding in the July-August period. The rainfall experienced was the largest in many years, and floods swept through areas in the far north that had remained outside the country's rainy climate map for decades as shown in the picture (Figure 26). The Early Warning Unit of the Sudan Meteorological Authority (SMA) also predicted that heavy rains would continue during September, accompanied by thunderstorms and strong winds, which may cause sudden torrential floods in four states: Sennar, the Red Sea, the Nile River, and the Northern Estates.

Figure 26: Flooding in Sudan July-August 2024.

Gash River was flooded, and several parts of Kassala Estate were affected. The Blue Nile did not flood due to the filling of the GERD. However, Jebel Aulia Dam received high flows from the White Nile. Water level derived from altimetry data indicated that the water level of the dam has been building up behind the dam, but not yet critical. The low flows of the Blue Nile didn't block the outflows of Jebel Aulia as earlier anticipated in JJAS 2024.

Flooding in Sudan impacted several sectors including Agriculture, damaging crops and submerging plains that are typically used for crop cultivation. The flat agricultural lands are not properly drained and will require an extended period to dry out, effectively resulting in substantial loss of the current agricultural season. The water levels in rivers and reservoirs increased leading to improved availability of water supply for domestic, irrigation and livestock use in Tekeze Atbara River and the Main Nile (Figure 27). This enhanced recharge of groundwater in Tekeze Atbara River and the Main Nile and stability in hydropower generation.

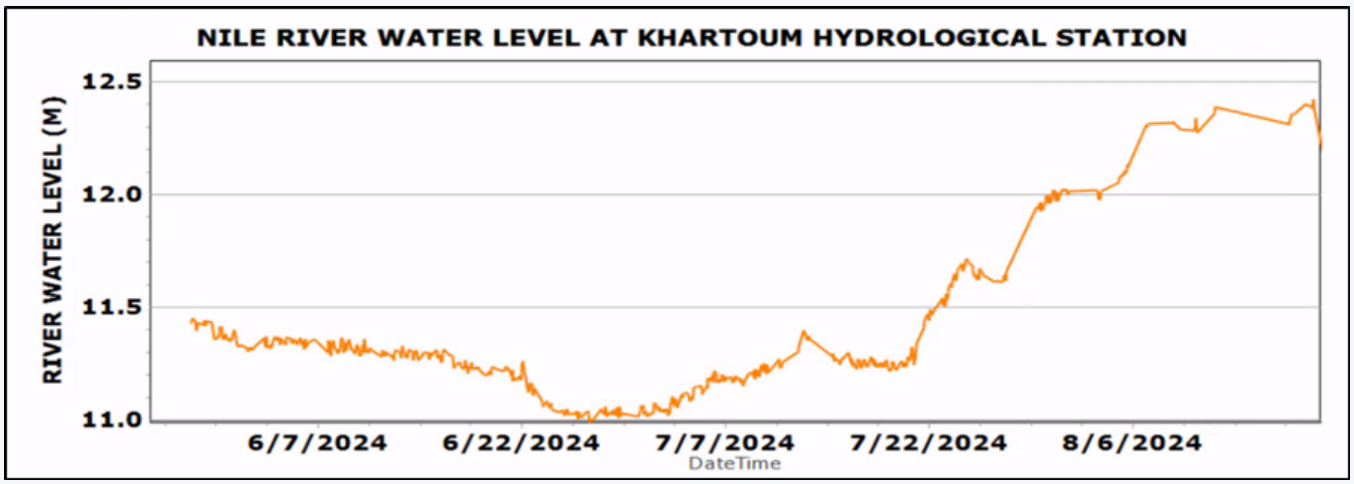

Figure 27: Increased Nile River water level at Khartoum hydrological station for JJA period.

The flooding also impacted public in infrastructure, transport, lives and livelihood of several communities. Flash floods in the northern states of Sudan have resulted in over 70 fatalities and significant property damage.

Heavy rains have led to the collapse and destruction of thousands of homes in both urban and rural areas, forcing families to displace in the open out of their homes. There are growing concerns about the potential flooding of entire regions situated along the flood path. In the energy sector, the hydropower generation has benefited from the elevated water levels, which have ensured a consistent and feasible supply to the turbines. Additionally, the operation of upstream dams has helped smoothing the devastating effects of the floodwaters, particularly along the Blue Nile and Tekeze-Atbara rivers. The Arba'at Dam, near Port Sudan in Sudan's Red Sea State, collapsed on the on 25 August 2024, gashing about 5 million cubic meters of silt downstream, killing about 60 people and severely impacting agriculture and water supply and causing extensive damage following heavy rains, and flood-wave leading to a critical humanitarian situation in the affected areas.

4.7.2 October -December Outlook 2024 Season and Implications

The October November December season is a dry season over Sudan as almost no rainfall is predicted. Temperature is expected to rise. During this period Sudan utilizes the stored water for irrigation, power generation, and domestic use. More than 85% agricultural projects in Sudan are rainfed in JJAS period. However, in OND only irrigated projects are operationalized. The on-going civil strife has hampered the prospects of irrigated agriculture in Sudan resulting to the current food insecurity. Several farmers have been displaced and their seeds were looted. The water needed for irrigation in the Gazira Schemes was reduced by more than 60 % due to the massive migration of the farmers. The irrigation projects along the White Nile will be affected by the low water levels due to the big opening of Jebel Aulia Dam, and challenges of operation of the Dam due to the civil war as the dam operators have left the area because of insecurity in the region.

The high flows arriving to Jebel Aulia Dam will not be utilized due to the large gates opening of the dam. By the end of October, the stored water will be released from the reservoir. Figure 28 details the forecasted net inflow and outflow of Jebel Aulia Dam for the period covering OND 2024 with the peak storage and releases expected to converge in the 1st week of November. However, this simulation is based on the dam operation rules (before the war) which may have changed now. However, the expected storage over Tekeze Atbara River and the Main Nile River is expected to support the existing project and domestic uses.

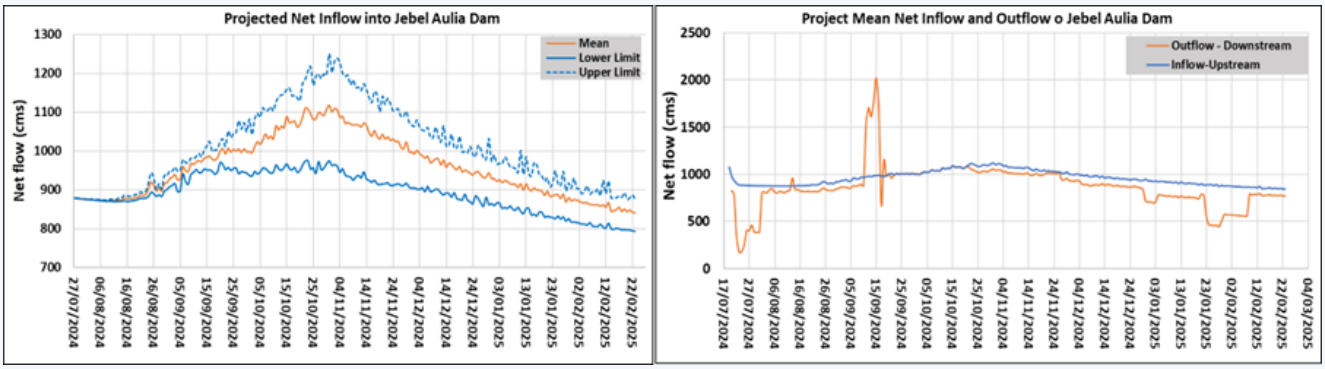

Figure 28: Project net inflow and outflow of Jebel Aulia Dam in Sudan for OND 2024 Season

Infrastructure, transport, lives and livelihoods along the Main Nile will be positively affected by the coming dry season. This will give chance for excessive water to drain and dry out and the restoration of the damaged facilities. Sustained energy is expected from the dams on Tekeze Atbara river and the Main Nile.

Therefore, the following strategies are proposed:

i. Proper operation and good management of dams to mitigate the variation of the discharge.

ii. Continuous monitoring of rivers and reservoirs that are currently at high levels and disseminate early warning information promptly.

iii. Concerted efforts should be made by international community and regional bodies to mediate the ongoing conflict and call for immediate response in the vulnerable regions especially for operation of the reservoirs such as Jebel Aulia dam.

iv. Reports indicate that no maintenance has been undertaken on the Jebal Aulia dam for almost two years. Combined with current non-operational status, failure of the dam to raise the water level of the White Nile may lead to a failed agricultural season.

v. Encourage information sharing from neighbouring countries such as Uganda, South Sudan and Ethiopia on the White Nile and Blue Nile respectively.

4.8 TANZANIA

Tanzania is in the upstream part of the Nile Basin covering an area of about 945,100 km2 with about 9% in the Nile River Basin representing 2.7% of the Nile Basin drainage area. The country Nile Basin area is located in the Lake Victoria Basin which supports about 6 million people in the country.

The Lake Victoria Basin has been divided into five

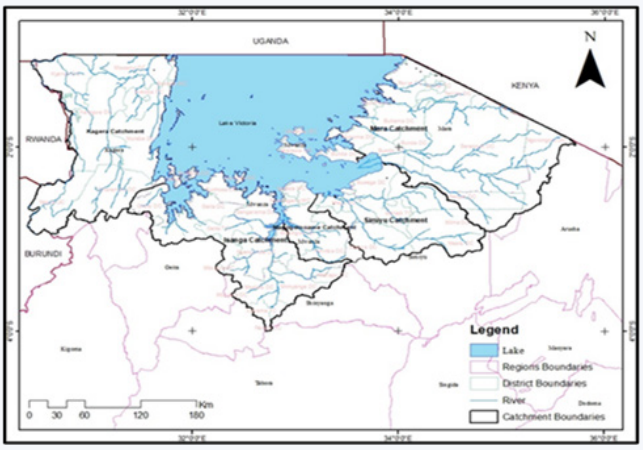

Figure 29: Lake Victoria Basin-Tanzania

(5) catchments such as Kagera, Mara, Simiyu, Magogo-Moame, and Isanga (Figure 29). Within the mentioned catchments main rivers include Kagera, Simiyu, Mbarageti, Grumeti, Duma, Mara, Ngono, Magogo-Moame, Isanga and Mori. In the season of June to September 2024, the basin had prolonged dry weather conditions as forecasted by the Tanzania Meteorological Agency (TMA).

4.8.1 Performance of Jun-September 2024 Season and Impacts

The information from both regional and national monitoring stations from June to August 2024 show that river inflows and lake levels are still above the recorded values of June – August 2023. However, the current measurements for both river inflows and lake levels in the basin show a declining trend which is expected to continue till September (Figure 30) but the rivers and lake water levels and flows recorded from the monitoring stations remained higher in JJAS 2024 compare to JJAS 2023 season.

4.8.2 October -December Outlook and Implications

The October to December 2024 seasonal forecast indicates normal to below normal rainfall in most parts of Tanzania. However, the Lake Victoria Basin in Tanzania is expected to receive near normal to above normal rainfall in the OND 2024 season. The above normal condition is most likely to increase the river flows and flooding in the flood prone areas of the basin such as Mara River and Kagera regions.

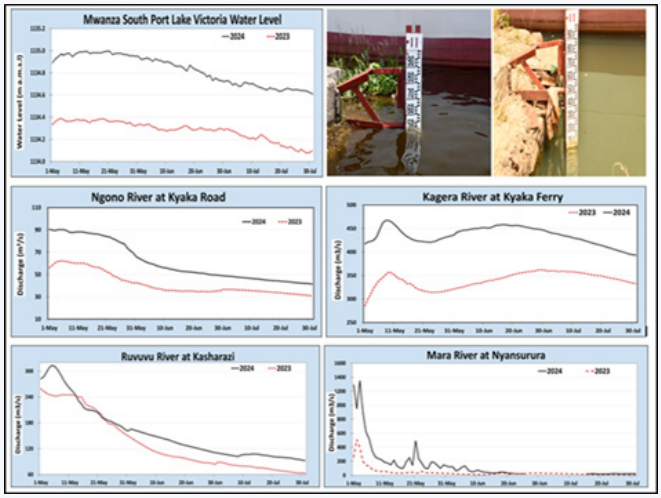

Figure 30: Trend of Rivers flowing into Lake Victoria Tanzania for JJAS 2024 season

Therefore, the following strategies are proposed:

i. Prepare communities for rainwater harvesting to take advantage of the rainy season,

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

iii. Increase awareness creation to the vulnerable communities that are most likely to be impacted by the above normal rainfall predicted over the shores of Lake Victoria

4.9 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-basin, namely, Bahr El Jebel, Victoria Nile, Lake Victoria and Lake Albert. The Uganda is sub-divided into eight major drainage basins: Lake Victoria, Lake Albert, Lake Kyoga, Lake Edward, Victoria Nile, Albert Nile, Aswa and Kidepo.

4.9.1 Performance of Jun-September 2024 Season and Impacts

The regional and national rainfall outlook for the JJA 2024 season indicated wetter than normal conditions in Northeastern Uganda and parts of West Nile while the rest of the country was predicted to receive near normal rainfall. There is agreement between both the regional rainfall outlook and the downscaled national rainfall outlook apart from Southwestern Uganda which was predicted to receive below normal rainfall (Figure 1). Although the Uganda National Meteorological Agency (UNMA) is yet to issue the rainfall performance of the JJA 2024 season as the National Climate Outlook Forum (NCOF) planned, light and scattered rain was observed from July in several parts particularly in central, western and Northen Uganda.

The forecasted hydrological outlook focused on the three major lakes in Uganda; Victoria, Kyoga and Albert and River Nile as highlighted below;

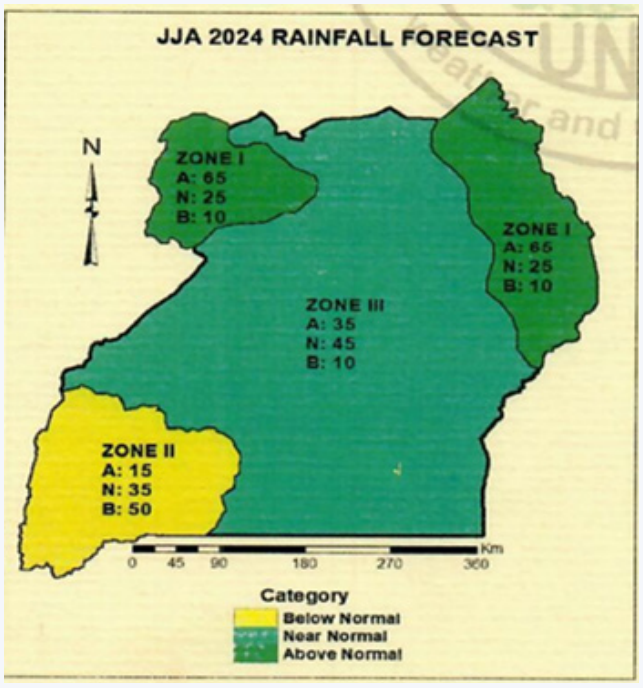

Figure 31: National Rainfall Outlook for JJAS 2024

The Outflows from Lake Victoria: Basing on the outlook in figure 1 above and the status of Lake Victoria water levels during the March-May (MAM) season, it was predicted that the high outflows from

the lake would be sustained through the JJA 2024 season. The actual outflows from Lake Victoria during the JJA 2024 season were high as predicted with a declining trend of the water levels in the lake (Figure 32).

The water levels in Lakes Kyoga and Albert: similarly, basing on the outlook in figure 1 and considering the continued high inflows from Lake Victoria, combined with additional inflows from rainfall in the Kyoga and Albert regions, the water levels in Kyoga and Albert were predicted to increase and reach maximum around November or December 2024. The water levels in both lakes have drastically increased during the JJA 2024 season as predicted (Figure 32). The Lake Kyoga water level hit the new historical maximum of 2020 by mid July 2024.

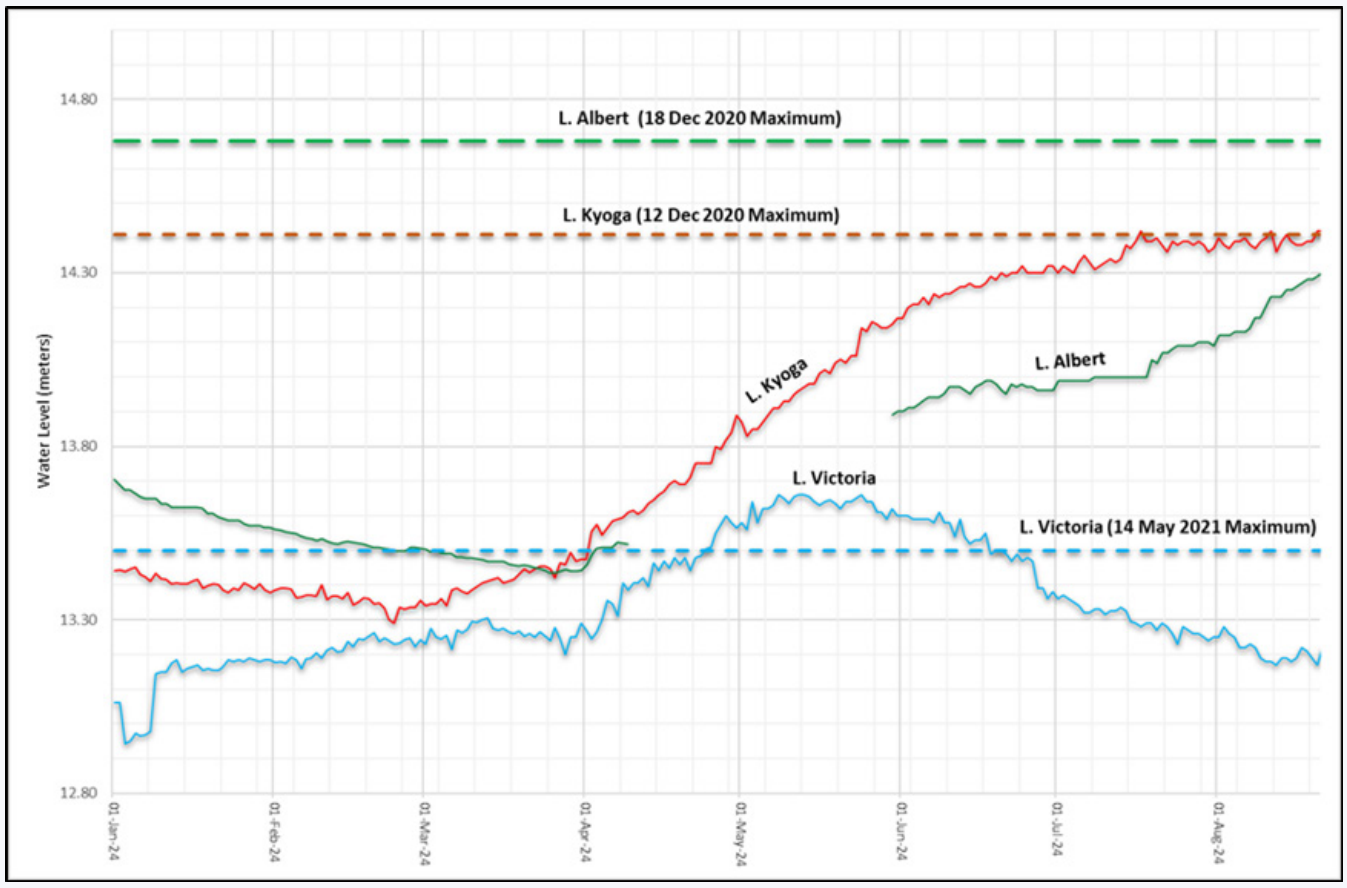

Figure 32: Trend of Water Levels in Lake Victoria, Kyoga and Albert During JJA 2024 Season

Flash flood events were forecasted in the Lake Kyoga – Victoria Nile Sub basin in the administrative units of Kapchorwa – Kween, Kapchorwa – Tingey, Sironko – Bulambuli, and Sironko - Mt. Elgon towards the end of the JJA season 2024. Lakeshores flooding was also observed in Lake Victoria, Kyoga, Albert and along River Nile leading to destruction of roads in several parts of the country. For example, five major roads were cut off in eastern Uganda in six districts. There was flooding of homes and gardens affecting livelihoods. For instance, seven districts in the Lake Kyoga basin were affected by floods.

This led to disruption of social services like education and health (Figure 8). The districts include Kayunga, Nakasongola, Amolatar, Kalaki, Kaberamaido, Serere and Kwania. There was flooding of homes around Lake Albert especially at the landing sites within the three town councils of Bulisa, Butiaba and Wanseko. There was an increase in the

movement of water weeds which is affecting operation of hydropower plants. The Figure 33 provides plate descriptions of the impacts of the JJAS season

Figure 33: Summary plate for the impacts of JJAS 2024 season in some parts of Uganda

4.9.2 October -December 2024 Season Outlook and Implications

The OND Climate Outlook 2024 outlook indicates neutral conditions in much of Northeastern (Karamoja Sub-region), part of central and southwestern Uganda. Wetter than normal conditions with probabilities of 45% are expected in West Nile, Northern and part of the Elgon subregion while below average rainfall with probabilities of 45% are expected in much of central and parts of western Uganda. Average to cooler than average conditions are expected in the Northern, Northeastern and part of West Nile region while warmer than average temperatures are expected elsewhere. According to the climate outlook for OND season, high flows are predicted to be sustained in the Nile and water levels will remain high particularly in Lakes; Victoria, Kyoga and Albert.

The sectorial anticipated impacts include the following

i. Agriculture - The irrigation schemes in western Uganda might not have enough water during the season due to the predicted below normal rainfall. This might lead to reduced crop harvest.

ii. On the Water Resources the Outflows from Lake Victoria: Basing on the outlook in figure 2 and the status of Lake Victoria water levels during the June-August (JJA) season, the outflows are expected to remain relatively high through the OND 2024 season. Water levels in Lakes Kyoga and Albert: The continued high inflows from Lake Victoria, combined with additional inflows from rainfall in the Kyoga and Albert regions, the water levels in Kyoga and Albert are predicted to continue rising and reach maximum by the end of 2024.

iii. The sustained high outflows from Lake Victoria and the rising water levels of Lake Kyoga and Albert are expected to cause more flooding which may lead to; pollution of water sources, siltation of reservoirs and submergence of hydrological stations.

iv. Destruction and damage to infrastructure such as; roads, bridges and buildings is expected to

continue due to anticipated flooding around the three major lakes. Marine transport will be affected particularly ferry landings and crossings due to increased water levels and movement of floating weeds and islands. Livelihoods will be affected as homes and gardens get flooded and social services such as schools and hospitals get cut-off.

v. Considering the OND 2024 climate outlook and status of water levels in the lakes and the Nile, stable hydropower generation is expected to continue. The lake levels are expected to remain below the historic maximum for the forecasted flow scenario (Figure 34). However, there could be interruptions in operations due to the anticipated increase of water weeds and floating islands. Operation and maintenance costs are also anticipated to increase.

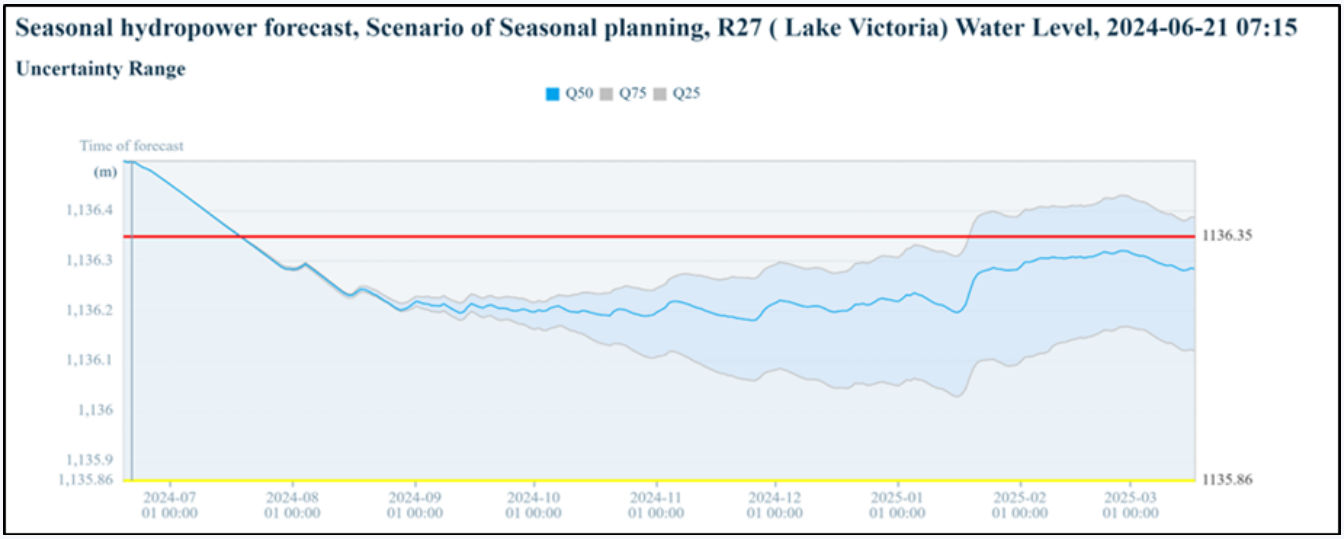

Figure 34: Forecasted flow for Lake Victoria covering the OND 2024 season

Therefore, the following strategies for interventions are necessary measures to reduce the risk of hydrological disaster during the OND season in Uganda.

i. There is a likelihood of sustained high-water levels in all the three lakes of Victoria, Kyoga and Albert which may lead to prolonged inundations in most parts of the country particularly those areas close to lake shorelines and riverbanks. Therefore, the communities living around the three lakes especially at the landing sites should be encouraged to move away from lower ground to higher ground.

ii. Intensify monitoring of water levels and flooding to provide continuous advisories.

iii. Provide regular updates to national & transboundary stakeholders.

iv. Put in place surveillance teams to monitor movement of floating weeds & islands.

v. Budget for emergencies such as; mobile water treatment, rehabilitation of hydrological infrastructure.

vi. National Hydrological Services (NHS) should use the opportunity to update ratings at high flows.

vii. Encourage communities to explore flood-based farming initiatives.

5.0 BASIN WIDE IMPLICATION AND ADVISORY

5.1 High Likelihood of Wetter-than-normal Conditions

There is a high probability of experiencing wetter-than-usual conditions across several regions. The central and western Ethiopia, southern South Sudan, northern Uganda, western Kenya, and Rwanda are expected to receive above-average rainfall. This may benefit agricultural activities, support vegetation growth for livestock forage and improve productivity resulting to food security but some areas are expected to flood. The following are implications and advisory for the above predictions:

i. Increased river flows and lake levels enhances water resources availability for irrigated agriculture and domestic water supply and hydropower generation resulting to energy security due to improved water availability and storage. However, in these areas, the risk of flooding and related disasters is high, particularly in low-lying areas, and could lead to displacement of people, loss of lives and livelihood, damage to critical public infrastructure and hampering of traffic flow and transportation in both urban and rural areas.

ii. Stakeholders in these regions should prepare for potential excess rainfall which will enhance water availability for different uses and benefit agricultural activities. However, this also raises concerns on soil erosion, landslides, and risk of spreading waterborne diseases. Necessary measures to mitigate flood-related risks through enhanced warning information, disaster preparedness and disease surveillance should be put in place.

iii. Create awareness on flood risk and enhance communication channels to the vulnerable population. This includes working with disaster management and response team to develop and implement actionable plan and training. The develop and implement response plan and training the response team and mapping of flood evacuation areas is key to disaster risk reduction and resilience building.

iv. Continues monitoring the situation and review forecast. Institutionalize systems that ensure uninterrupted supply of water treatment chemicals to ensure access to good water quality.

v. Prior clearing and cleaning of drainage systems in urban centres to ensure quick flood evacuation to reduce the risk of urban flooding.

vi. Enhancement of safe releases from reservoir and dam to create room for more storage as a key strategy that can reduce the risk during this period.

vii. Relevant stakeholders in Member States are encouraged to disseminate flash flood early warning information from both Nile Basin Flash Flood Early Warning Information and the Eastern Nile Flood Forecasting System to encourage the vulnerable to take actions that reduces their risk to flood disaster.

5.2 Increased Likelihood of Drier than normal Conditions

The OND climate outlook indicates a heightened probability of drier-than-average conditions across the eastern Horn of Africa and some part of the basin. This includes regions that are already susceptible to drought, further exacerbating the potential for water scarcity and negatively impacting agriculture, food security, and livelihoods. The affected areas may experience reduced rainfall, which can strain water resources and increase the risk of drought, making it imperative for governments,

communities, and humanitarian organizations to prepare for these challenging conditions. In addition, the drought conditions may compel women and children to travel long distances in search of water, increasing their vulnerability to violence, including sexual assault.

The drier than normal conditions might increase incidences of insecurity as pastoralist and nomads intensify their search for forage and water for their livestock.

i. To mitigate this risk, it is strongly recommended that affected countries, districts and region prioritize the construction and provision of water sources in safe and accessible locations. This will ensure that these critical resources are closer to communities, especially in areas where women and children are most at risk, which can significantly reduce the exposure to violence and enhance the overall safety and well-being of these vulnerable groups.

ii. Water vending remains an alternative option to ensure availability of portable water in the drier regions.

iii. Water conservation and increasing irrigation efficiency as well as use of groundwater from the existing boreholes should be enhanced to supplement dwindled surface water.

iv. More attention should be given to water management to be encouraged for optimal use.

5.3 Drier Conditions Expected

As the season ends in December, drier-than-normal conditions are anticipated in eastern Kenya, southern Uganda, Sudan and South Sudan. These areas should prepare for potential water shortages, which could impact both agricultural production and access to water for domestic and livestock use. Proactive measures, such as water conservation strategies and drought-resistant farming practices, will be crucial in managing the expected dry conditions.

5.4 Equal Probabilities in Select Regions

In regions such as southwestern Ethiopia, South Sudan, central and southern Kenya, central and southern Uganda, eastern Rwanda, and eastern and northwestern Tanzania, the forecasts indicate equal probabilities for average, above-average and below-average rainfall. This suggests that these areas could experience a wide range of outcomes, making it difficult to predict specific impacts. Consequently, it is essential for stakeholders in these areas to remain vigilant and prepared for all scenario, ensuring that both water conservation measures and flood management strategies are in place.

5.5 Anticipated Shifts in Weather Patterns

Southern Ethiopia is expected to experience drier conditions, potentially exacerbating water shortages and impacting agricultural productivity. This may benefit water storage and agriculture but also necessitates caution against the dangers of flooding and waterlogging, which could affect crop yields resulting to food insecurity in some areas and public infrastructure. Conversely, western parts of the region are likely to receive increased rainfall.

6.0 ACKNOWLEDGMENT

The regional expert on flood advisory forum and the Nile Basin Regional Hydrological Monitoring System is supported by Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) with funding from the Federal Ministry of Economic Cooperation (BMZ) under the project "Support to transboundary cooperation in the Nile Basin". NBI wishes to acknowledge the invaluable contribution and support from the regional expert members and with special gratitude to the IGAD Climate Prediction and Applications Centre (ICPAC), Lake Victoria Basin Commission (LVBC) and Uganda Electricity Generating Company Ltd.

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