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HYDRO METEOROLOGICAL BULLETIN

3RD QUARTER, 2023

HYDO METEOROLOGICAL INFORMATION FOR MANAGEMENT OF WATER RELATED ACTIVITES

Hydro Meteorology Bulletin

3RD QUARTER, 2023

Compilation Of Flood & Drought
Monitoring Information
Over Nigeria

July, August and September, 2023

A publication of Nigerian Meteorological Agency

Our Mandate

To provide for the regulation of meteorology and for related matters

Our Vision

To be a World Class provider of Weather and Climate services for safety and sustainable national socio-economic development.

Our Mission

To observe Nigerian Weather and Climate and provide Meteorological, Hydrological, and Oceanographic Services in support of National needs and International Obligations

Who We Serve

Aviation, Agriculture, Building and Construction, Commerce, Health, Hydrology, Marine, Oil and Gas, Sports, Social Events, Power and Energy, Telecommunication and more...

EDITORIAL

PREFACE

This Bulletin is a publication of the Nigerian Meteorological Agency (NiMet) produced for the purpose of providing hydro-meteorological information to water dependent sectors such as agriculture, hydropower/electricity generation, marine, water resources management, environment, dam management, construction, research institutes, universities and other end users.

The HydroMet division of NiMet routinely monitors flood and drought in all the states of Nigeria using Standardized Precipitation Index (SPI). Standardized Precipitation Index (SPI) expresses the actual rainfall as standardized departure from rainfall probability distribution function and, hence, this index has gained importance in recent years as a potential drought indicator permitting comparisons across space and time.

SPI can also indicate the potential for possible occurrence of flood over a geographical area. Based on these analyses, four (4) maps are developed categorizing the degree of wetness or dryness for specified months of the year. The maps are generated for the:

1. 1-month (for meteorological drought).
2. 3-months SPI (for agricultural drought).
3. 6-months SPI (for groundwater drought) and the,
4. 12-months SPI (for stream-flow lake storage drought monitoring).

Since the SPI tool is calibrated, it enables the identification of the degree of dry or wet climate conditions emanating from rainfall variations. These conditions, based on the analysis and calibration, can be used to describe the wetness or dryness of a location as normal/moderate/severe/extreme. It is therefore expected that, among other things, the information contained in this bulletin could optimally guide the management of water-related sectors of the economy, and for this purpose this is a very useful tool in the hands of stakeholders such as dam managers, reservoir operators among others. While we assure the public of our resolve and readiness to continually upgrade this product, feedback from our stakeholders in the form of suggestions would be highly appreciated.

Prof. Mansur Bako Matazu
Director-General/CEO

Introduction

NIGERIA AND ITS CLIMATE

Nigeria is located between latitude 40N to 140N and longitude 30E to 150E respectively with a total area of 923,768 square kilometres (km2). Nigeria has a tropical climate with variable rainy and dry seasons.

Hydrometeorological information plays vital role in the orderly and efficient development and control of water resources. It provides information for assessing, developing and managing the water-related environment. The basic orientation therefore, is to make available qualitative hydrometeorological information and products to end users in all aspects of human endeavor in fulfilment of the mandates of the Agency.

Drought is a subject that has to do with water deficiency, and marked by water falling below the current requirements of an area. This can result to negative impacts to the environment and human activities. Drought can be natural, temporal, local or regional climatic hazard. This water deficit may result from shortfall in precipitation, stream flow, soil moisture or any combination of these.

On the other hand, flood is a large amount of water covering an area that is usually dry. Floods can be caused by several things ranging from natural to human induced.

June-July-August (JJA) is the peak of the raining season across the country. It's usually within this period that the southern part of the country experiences its first break, while the north experiences the peak of its season.

Noticeable in this period under review was the persistent dryness due to lower amounts of rainfall recorded at the Yobe- Gombe states axis.

As at October 2023, according to a NEMA report on "The summary of 2023 floods and climate related disasters", that the 2023 floods affected 171,545 persons, submerged over 24,000 houses, over 8,000hectares of lands and resulted to the death of over 45 persons.

It was also observed that there were several reports of devastation e.g. falling of poles, building roofs, bridges collapse and even death etc. usually associated with the rainy season.

Monitoring of these events is therefore necessary for mitigation and planning purposes, and which makes this product a veritable tool.

APPLICATIONS OF THE BULLETIN TO RELEVANT SECTORS OF THE ECONOMY

NiMet's Hydrometeorological Bulletin provides useful information for planning, operations and decision making in various sectors of the economy that are dependent on or affected by water availability. These sectors include agriculture, hydrology and water resources, dams and hydroelectric power generation.

1. AGRICULTURE

This HydroMet Bulletin provides information on the state of soil moisture content across Nigeria at any period of the year. Soil moisture content is critical for crop production. The information provided in this Bulletin therefore helps farmers to take critical decisions during periods of land preparation, planting time, seed and seedling selection, fertilizer application, irrigation requirement and planting in both the dry and rainy seasons. Thus, the information in the Bulletin helps to optimize crop production and enhance food security. It also provides early warning information for possible occurrence of drought or flood in any part of the country.

2. HYDROLOGY AND WATER RESOURCES

The HydroMet Bulletin is also a useful tool for monitoring the prospects of water availability for domestic, industrial, agricultural and hydro-power generation needs. In addition, the product assists water resources managers in monitoring trans-boundary streams and river flows. Generally, stream-flows and ground water recharge are usually affected by water availability which can be monitored using the Standardized Precipitation Index (SPI) over the preceding 6 and 12 months.

3. DAM MANAGEMENT

The Bulletin provides information for adequate monitoring of water levels in dams. This is to help dam managers to effectively manage the dams to avoid failure and flooding of downstream communities and ecosystems.

4. HYDRO-ELECTRIC POWER GENERATION

This Bulletin helps to determine power generation potential of dams, considering the volume of water accumulated for driving the turbines

5.MARITIME AND WATERWAYS

This product can assist operators of coastal marine and inland waterways transportation in monitoring water levels. This is useful for determining the passenger and cargo loads, as well as the speed of the ferryboats and other river crafts.

6.ENVIRONMENTAL PLANNING

The HydroMet Bulletin is a strategic product that can help environmental planners to identify potential flood prone
areas and plan proper drainage systems, especially in urban areas.

7.FLOOD & DROUGHT DISASTER MANAGEMENT

Flood disasters are quite common in Nigeria during the rainy season. Droughts also affect many communities during the dry season. The Standardized Precipitation Index (SPI) information provided in this Bulletin could be used by disaster managers to identify areas where the soil moisture has reached saturation levels such that any additional rainfall may result in massive runoff and flooding in that area.

Similarly, the information in this Bulletin could be used for early detection of onset of drought and necessary measures taken by relevant agencies as well as communities that are likely to be affected.

JULY,2023 ANALYSIS

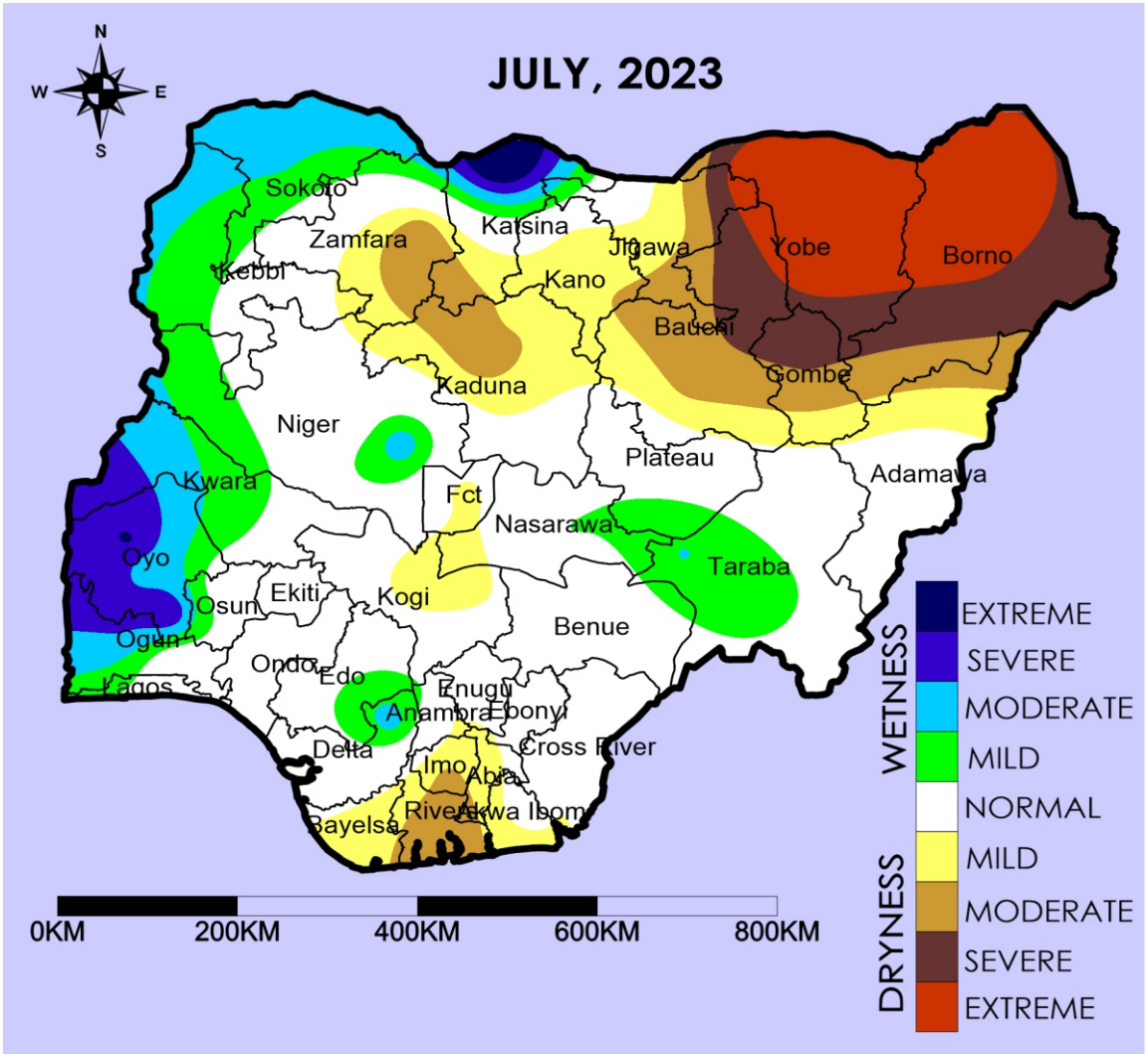


Figure 1:1-Month Standardized Precipitation Index (Meteorological Drought Monitoring)

The 1-month SPI analysis (Figure 1), shows that places like parts of Yobe, Borno, Bauchi, Gombe, Bayelsa, Rivers, Imo, Zamfara, Kano, Kaduna, Katsina, Jigawa, Adamawa, Kogi, FCT and Akwa Ibom states experienced mild-to-extreme dryness. On the contrary, mild-to-extreme wetness was experienced over states like parts of Sokoto, Kwara, Oyo, Ogun, Kebbi, Katsina, Niger, Taraba, Nasarawa, Plateau, Osun, Edo, and Anambra states. The rest of the country remained under normal soil moisture conditions associated with the period under review.

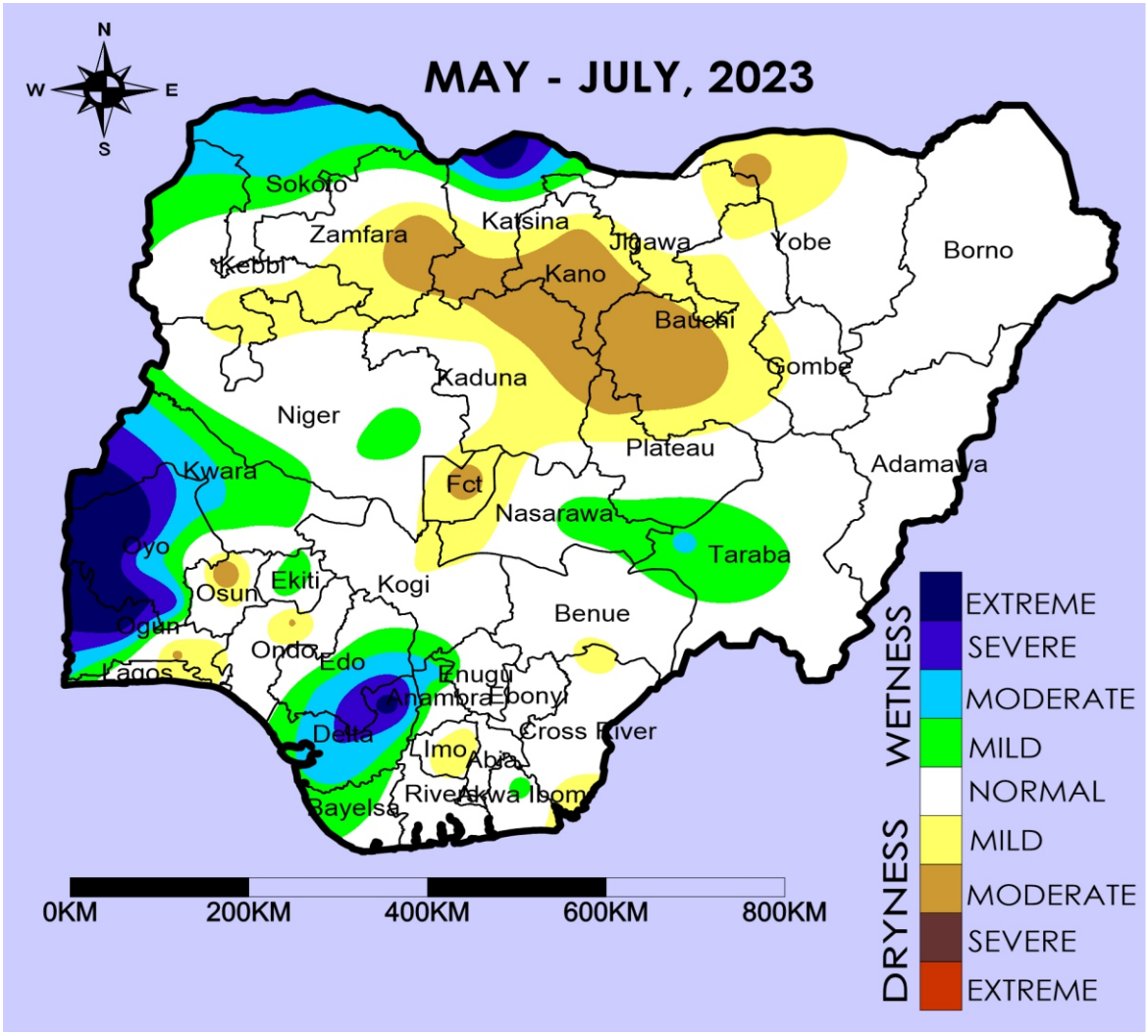


Figure 2 :3-Month Standardized Precipitation Index (Agricultural Drought Monitoring)

The 3-month SPI analysis (Figure 2), shows that places like parts of Kano, Zamfara, Yobe, Katsina, Kaduna, Jigawa, Gombe, plateau, Kebbi, FCT, Nasarawa, Osun, Ondo, Lagos and Imo States experienced mild-to-severe dryness, while states like parts of Sokoto, Kwara, Oyo, Delta, Kebbi, Katsina, Niger, Nasarawa, Taraba, Ogun, Lagos, Edo, Bayelsa, and Enugu states experienced mild-to-extreme wetness, which indicates adequate soil moisture condition for Agricultural activities in those places.

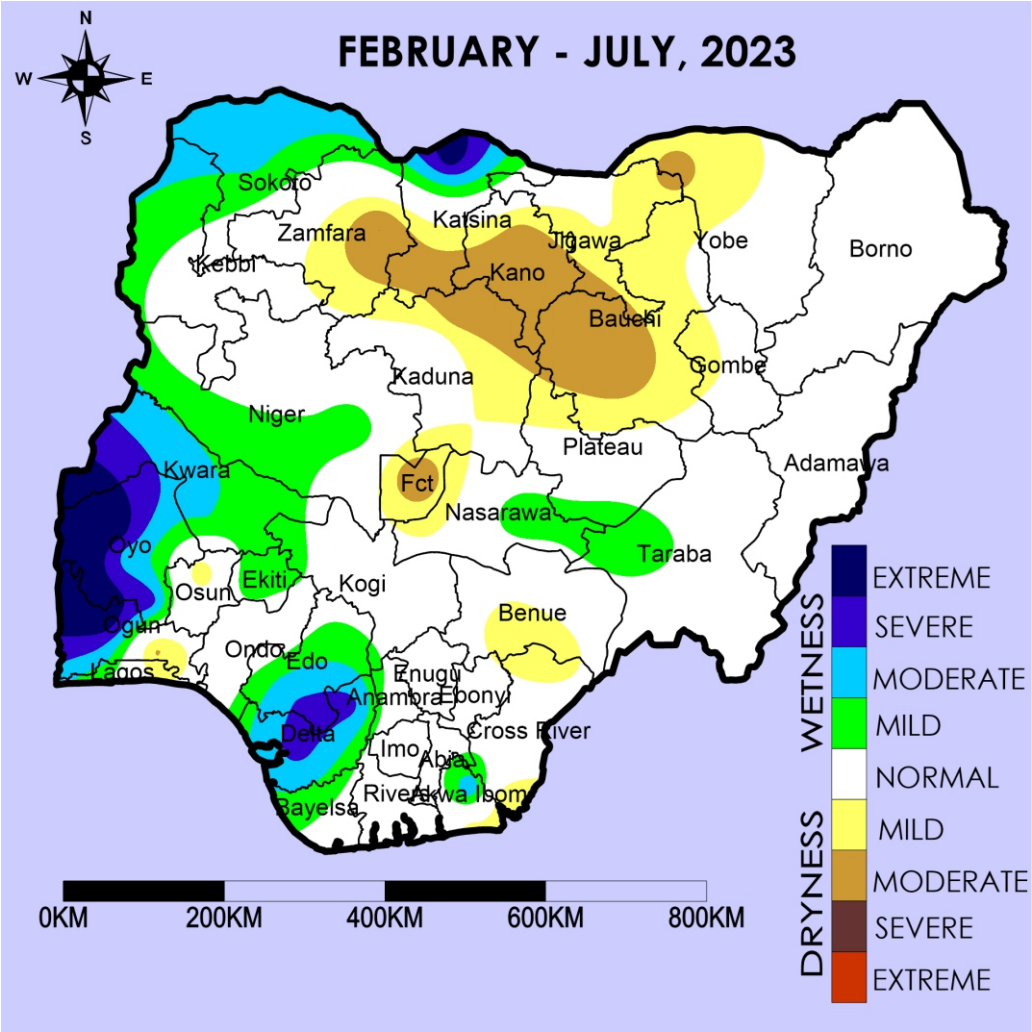


Figure 3 :6-Month Standardized Precipitation Index (Groundwater Monitoring).

The 6-month SPI analysis (Figure 3) reveals similar features with SPI-3 with the exception of states like parts of Kebbi, Osun, Ondo, and Imo where there was slight improvement in the soil moisture condition. Although the states in wetness conditions remains adequate for ground water recharge.

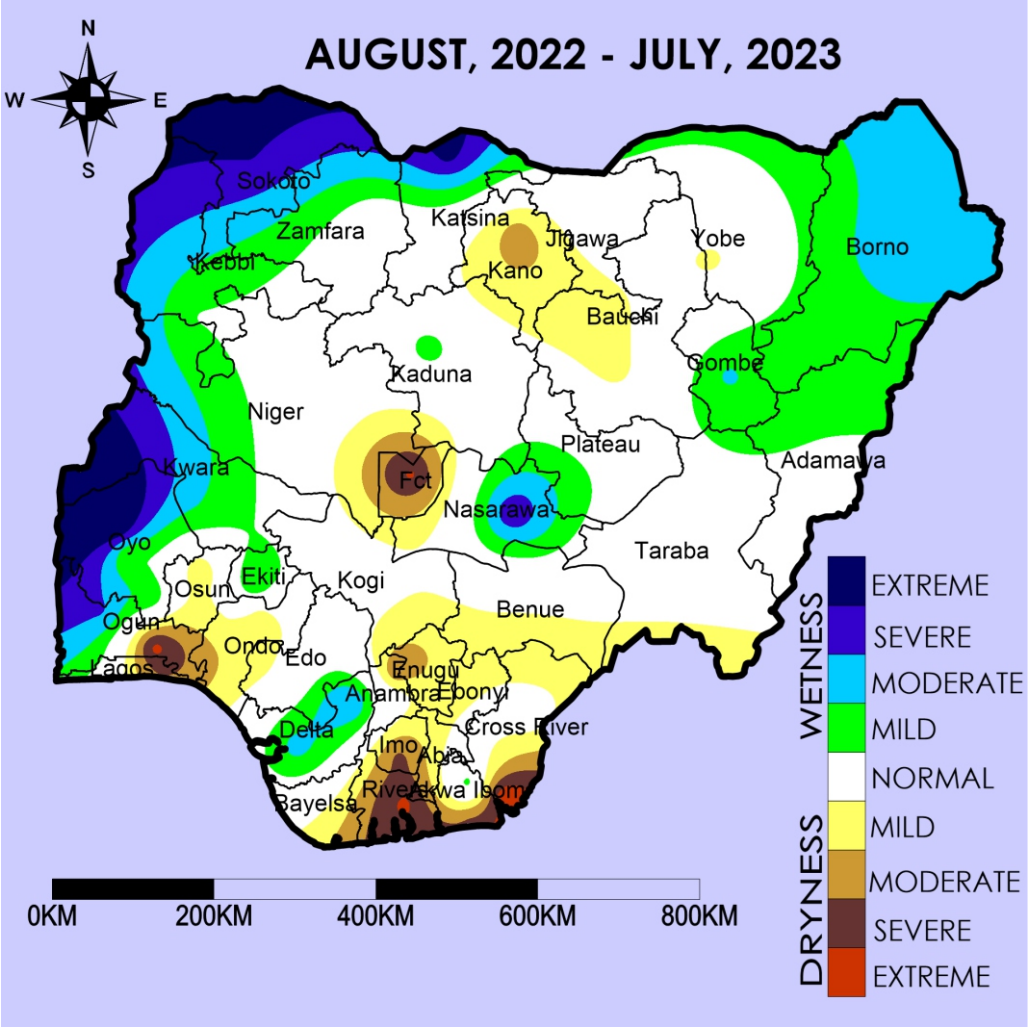
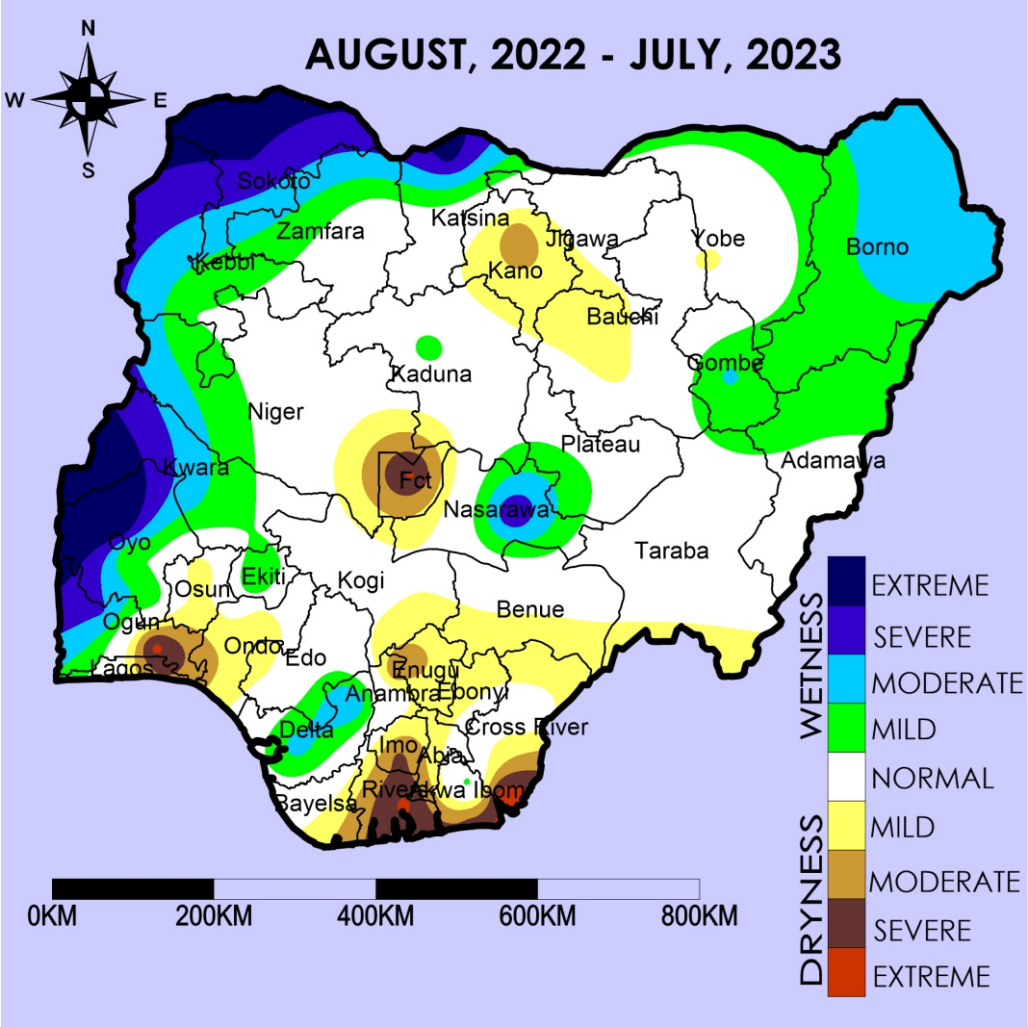


Figure 4: 12-Month Standardized Precipitation Inde (Stream flow and Lake Storage Monitoring).

The 12-month SPI analysis (Figure 4) depicts mild-to-extreme dryness over parts of the FCT, Rivers, Imo, Kano, Bauchi, Benue, Osun, Ogun, Ondo, Kogi, Anambra, Enugu, Ebonyi, Abia, Cross River, Bayelsa and Akwa-Ibom states. However, places like parts of Sokoto, Kebbi, Borno, Kwara, Oyo, Zamfara, Yobe, Katsina, Niger, Gombe, Adamawa, Plateau, Nasarawa, Ekiti, Ogun and Delta states experienced mild-to–extreme wetness. Hence, a good situation for adequate stream flow and lake storage.



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1.1 OUTLOOK FOR AUGUST, 2023

Rainfall is expected to be at its peak in most parts of the central and northern states. However, "Little Dry Season (August break)" is likely to occur in some parts of the southern states of the country. With an anticipated increase in river and stream flows, agricultural, hydropower, maritime, hydrological and other water-dependent activities are consequently expected to flourish. The possibilities of run-off over some states may not be ruled out.

Figure 5: Pictures showing flood disaster in state (source: The Guardian)

August, 2023 Analysis

EVALUATION: The Standard Precipitation Index (SPI) analysis for August 2023, shows the degrees of wetness and dryness across the country. Rainfall was actually recorded in ample amount over most parts of the country, although, the effect of the Little Dry Season has not been established. In addition, there were cases of run -off leading to floods in some states as presented in the outlook for August in the July edition of this bulletin.

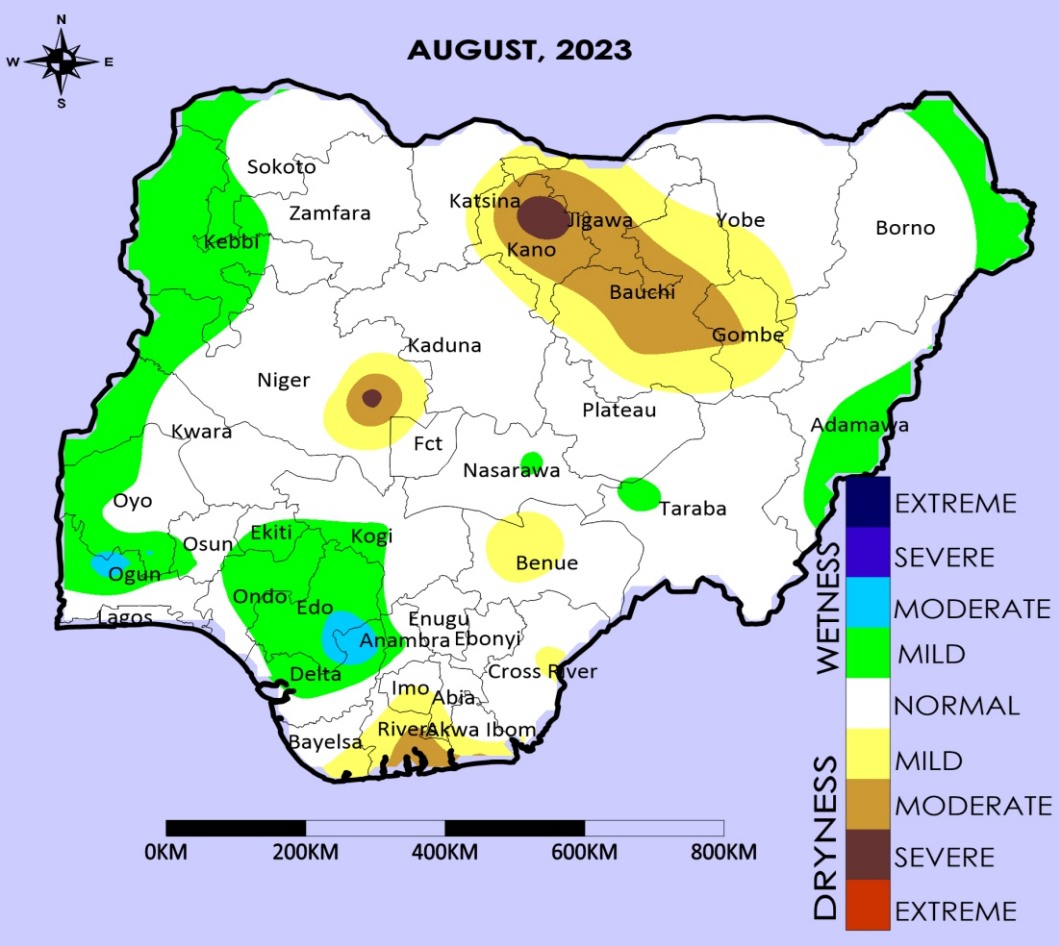

Figure 6: 1-Month Standardized Precipitation Index (Meteorological Drought Monitoring)

The 1-month SPI (Figure 6) shows that parts of Kebbi, Niger, Borno, Taraba, Adamawa, Nasarawa, Kogi, Oyo, Ogun, Ondo, Edo, Ekiti and Delta states recorded mild-to-moderate wetness. However, most parts of Kano, Jigawa, Bauchi, Katsina, Gombe, Niger, the FCT, Benue, Imo, Rivers and Bayelsa states experienced mild-to-severe dryness. The rest of the country recorded normal soil moisture condition associated with the period under review.

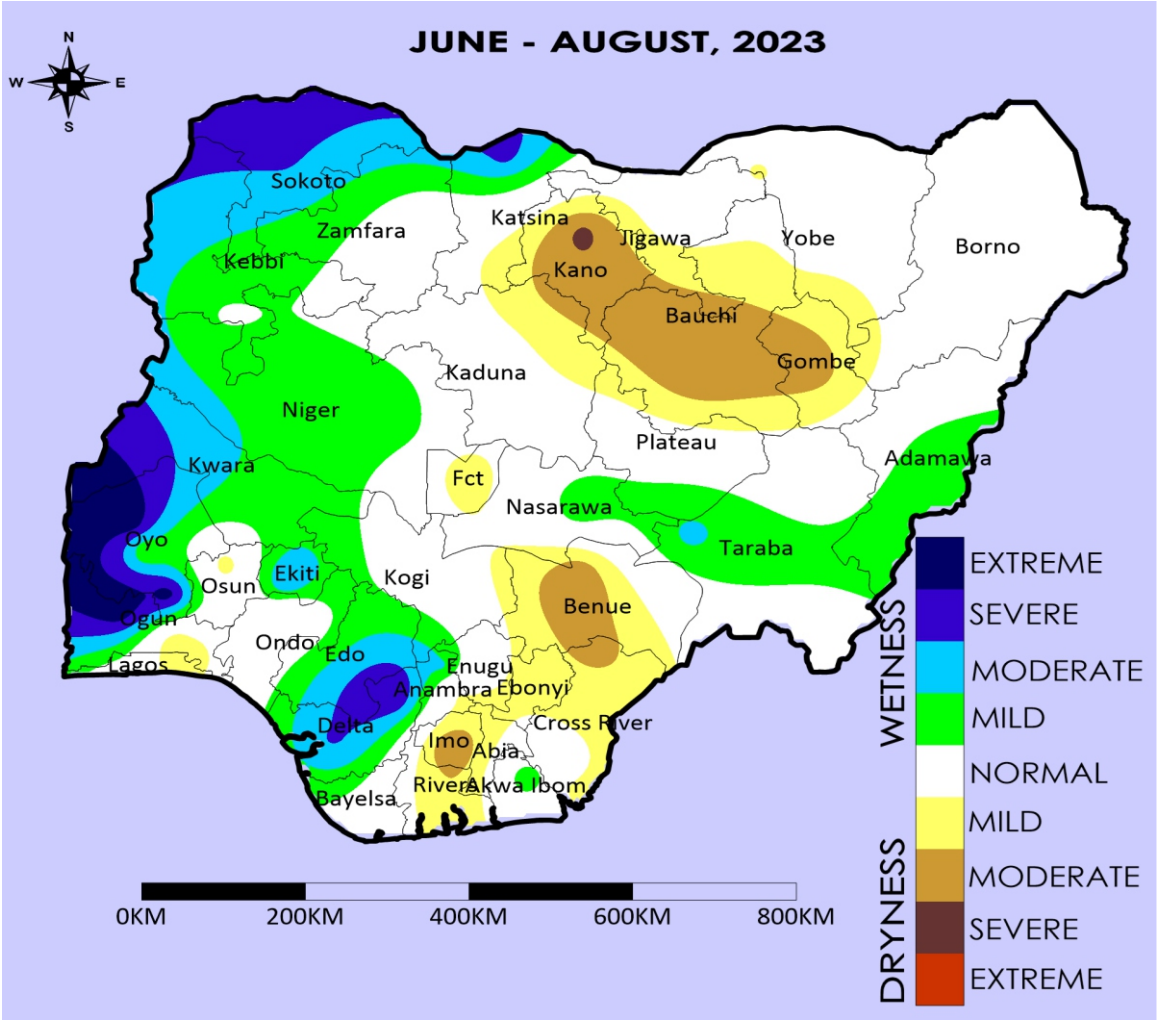

Figure 7: 3-Month Standardized Precipitation Index (Agricultural Drought Monitoring)

The 3-month SPI (Figure 7) shows that most parts of Sokoto, Kebbi, Katsina, Kwara, Oyo, Ogun, Zamfara, Niger, Ekiti, Taraba, Adamawa, Anambra, Enugu, Edo and Delta states experienced mild-to-extreme wetness. However, parts of Kano, Jigawa, Bauchi, Gombe, Yobe, the FCT, Katsina, Benue, Kaduna, Imo, Ebonyi, Cross River, Rivers, Ogun and Lagos states experienced mild-to-severe dryness condition. Those places that recorded above-normal rainfall invariably had adequate soil moisture condition, which would favor agricultural activities.

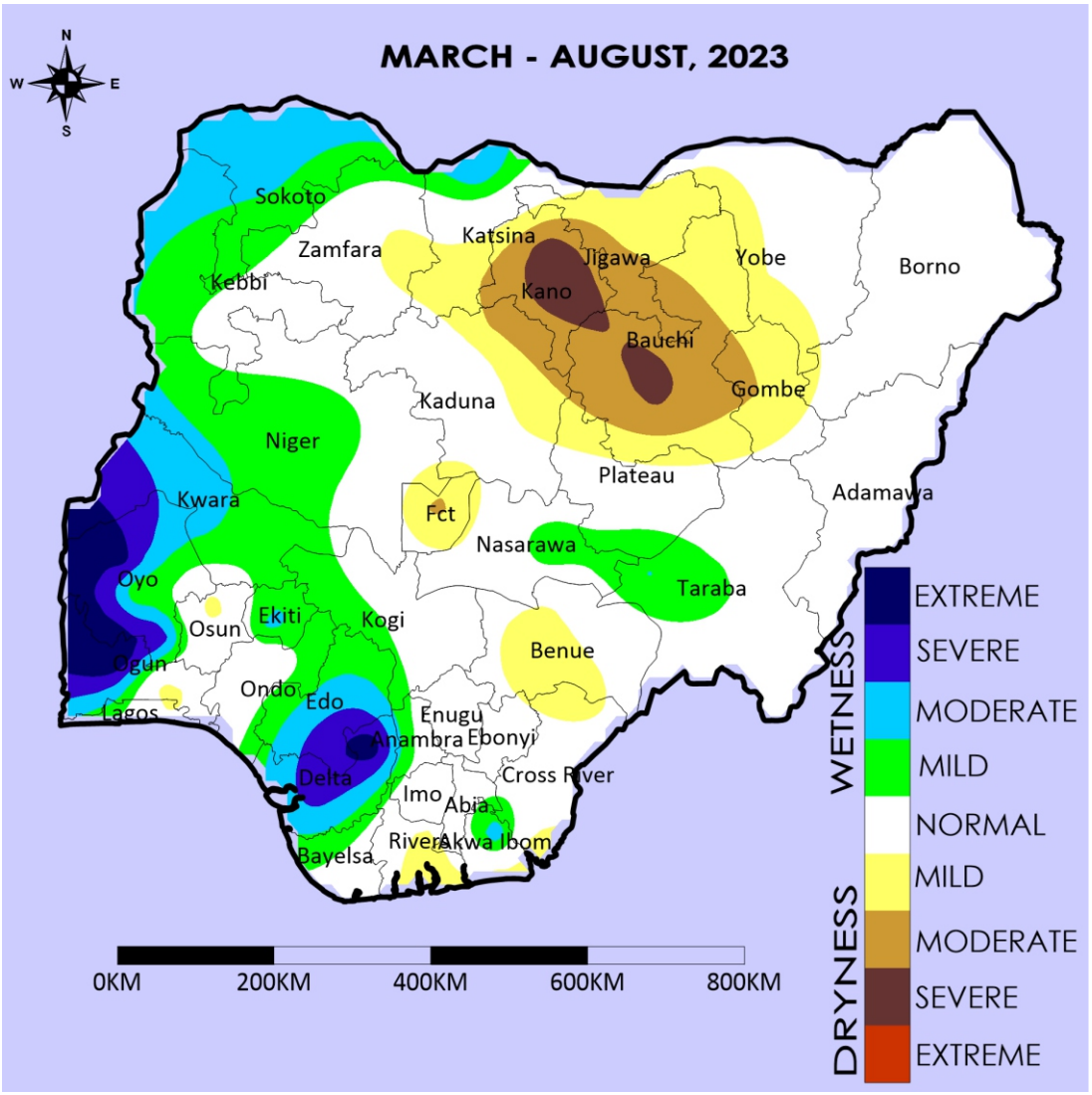

Figure 8: 6-Month Standardized Precipitation Index (Streamflow and Lake storage Monitoring)

The 6-month SPI (Figure 8) reveals that most parts of Sokoto, Kebbi, Katsina, Niger, Kwara, Oyo, Ogun, Ekiti, Edo and Delta, Nasarawa, Taraba and Akwa-Ibom states, have in the last six months, cumulatively recorded mild-to-extreme rainfall. These locations with above-normal rainfall indicate availability of surplus moisture for ground water recharge. However, Mild-to- Severe rainfall deficit has persisted in parts of Kano, Bauchi, Gombe, Yobe, Benue states and the FCT.

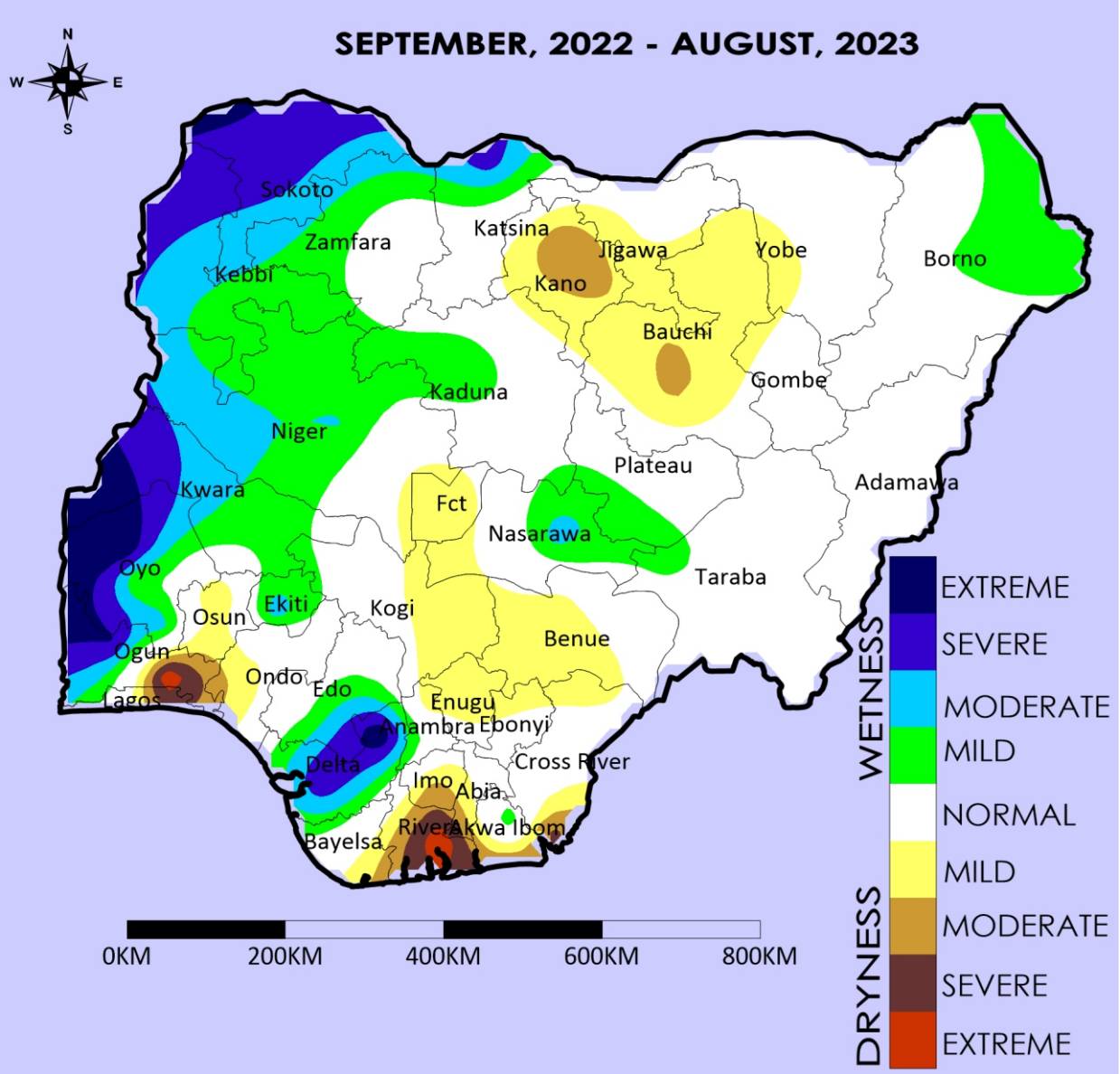

Figure 9: 12-Month Standardized Precipitation Index (Streamflow and Lake storage Monitoring)

The 12-month SPI (Figure 9), shows persistent rainfall deficit over parts of Kano, Jigawa, Bauchi, the FCT, Benue, Lagos, Akwa-Ibom and Rivers states cumulatively, in the last 12 months. However, the level of soil moisture in other parts of the country remained favourable for stream flow and lake recharges.

2.1 OUTLOOK FOR SEPTEMBER, 2023

Wide spread of rainfall activities is expected over most parts of the country, and with anticipated increase in river and stream flows, all water dependent activities are consequently expected to receive a boost. However, there is possibility of occurrence of run-off in some states, and which can be exacerbated with the release of water from the Lagdo-Dam in Cameroon.

Figure 10: Pictures showing flood disaster in Chiledi Community, Kirfi Local Government Area of Bauchi on 28th of August, 2023. (source: www.environewsnigeria.com)

September, 2023 Analysis

EVALUATION: The Standard Precipitation Index (SPI) analysis for September, 2023, shows the of wetness and dryness across the country. As outlined in the outlook for September in the August edition of this bulletin, there was wide spread of rainfall activities over most parts of the country and the release of water from the Lagdo Dam in Cameroon. These led to the exacerbation of the flooding events experienced over most states in the country. Moreso, the effect of the Little Dry Season over the southern states was seen to be established.

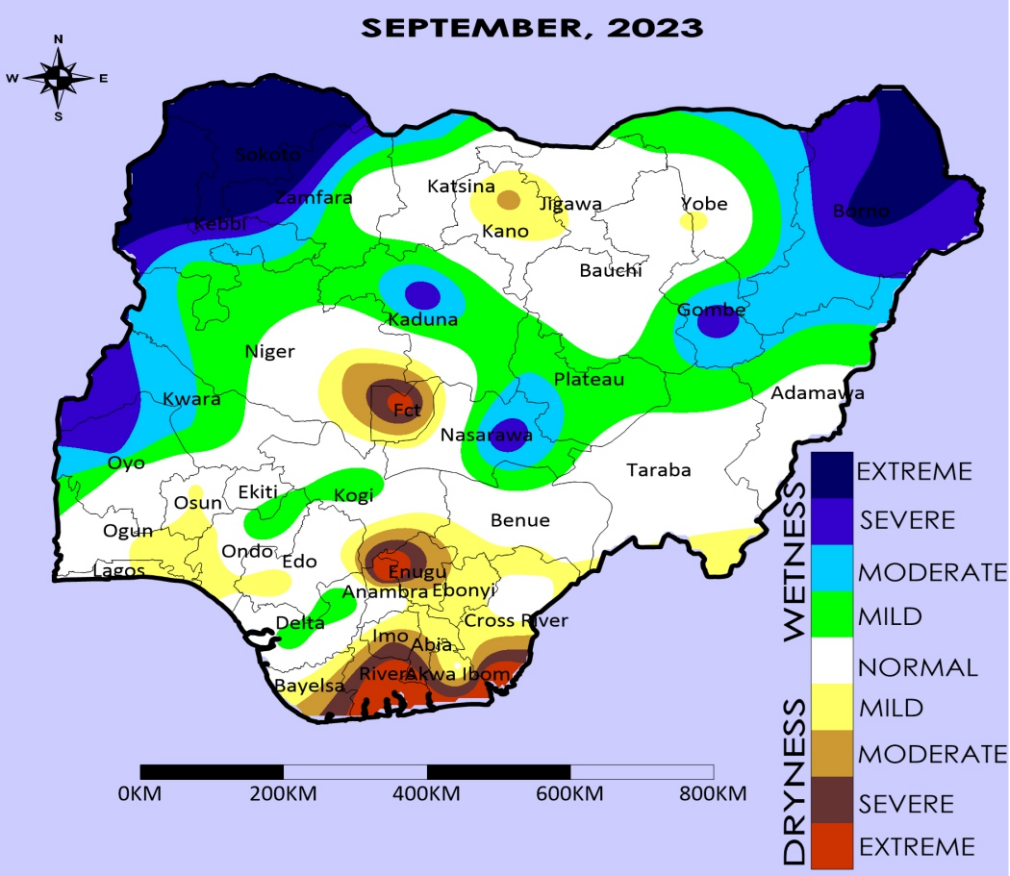

Figure 11: 1-Month Standardized Precipitation Index (Meteorological Monitoring)

The 1-month SPI (Figure 11), shows prevalence of wetter rainfall conditions in most parts of the country particularly over parts of Sokoto, Borno, Kebbi and Zamfara states. In contrast, mild -to- extreme dryness was experienced over parts of the FCT, Kano and the southern parts of the country. The effect of dryness over most parts of the southern states could be attributed to the effect of little dry season (LDS).

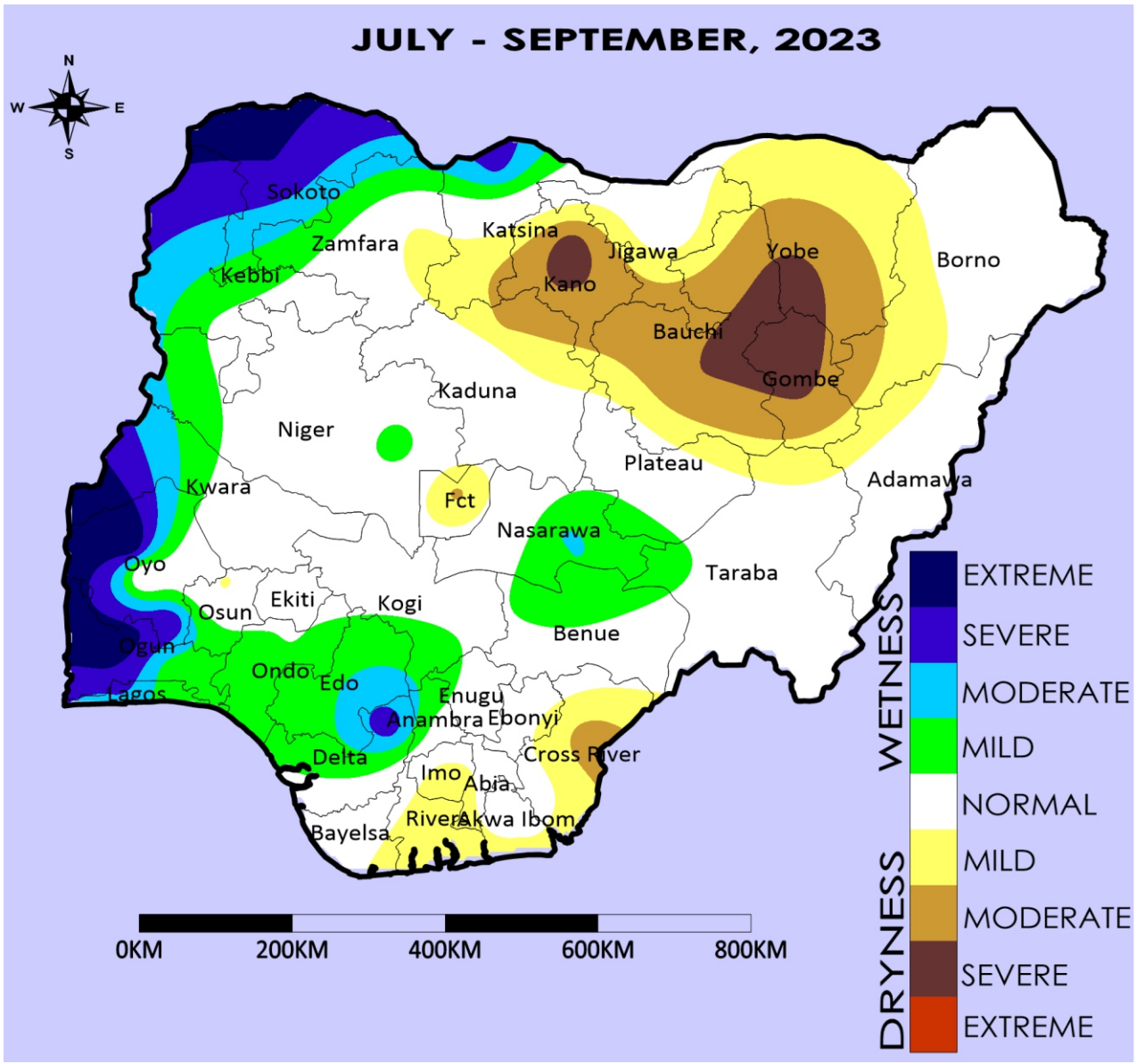

Figure 2: 3-Month Standardized Precipitation Index (Agricultural Drought)

The 3-month SPI (Figure 12), indicates that places, like parts of Yobe, Gombe, Bauchi, Kano, Jigawa, Borno, Kaduna, Plateau, Adamawa, FCT, Cross River, Imo, River states and the FCT experienced dryness condition. While, over parts of Sokoto, Ogun, Lagos, Edo, Katsina, Zamfara, Kebbi, Niger, Kwara, Kogi, Nasarawa, Benue, Ondo, Anambra and Delta states experienced wet conditions. There may be some concerns however, regarding agricultural activities over parts of Kano, Jigawa, Yobe and Bauchi states.

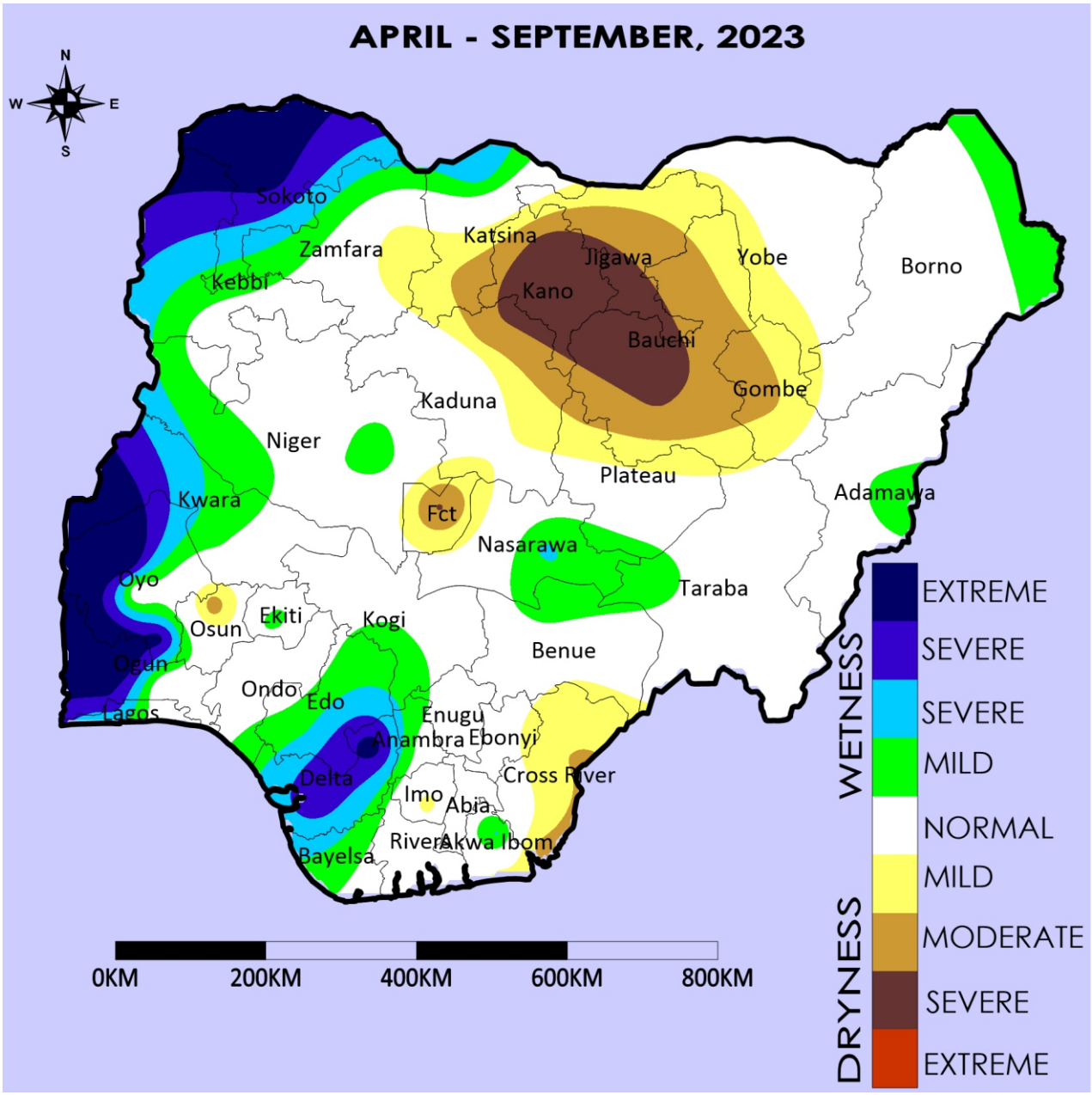

Figure 13: 6-Month Standardized Precipitation Index (Groundwater Monitoring)

The 6-month SPI (Figure 13), reveals mild-to-extreme wetness over parts of Sokoto, Kebbi, Zamfara, Borno, Niger, Kwara, Nasarawa, Kogi, Adamawa, Benue, Taraba, Oyo, Ogun, Lagos Edo, Anambra, Delta and Bayelsa states. However, parts of Kano, Bauchi, Jigawa, Katsina, Yobe, Gombe, Kaduna, Plateau, Osun and Cross River states and the FCT experienced mild -to-extreme dryness.

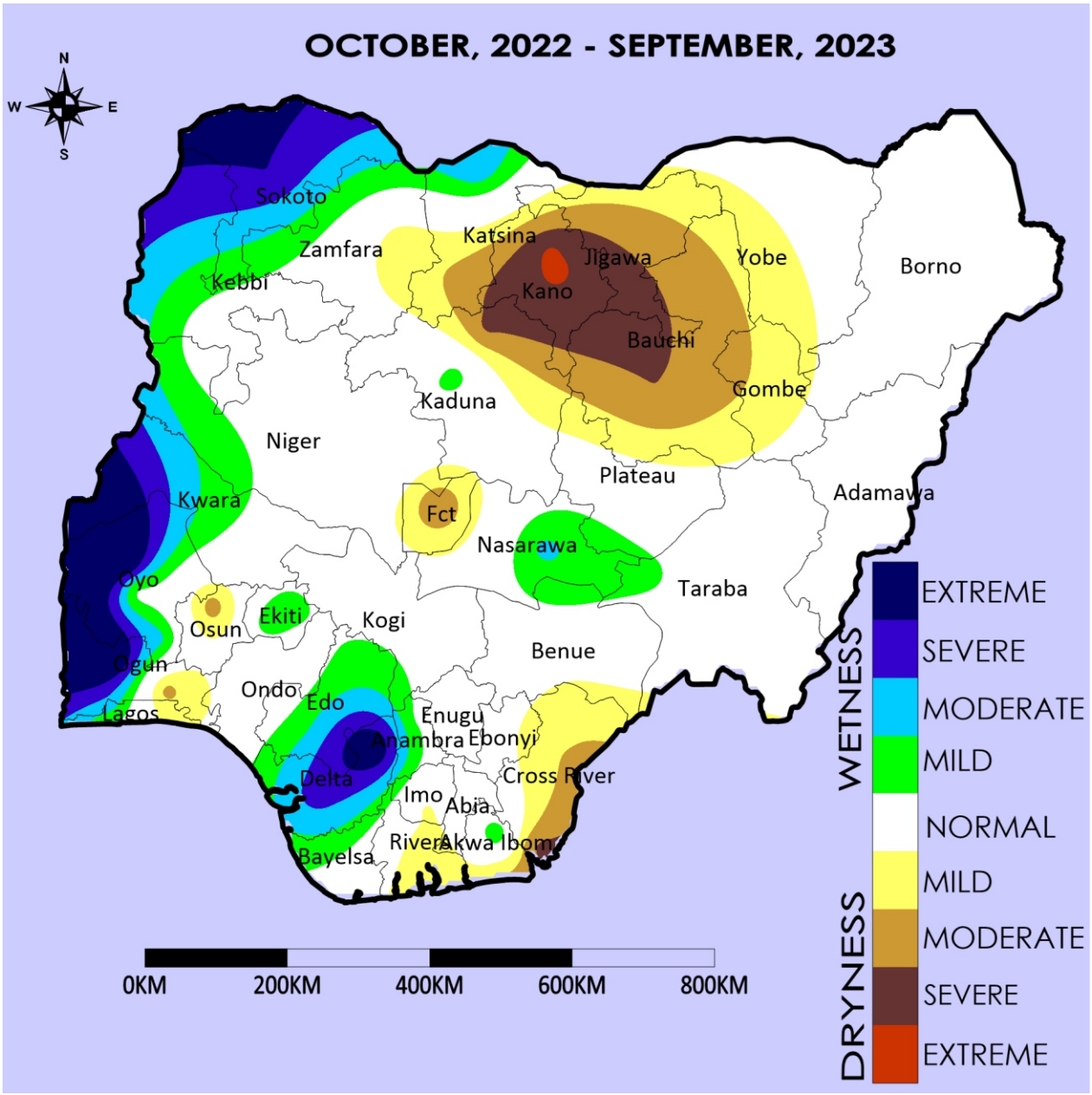

Figure 14: 12-Month Standardized Precipitation Index (Stream flow and Lake Storage Monitoring)

The cumulative 12-month SPI for stream flow and lake storage monitoring (Figure 14), reveals similar features with SPI 6 with the exception of parts of Borno, Adamawa, Niger and Kaduna states where there was slight deterioration of wetness over those areas.

3.1 OUTLOOK FOR OCTOBER, 2023

Gradual decrease in rainfall is expected over the northern states, indicating the end of raining season due to the southward movement of the ITD. The central and the southern states may continue to experience normal rainfall with considerable reduced intensity rate. The expected increased river and stream flow will favour marine and hydropower activities particularly over the coastal regions of the country. Chances of isolated cases of surface runoff may not be ruled out in some parts of the country.

Figure 15: A flooded section on Lawoya Road, Ikotun, Alimosho LGA on the 20th of September, 2023. Source: Premiumtimesng.com

4.0
Appendix: List of Terminologies and Definitions

I. Standardized Precipitation Index

In its simplest form Standardized Precipitation Index (SPI) is calculated as the ratio of the mean deviation of accumulated rainfall at a location over a given period to the corresponding standard deviation. In very basic terms SPI is an index used to compare actual change in amount of rainfall (increase or decrease in rainfall amount in relation to its long term normal or average) with its corresponding expected increase or decrease.

1-month SPI for meteorological drought

This is the standardized precipitation index for one-month accumulated rainfall and it is use for meteorological drought.

3-months SPI for agricultural drought

Is the standardized precipitation index for three-month accumulated rainfall and it is used for agricultural drought.

6-months SPI for groundwater monitoring

Is the standardized precipitation index for six-month accumulated rainfall and it is used for groundwater monitoring.

12-months SPI for stream-flow lake storage drought monitoring.

Is the standardized precipitation index for twelve-month accumulated rainfall and it is used for stream flow lake storage drought monitoring.

II. Drought

A drought is a climatic condition at a place characterized by less precipitation (rain or snow) than normal over a few months or even longer.

III. Surface Runoff

Is the flow of water occurring on the ground surface when excess rainwater, storm water, melt water, or other sources, can no longer sufficiently rapidly infiltrate in the soil. This can occur when the soil is saturated by water to its full capacity, and the rain arrives more quickly than the soil can absorb it.

IV. Extreme Rainfall Events

These are rainfall events that rarely occur which can be attributed to events at the 5th (or lower) percentile or 95th percentile (or higher) in the historical rainfall data distribution.

This Quarterly Hydro Meteorological Bulletin is a Publication of the Nigerian Meteorological Agency (NiMet)

Nigerian Meteorological Agency (NiMet)
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