FLOOD & DROUGHT BULLETIN

MARCH 2024

GHANA METEOROLOGICAL AGENCY

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INTRODUCTION

The Flood and Drought bulletin is a monthly analysis of rainfall in Ghana prepared and released by the Ghana Meteorological Agency (GMet). The bulletin provides an authoritative and scientific understanding of rainfall variability which is essential for accurate hydrological modeling, climate change assessments, and effective water resource planning to mitigate risks associated with extreme events like droughts and floods.

Among other services and products, the Flood and Drought bulletin complements the objectives of GMet in line with the National Framework for Climate Services (NFCS) to improve co-production, tailoring, delivery and use of science-based climate predictions and services focused on the five pillars of the Global Framework for Climate Services (GFCS) by the World Meteorological Organization (WMO): agriculture and food security, disaster risk reduction, energy, health and water.

The analysis in the Flood and Drought bulletin is based on the Standardized Precipitation Index (SPI) developed by McKee et al. (1993) for the purpose of *defining and monitoring drought*. Drought is an insidious natural hazard that results from lower levels of precipitation than what is considered normal. When this phenomenon extends over a season or a longer period of time, water becomes increasingly insufficient to meet the demands of human activities and the environment. Drought must be considered a relative, rather than absolute, condition. Drought means different things to different users such as water managers, agricultural producers, hydroelectric power plant operators and wildlife biologists. Even within sectors, there are many different perspectives of drought because impacts may differ markedly. Droughts are commonly classified by type as meteorological, agricultural and hydrological, and differ from one another in intensity, duration and spatial coverage (WMO, 2012).

THE STANDARDIZED PRECIPITATION INDEX (SPI)

SPI indicator, which was developed by McKee et al. (1993), and described in detail by Edwards and McKee (1997), measures precipitation anomalies at a given location, based on a comparison of observed total precipitation amounts for an accumulation period of interest (e.g. 1, 3, 12, 48 months), with the long-term historic rainfall record for that period. This indicator measures anomalies of accumulated precipitation during a given period. In calculating SPI, precipitation is the only required input parameter (McKee and others, 1993, 1995). The SPI calculation for any location is based on the long-term precipitation record for a desired period. This long-term record is fitted to a probability distribution, which is then transformed into a normal distribution so that the mean SPI for the location and desired period is zero (Edwards and McKee, 1997).

The SPI is designed to quantify the precipitation deficit for multiple timescales and can be calculated from 1 month up to 72 months. Statistically, 1–24 months is the best practical range of

application (Guttman, 1994, 1999). The Flood and Drought bulletin of Ghana considers only the 1-month, 3-month, 6-month and 12-month SPI.

1-month SPI

The 1-month SPI compares the precipitation of a specific month with the precipitation totals from the same month for all the years included in the historical record.

3-month SPI

The 3-month SPI provides a comparison of the precipitation over a specific 3 consecutive month period with the precipitation totals from the same 3-month period for all the years included in the historical record.

6-month SPI

The 6-month SPI compares the precipitation for a specific 6 consecutive months with the same 6-month period over the historical record.

12-month SPI

The 12-month SPI is a comparison of the precipitation for 12 consecutive months with that recorded in the same 12 months in all previous years of available data.

These timescales reflect the impact of drought on the availability of the different water resources. Meteorological and soil moisture conditions (agriculture) respond to precipitation anomalies on relatively short timescales, for example 1 to 3 months (SPI-1 to SPI-3), whereas streamflow, reservoirs, and groundwater respond to longer-term precipitation anomalies, for example 3 months to 12 months (SPI-3 to SPI-12) or longer (EDO, 2020).

A real strength of the SPI is its ability to be calculated for many timescales, which makes it possible to deal with many of the drought types described above. The ability to compute the SPI on multiple timescales allows for temporal flexibility in the evaluation of precipitation conditions in relation to water supply.

In the Flood and Drought bulletin, the SPI values for any given location and accumulation period, are classified into nine different precipitation regimes (from dry to wet), as shown in Table 1. As can be seen, increasingly severe rainfall deficits (i.e., meteorological droughts) are indicated as SPI decreases below -0.5, while increasingly severe excess rainfall is indicated as SPI increases above 0.5.

ANOMALY	*RANGE OF SPI VALUES*	*PRECIPITATION REGIME*	*COLOUR*
Negative	Min <= SPI <= -2.0	Extreme dry	
	-2.0 < SPI <= -1.5	Severe dry	
	-1.5 < SPI <= -1.0	Moderate dry	
	-1.0 < SPI <= -0.5	Mild dry	
None	-0.5 < SPI <= 0.5	Normal precipitation	
Positive	0.5 < SPI <= 1.0	Mild wet	
	1.0 < SPI <= 1.5	Moderate wet	
	1.5 < SPI <= 2.0	Severe wet	
	2.0 < SPI <= Max	Extreme wet	

Table 1: SPI classification scheme used in the Flood and Drought bulletin

SPI ANALYSIS FOR MARCH 2024

The SPI analysis for rainfall in March 2024 has been generated in multiple timescales of 1-month (March 2024), 3-month (January 2024 - March 2024), 6-month (October 2023 – March 2024) and 12-month (April 2023 - March 2024). The maps generated depict the severity (positive or negative) of rainfall anomalies for the period under review.

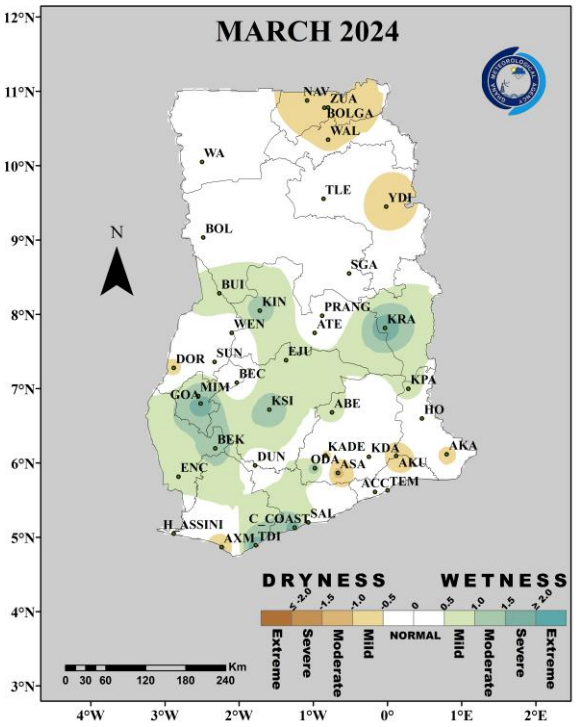

Fig. 1(a): 1-Month SPI *(for meteorological drought)*: March 2024

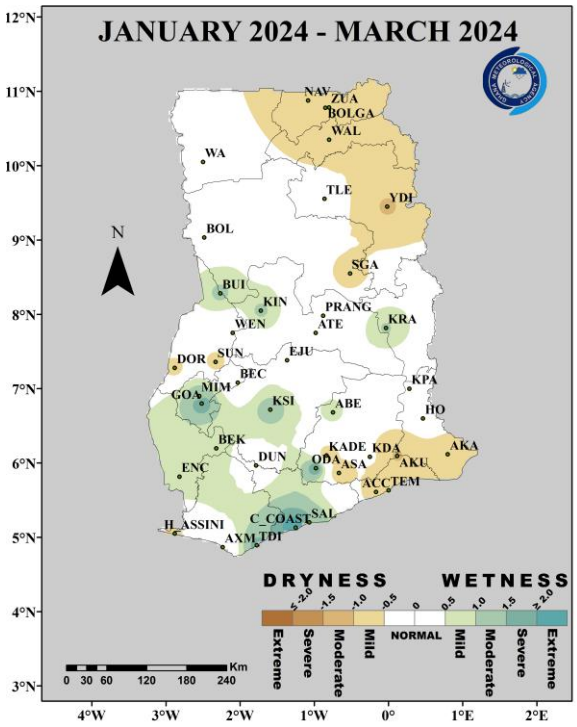

Fig. 1(b): 3-Month SPI *(for agricultural drought)*: January 2024 – March 2024

1-Month SPI (March 2024)

The 1-Month SPI shown in Fig. 1(a) indicates that mostly normal condition in the Savanna zone with Walewale, Bolgatanga, Zuarungu, Navrongo and Yendi showing mild dry condition. The Transition zone had mild to severe wet conditions in places like Kete Krachi, Bui and Kintampo with Dormaa showing mild dryness. Mild to severe wet conditions are seen in the Forest zone in areas such as Kumasi, Goaso, Mim, Sefwi Bekwai, Enchi, Takoradi, Akim Oda, Abetifi and Kpando while Asamankese, Kade, Axim and Akuse showed mild to moderate dry conditions. The Coastal zone displayed moderate wet condition in Cape Coast while Akatsi had mild dry condition.

3-month SPI (January 2024 - March 2024)

The 3-Month SPI in Fig 1(b) shows normal condition in the Savanna zone with mild to moderate dry conditions in areas such as Navrongo, Walewale, Bolgatanga, Zuarungu and Yendi. In the Transition zone, Bui, Kintampo and Kete Krachi had moderate wet condition while mild dryness is seen in Salaga, Dormaa and Sunyani. The Forest zone recorded mild to severe wet conditions in areas such as Mim, Goaso, Enchi, Kumasi, Takoradi, Akim Oda and Abetifi while mild to moderate dryness is shown in Half Assini, Kade, Asamankese and Akuse. The Coastal zone showed moderate to extreme wet conditions in Cape Coast and Saltpond with Accra, Tema and Akatsi displaying mild dry condition.

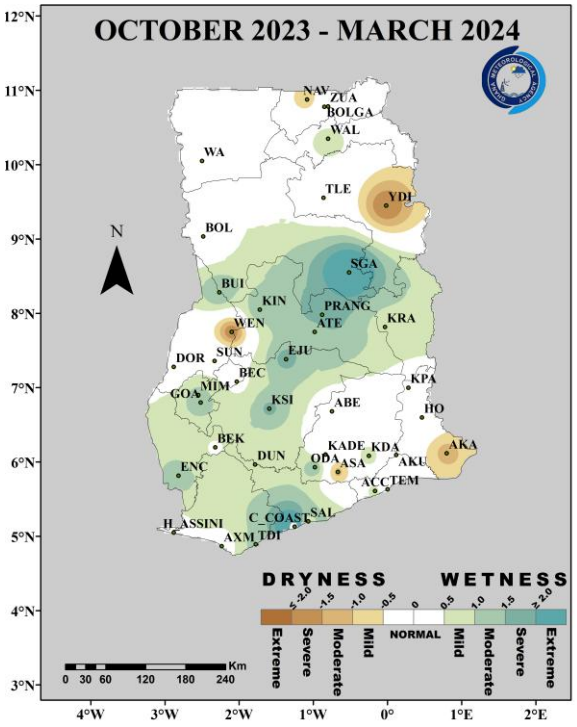

Fig. 1(c): 6-Month SPI *(for hydrological drought)*: October 2023 – March 2024

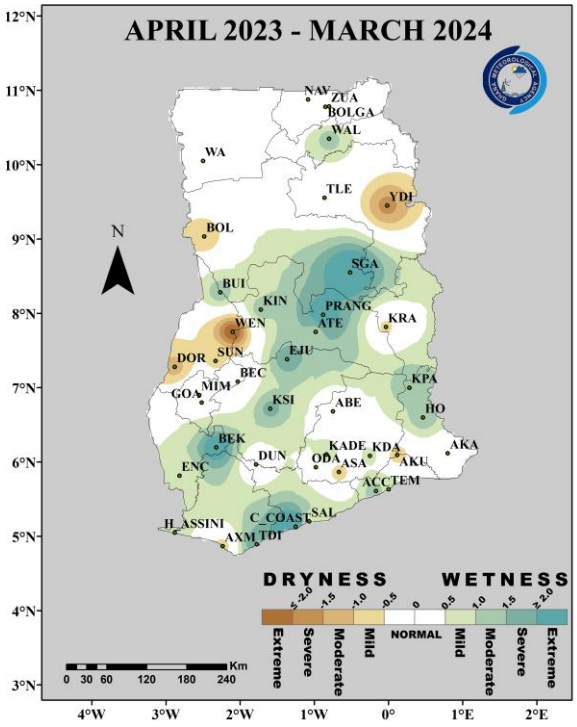

Fig. 1(d): 12-Month SPI *(for streamflow and lake storage drought)*: April 2023 – March 2024

6-month SPI (October 2023 - March 2024)

The 6-month SPI shown Fig. 1(c) reveals predominantly normal condition in the Savanna zone with mild wet condition in Walewale while Navrongo and Yendi showed mild to moderate dryness. The Transition zone shows severe to extreme wetness in Salaga and Prang with mild to moderate wet conditions in areas such as Bui, Kintampo, Atebubu and Kete Krachi while severe dryness is seen in Wenchi. Ejura, Goaso, Mim, Enchi, Takoradi, Dunkwa and Koforidua in the Forest zone recorded mild to severe wetness while Asamankese showed moderate dryness. The Coastal zone shows severe to extreme wetness in Cape Coast and Saltpond with Accra depicting mild wet condition while Akatsi had moderate dry condition.

12-month SPI (April 2023 - March 2024)

The 12-Month SPI in Fig. 1(d) reveals that the Savanna zone experienced mostly normal conditions with mild to moderate wet condition in Walewale and mild to severe dry dryness in Yendi and Bole. The Transition zone recorded extreme wet condition in Salaga and Prang with moderate wetness in Atebubu, Kintampo and Bui while Dormaa, Sunyani and Kete Krachi registered mild to moderate dry conditions with Wenchi having extreme dry condition. Severe to extreme wet conditions are shown in areas such as Ejura, Kumasi, Sefwi Bekwai and Takoradi with mild to moderate wetness in Kpando, Ho, Koforidua, Kade, Enchi and Half Assini while mild dry condition is seen in Axim, Asamankese and Akuse. The Coastal zone had moderate to extreme wet conditions in Cape Coast and Accra.

STATIONS

Station	Abbreviation	Station	Abbreviation	Station	Abbreviation
Abetifi	ABE	Enchi	ENC	Sunyani	SUN
Accra	ACC	Goaso	GOA	Takoradi	TDI
Akatsi	AKA	Half Assini	H_ASSINI	Tamale	TLE
Akim Oda	ODA	Ho	HO	Tema	TEM
Akuse	AKU	Kade	KADE	Wa	WA
Asamankese	ASA	Kete Krachi	KRA	Walewale	WAL
Atebubu	ATE	Kintampo	KIN	Wenchi	WEN
Axim	AXM	Koforidua	KDA	Yendi	YDI
Bechem	BEC	Kpandu	KPA	Zuarungu	ZUA
Bole	BOL	Kumasi	KSI		
Bolga	BOLGA	Mim	MIM		
Bui	BUI	Navrongo	NAV		
Cape Coast	C_COAST	Prang	PRANG		
Dormaa	DOR	Salaga	SGA		
Dunkwa	DUN	Saltpond	SAL		
Ejura	EJU	Sefwi Bekwai	BEK		

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