

FLOOD & DROUGHT BULLETIN

DECEMBER 2024

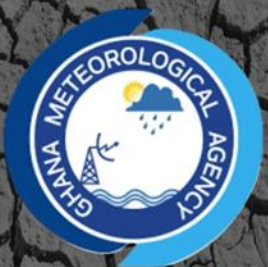


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INTRODUCTION

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.

<i>ANOMALY</i>	<i>RANGE OF SPI VALUES</i>	<i>PRECIPITATION REGIME</i>	<i>COLOUR</i>
Negative	Min $\leq$ SPI $\leq$ -2.0	Extreme dry	
	-2.0 < SPI $\leq$ -1.5	Severe dry	
	-1.5 < SPI $\leq$ -1.0	Moderate dry	
	-1.0 < SPI $\leq$ -0.5	Mild dry	
None	-0.5 < SPI $\leq$ 0.5	Normal precipitation	
Positive	0.5 < SPI $\leq$ 1.0	Mild wet	
	1.0 < SPI $\leq$ 1.5	Moderate wet	
	1.5 < SPI $\leq$ 2.0	Severe wet	
	2.0 < SPI $\leq$ Max	Extreme wet	

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

SPI ANALYSIS FOR DECEMBER 2024

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

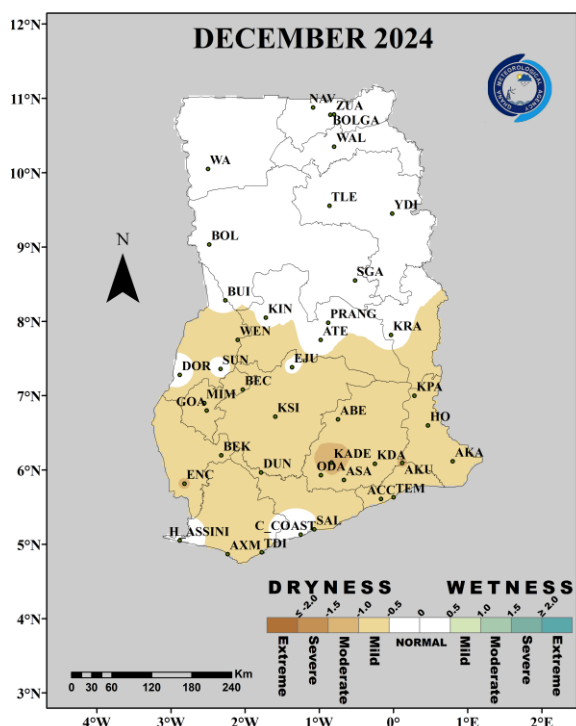


Fig. 1(a): 1-Month SPI (for meteorological drought): December 2024

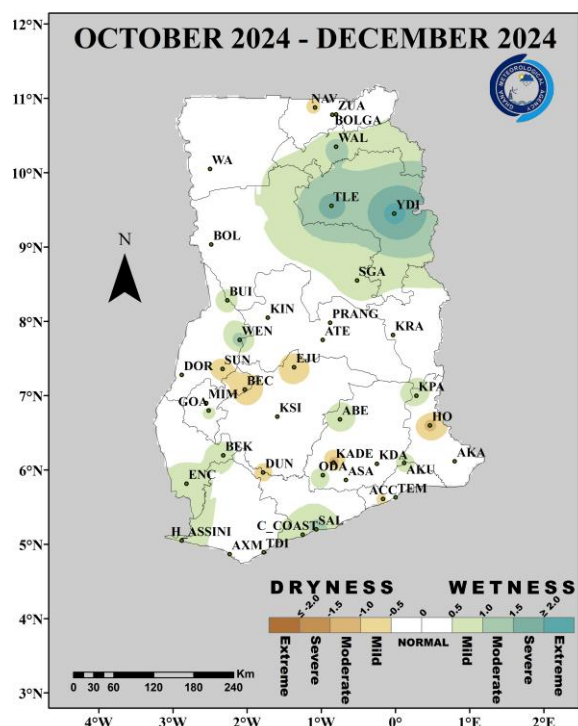


Fig. 1(b): 3-Month SPI (for agricultural drought): October 2024 – December 2024

1-Month SPI (December 2024)

The 1-Month SPI as shown in Fig. 1(a) depicts mainly normal condition over the Savanna zone. The Transition zone shows partly normal condition and mild dry condition. Mild dry condition dominate the Forest with moderate dryness in areas such as Enchi, Kade and Akuse while the Coastal zone is predominantly characterized by mild dry condition.

3-month SPI (October 2024 - December 2024)

The 3-month SPI in Fig. 1(b) reveals mild to severe wet conditions in areas such as Walewale, Tamale and Yendi in the Savanna zone with Navrongo showing mild dry condition. Bui and Wenchi in the Transition zone had mild to moderate wet condition while Sunyani and Bechem showed mild dryness. In the Forest zone, Goaso, Enchi, Sefwi Bekwai, Half Assini, Abetifi, Akim

Oda, Akuse and Kpando display mild wet condition with Ejura, Dunkwa, Kade and Ho showing mild to moderate dry condition. Cape Coast and Saltpond within the Coastal zone show mild to moderate wet conditions while Accra display mild dry condition.

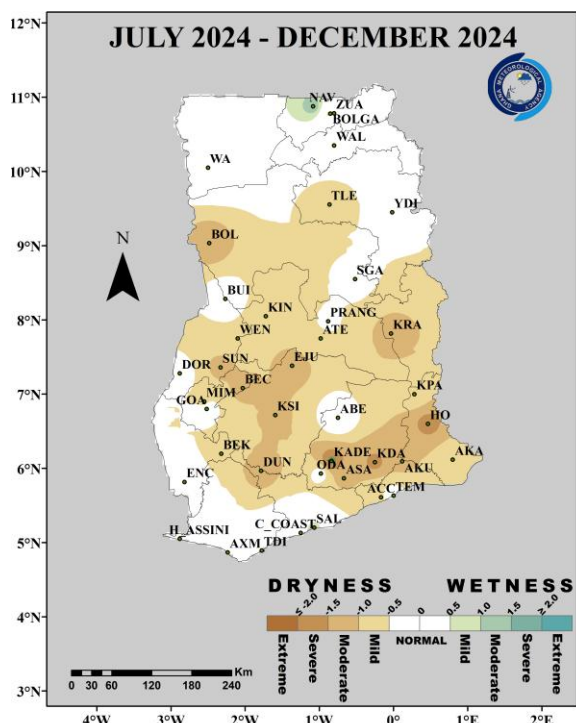


Fig. 1(c): 6-Month SPI (for hydrological drought): July 2024 – December 2024

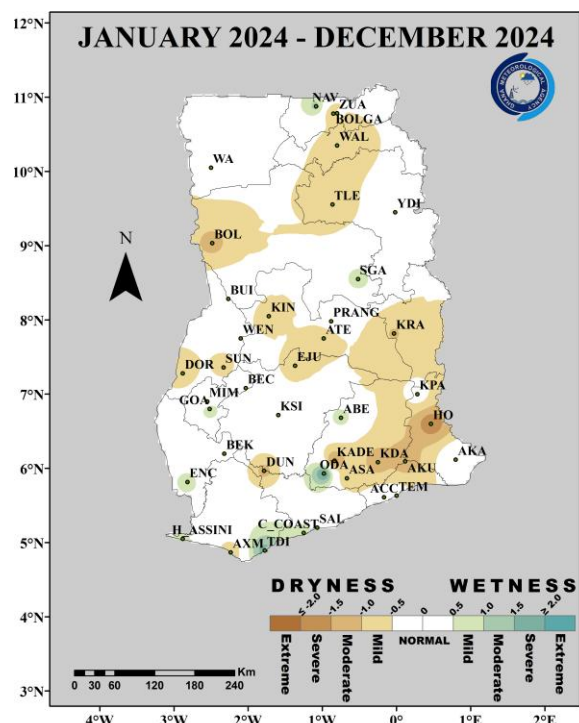


Fig. 1(d): 12-Month SPI (for streamflow and lake storage drought): January 2024 – December 2024

6-month SPI (July 2024 - December 2024)

The 6-Month SPI in Fig. 1(c) shows moderate wet condition in Navrongo within the Savanna zone with Tamale and Bole displaying mild to moderate dry conditions. Mild dry condition dominates the Transition zone with Sunyani, Bechem and Kete Krachi recording moderate dry condition. The Forest zone shows mostly mild dry condition with moderate to severe dry conditions seen in areas such as, Ejura, Kumasi, Dunkwa, Kade, Asamankese, Akuse, Koforidua and Ho. The Coastal zone is characterized mild dry condition in Accra and Akatsi.

12-month SPI (January 2024 - December 2024)

The 12-Month SPI as shown in Fig. 1(d) reveals normal condition dominating the country. Mild wet condition is shown in Navrongo within the Savanna zone with Tamale and Bole showing mild to moderate dry condition. Salaga in the Transition zone show mild wet condition while Dormaa, Sunyani, Kintampo, Atebubu and Kete Krachi display mild to moderate dry conditions. In the Forest zone, mild to moderate wet conditions are seen in Goaso, Enchi, Akim Oda, Abetifi and

Takoradi with mild to moderate dry conditions shown in areas including Ejura, Dunkwa, Axim, Kade, Asamankese, Koforidua, Akuse and Ho. The Coastal zone exhibits mainly normal condition.

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		

REFERENCE

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