



Eastern Nile Technical Regional Office
Nile Basin Initiative

**Development of
Nile Basin-wide Drought Early Warning System –
Nile DEWS**

DEWS Bulletin

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1.1 Introduction of Nile Basin Drought Early Warning System (Nile DEWS)

This bulletin offers temporal coverage at various intervals, including fortnightly, 1-month, 3-month, and 6-month periods for forecasted periods. This includes forecasted periods drought conditions across the Nile basin based on meteorological (SPI and SPEI) and hydrological (SSI) drought indices.

1.1.1 Meteorological Drought

A meteorological drought is defined as a period of significantly below-normal precipitation and above-normal temperature, leading to a shortage of water. This type of drought is typically measured by comparing current rainfall and temperature levels to historical averages over a specific period. In this study, forecasted meteorological drought has been quantified using SPI and SPEI.

SPI and SPEI: SPI and SPEI are the meteorological drought indices which quantify the drought and wet conditions over the various timescales (e.g., weekly, fortnightly, monthly, seasonal, annual, or more).

Long daily time series historical (ideally 30 years) precipitation, maximum temperature, and minimum temperature data are required to derive this index. Hence, in the current version of Nile DEWS, the latest 30 years daily time series precipitation (source: CHIRPS), and maximum & minimum temperatures (source: ERA5) data have been used to derive SPI and SPEI of different temporal resolutions (i.e., 15-day, 1-month, 3-month, and 6-month). The spatial resolution of CHIRPS data is $0.05^\circ \times 0.05^\circ$ and ERA5 is $0.25^\circ \times 0.25^\circ$, which has been re-gridded to $0.05^\circ \times 0.05^\circ$ spatial resolution. The range of SPI/SPEI is from +3.0 to -3.0, in which positive SPI/SPEI values indicate wet condition, negative values indicate drought condition, whereas SPEI values in the range of ± 0.49 indicate normal condition. More the negative values of SPI/SPEI, severe the drought condition.

1.1.2 Hydrological Drought

The hydrological drought express anomalies in different ways. They can be defined with the use of absolute values or deviations such as percentage deviation from a predefined threshold like annual average precipitation, streamflow, or other variables. There are several ways of expressing hydrological drought such as based on percentiles or standardized drought indices. Hence, in this study standardized based hydrological drought index (i.e., SSI) has been used to quantify the hydrological drought using the streamflow variable.

Standardized Streamflow Index (SSI): SSI is a hydrological drought index which quantifies streamflow anomalies by standardizing observed streamflow values relative to their historical mean and variability, allowing for the assessment of streamflow conditions over various timescales (e.g., weekly, fortnightly, monthly, seasonal, annual, or more). Long time series past (ideally 30 years) stream flow data is required to derive this index. Hence, in the current version of Nile DEWS, latest 30 years daily time series streamflow data including observed station data and simulated hydrological model data have been used to derive current time period SSI of different temporal resolutions (i.e., 15-day, 1-month, 3-month, and 6-month).

Range of SSI is from +3.0 to -3.0, in which positive SSI values indicate wet condition, whereas negative values indicate drought condition. More the negative values of SSI, severe the drought condition.

Table 1. Summary of severe and extreme hydrological drought condition based on SPEI across Nile basin during the different time periods

		Severe (<-1.99 to >-1.50)	Extreme (< -0.2)
Drought Condition	Sub-Basin		
Extreme Drought	BAS_downstream K Nynding (Baro_Akobo_Sobat), BAS_Pibor_downstream (Baro_Akobo_Sobat), BG_Bahr el Ghazal_North (Bahr_el_Ghazal)		
Severe Drought	BAS_K_Nanaam_Pibor (Baro_Akobo_Sobat), BAS_LowerBaro adura (Baro_Akobo_Sobat), BAS_LowerBaro downstream machar (Baro_Akobo_Sobat), BG_Bahr el Arab (Bahr_el_Ghazal), BG_Gel (Bahr_el_Ghazal), BJ_Bahr el Jebel North (Bahr_el_Jebel), BJ_Yei_Gol (Bahr_el_Jebel), BN_DS Rosires 2 (Blue_nile), BN_Abay_at_Shegolie (Blue_nile), BN_Beshilo (Blue_nile), BN_Blue Nile at Khartoum and Soba (Blue_nile), BN_Border (Blue_nile), BN_Diem_Roseries (Blue_nile), BN_DS Roseries (Blue_nile), LA_LakeEdward_lower (Lake_Albert), LA_LakeEdward_upper (Lake_Albert), LV_LakeVic_WetArea_East (Lake_Victoria), LV_LakeVic_WetArea_West (Lake_Victoria), MN_Atbara_Sherieq (Main_Nile), MN_Khartoum_Tamaniat (Main_Nile), TA_Qash Trib (Tekeze_Atbara), VN_Kafu (Victoria_Nile), VN_LakeKyoga (Victoria_Nile), VN_Malaba (Victoria_Nile), WN_Malakal Triangle (White_Nile), WN_Metut_Renk (White_Nile), WN_Renk_Kosti (White_Nile)		

Forecasted drought condition at different temporal resolutions during next six months across the Nile basin.












