(Determine drought vulnerability through analyzing several composite indices in the Decision Support System (DSS) tools for Rajshahi & Naogaon)

Aim and Objectives

- Mapping drought vulnerability and assessing spatiotemporal and vegetation characteristics of droughts for Rajshahi and Naogaon districts.
- Develop a web-based Decision Support System monitor, analyze droughts, and generate a drought watch bulletin.
- Training and awareness raising of users for the interpretation and application of products generated through the DSS.

Development Team: **PIESAT Information Technology Co., Ltd., Beijing, China**

Develop To: **Bangladesh Meteorological Department (BMD)**

Project: **Bangladesh Weather and Climate Services Regional Project (BWCSRP)**

Funded By: **The World Bank**

Data and Source

ENACTS monitoring data (BMD)

Dataset name	Product name	Product identification	Spatial resolution	Product cycle	Data format
ENACTS	Daily precipitation	Rainfall	About 0.05℃	Daily	NC
	Maximum temperature	Tmax			
	Minimum temperature	Tmin			

Agriculture Data, DAE

Data type	Format	content
Crop_based_area_Naogaon_Rajshahi	.xls	Area statistics of main crops in Study Area
Crop_based_Production_Naogaon_Rajshahi	.xls	Production statistics of main crops in Study Area

WRF data, Model

Mode	Product name	Variable name	Spatial resolution	Product cycle	Forecast duration	Data format
WRF	Temperature	T2	About 0.18℃	Daily	3 hours/16 days	NC
	Precipitation	RAINNC				

ECMWF Data, C3S

Mode	Product name	Variable name	Spatial resolution	Product cycle	Forecast duration	Data format
EC	Maximum temperature	mx2t24	About 1℃	Daily	24 hours / 112 days	GRIB
	Minimum temperature	mn2t24				
	Precipitation	tp				

Satellite data , MODIS

Satellite	Product identification	Product name	Spatial resolution	Product cycle	Data format
TERRA/MODIS	MOD09GA	Surface reflectivity	250 m	Daily	HDF
TERRA/MODIS	MOD11A1	Surface temperature	1,000 m	Daily	HDF

Meteorological Station Data, BMD

Meteorological production	Format	Station
Rainfall 1991-2020	csv	Station: Badalgachi Station: Rajshahi
RH 1991-2020	csv	Station: Badalgachi Station: Rajshahi

Algorithm principle

1. SPI calculation $$Z = S\left\{t - \frac{(c_2 t + c_1)t + c_0}{\left[(d_3 t + d_2)t + d_1\right]t + 1.0}\right\}$$

2. SPEI calculation $$SPEI = w - \frac{c_0 + c_1 w + c_2 w^2}{1 + d_1 w + d_2 w^2 + d_3 w^3}, \quad P \le 0.5$$

$$SPEI = -\left(\frac{c_0 + c_1 w + c_2 w^2}{1 + d_1 w + d_2 w^2 + d_3 w^3}\right), \quad P > 0.5, P = 1 - P$$

3. Normalized difference vegetation index (NDVI) calculation $$NDVI = \frac{NIR - R}{NIR + R}$$

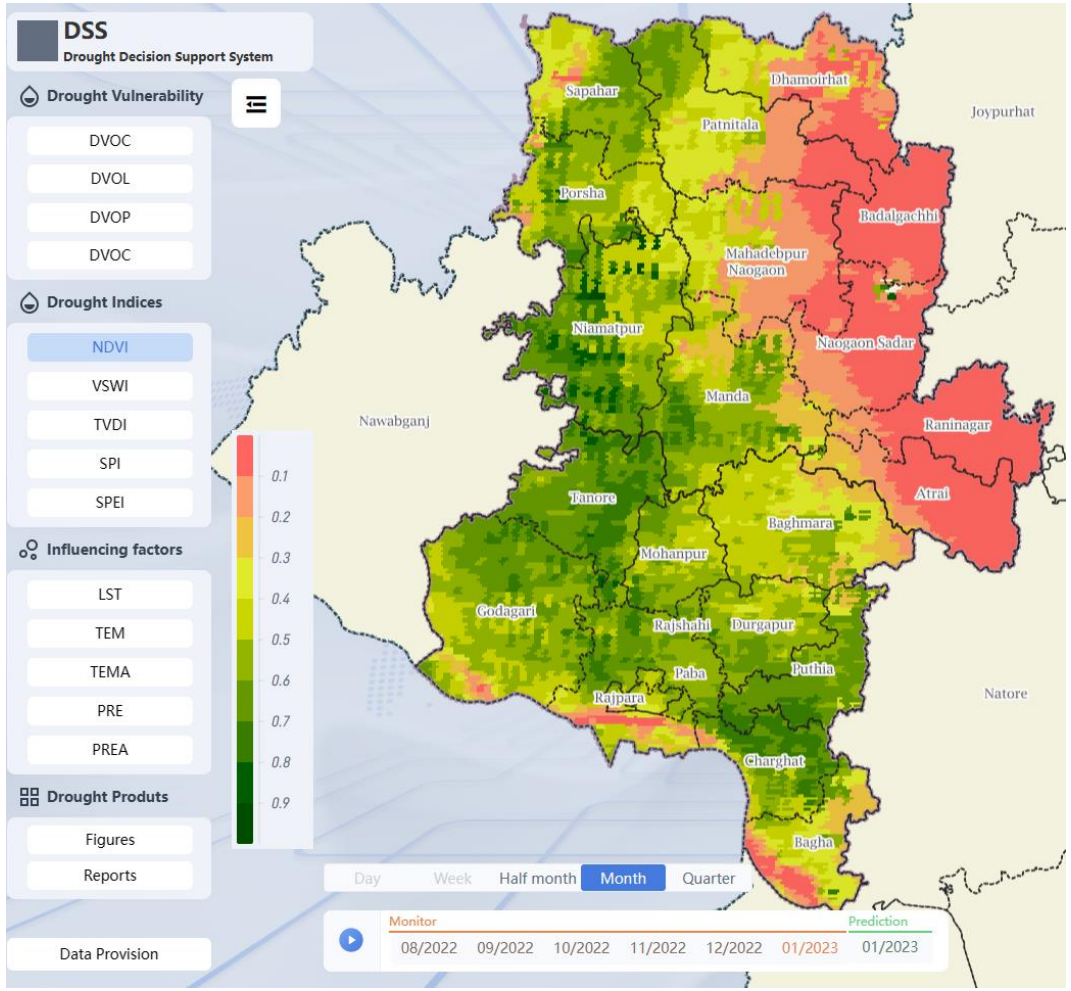
4. Vegetation supply water index (VSWI) calculation $$VSWI = \frac{NDVI}{T_s}$$

5. Temperature Vegetation Dryness Index (TVDI) calculation $$\mathrm{TVDI} = \frac{T_S - \mathrm{T_{Smin}}}{T_{Smax} - \mathrm{T_{Smin}}}$$

6. Hazard calculation $$H_{Di} = \sum_{j=1}^{n}\left(M_{ij} \times W_j\right)$$

7. Vulnerability calculation $$V = \frac{H \times E}{R}$$

Interface



Monitoring Period: 1981-2023

Time Resolution: half a month, a month and a quarter

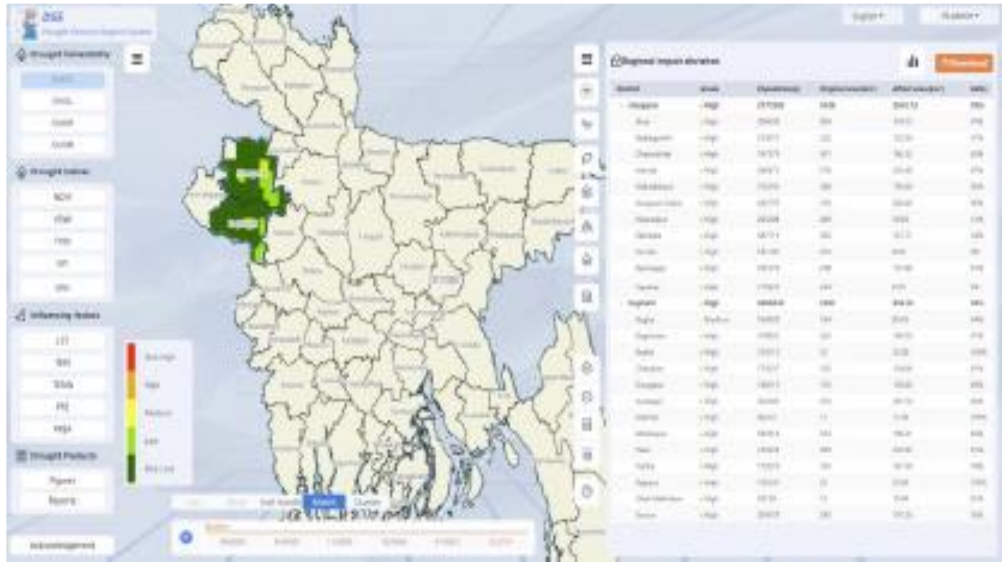
Drought Vulnerability

- DVOC: Drought Vulnerability of Crops
- DVOL: Drought Vulnerability of land
- DVOR: Drought Vulnerability of Rice
- DVOCo: Drought Vulnerability of Combine

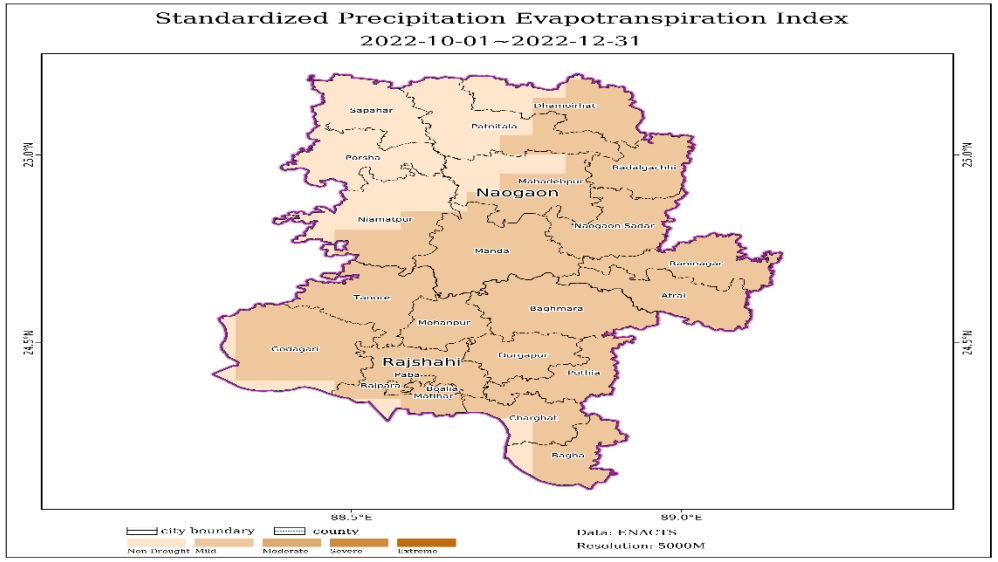
Influencing Factors

- LST: Land Surface Temperature
- TEM: Temperature
- TEMA: Temperature Anomalies
- PRE: Precipitation
- PREA: Precipitation Anomalies
- Soil Moisture

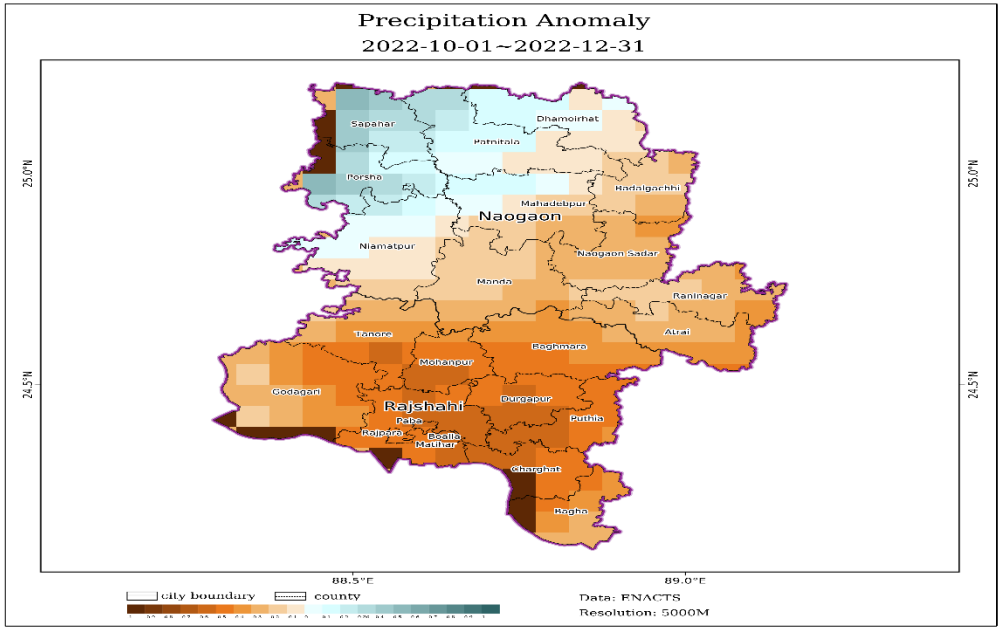
Drought Indicators for Vegetation Growth



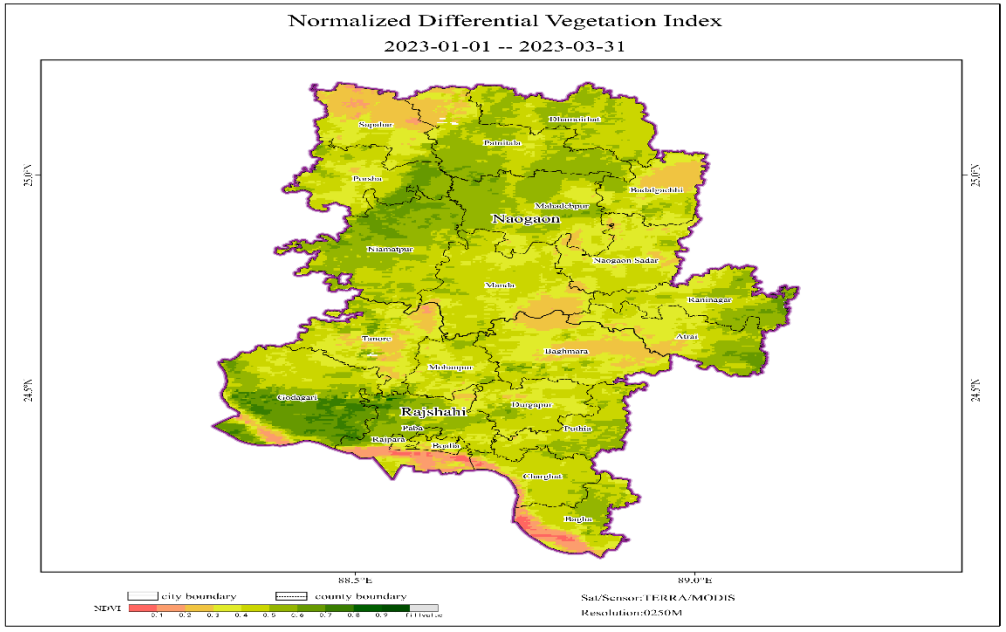
MENU



SPEI

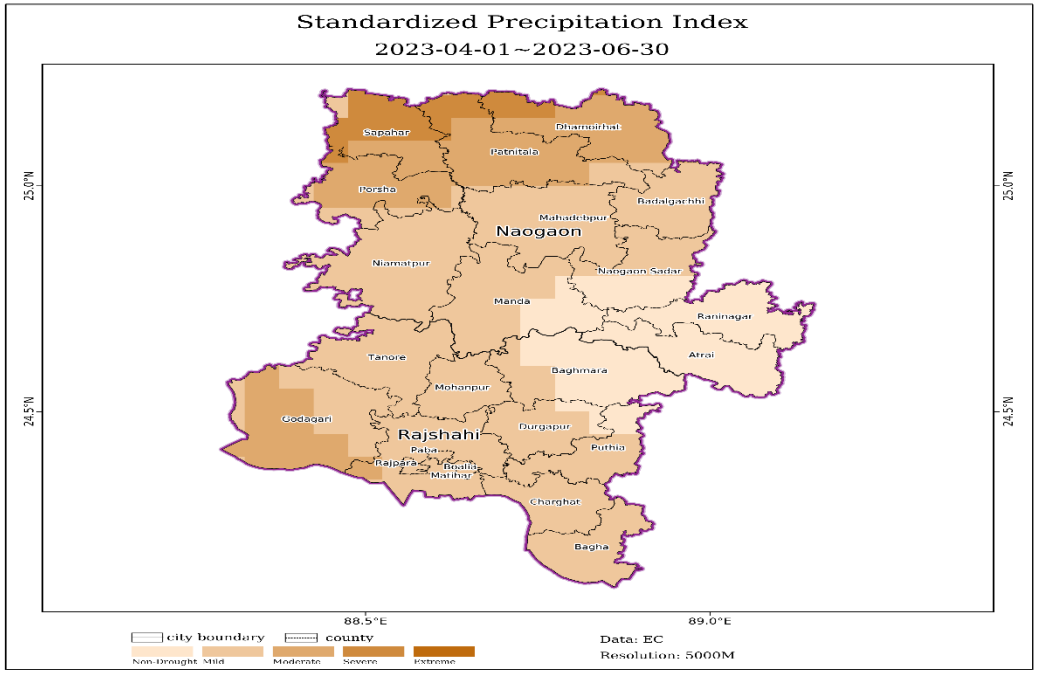


PREA

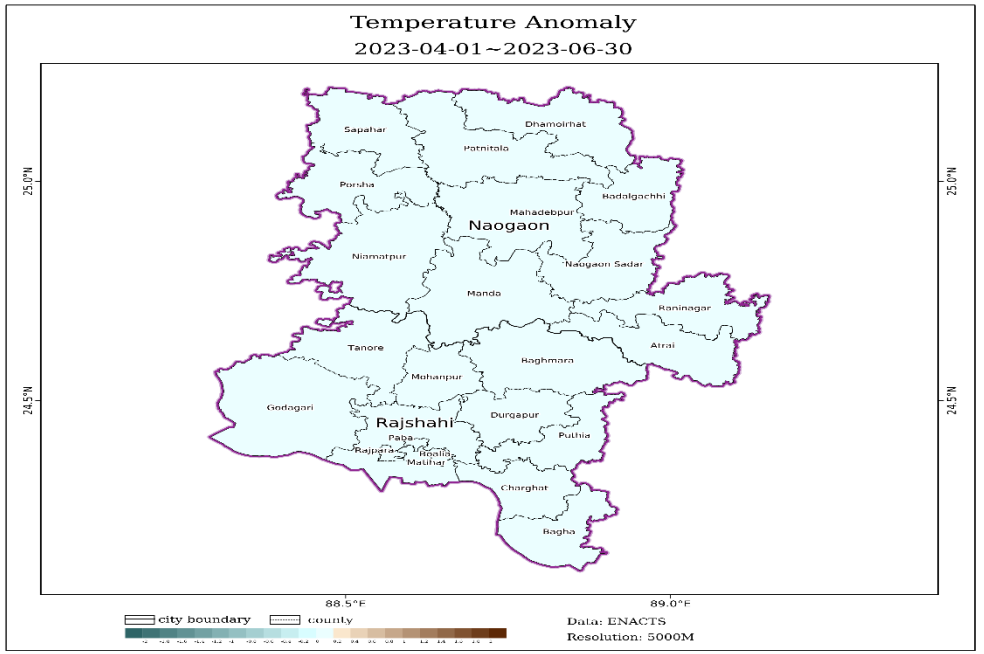


NDVI

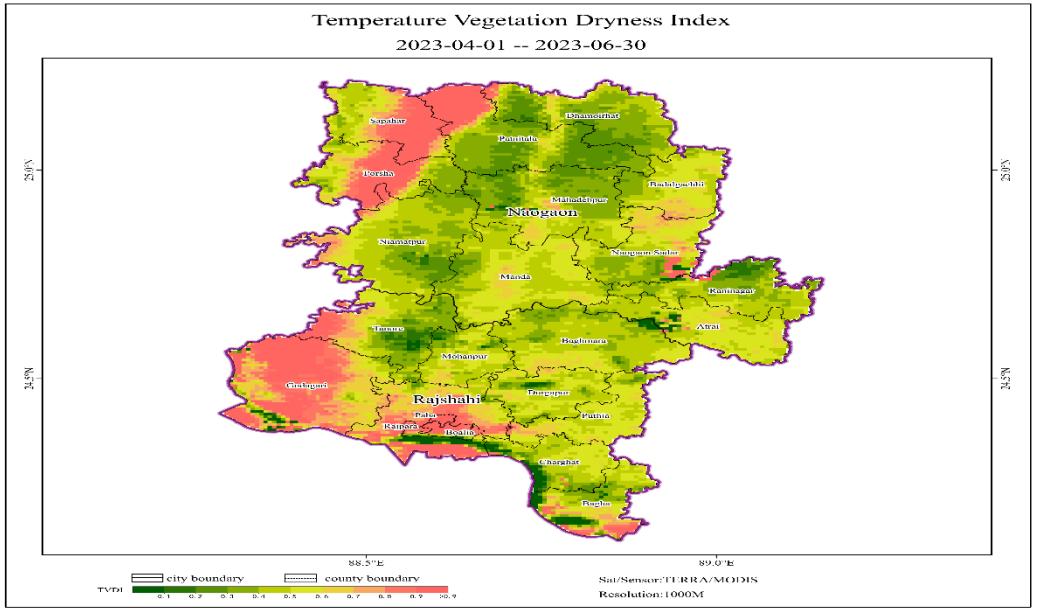
Drought Indicators for Vegetation Growth



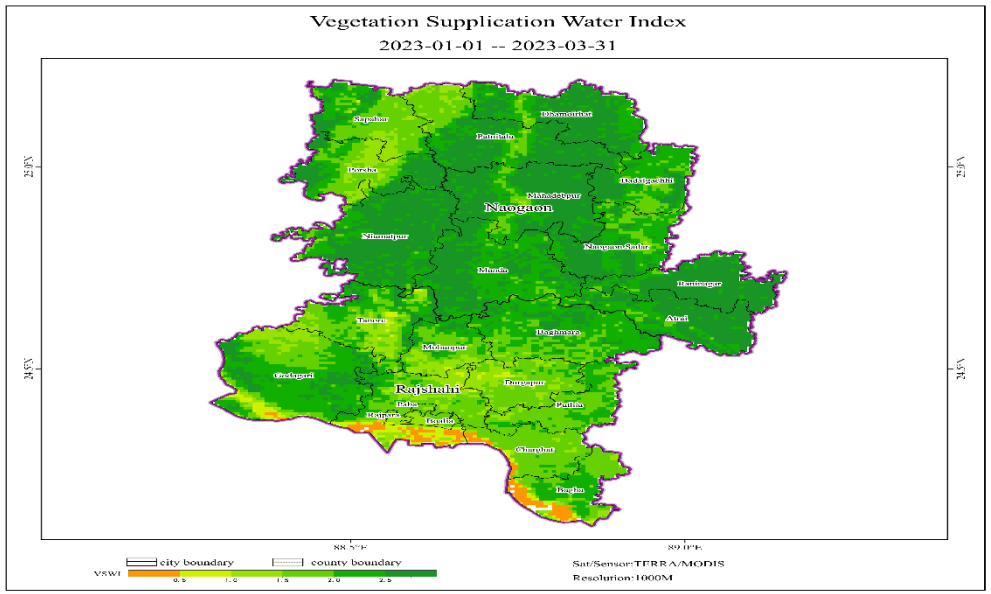
SPI



TEMA



TVDI



VSWI

Thank You To

Virtual Exchange on Institutional Coordination for Drought Resilience