Country Scale Drought Monitoring With Implication in MSDP

Hasan M Abdullah(PhD), Dept. of Agroforestry and Environment, BSMRAU, Gazipur Drought is an insidious natural hazard that results from lower levels of precipitations than usual.



Drought affects the whole water cycle, its triggering factor is a deficiency in precipitation(source:www.esipfed.org).

It is one of the main natural causes of agricultural,
 conomic, and
 environmental damage
 (Burton et al.1978; Wilhite and Glantz 1985; Wilhite 1993). In the past drought has attracted less scientific attention than flood or cyclone, several authors found that the impact of drought can be more defenseless than flood and cyclone (e.g. Shahid and Behrawan, 2008; Shahid, 2008).

Impacts of drought



Water Security





Crop Damage



Slum Fire



Hydropower



Insect Outbreak



Drainage System



Navigation System



Forest fire



Irrigation system



Livestock/Wildlife management

Ground water recharge

Arsenic contamination

and so on.....

Recently, a new drought index, the Standardized Precipitation–Evapotranspiration Index (SPEI), was proposed by Vicente-Serrano et al (2010).

The SPEI's main advantage over other widely used drought indices lies in its ability to identify the role of evapotranspiration and temperature variability with regard to drought assessments in the context of global warming.

SPEI can identify

drought prone area,
severity,
duration,
onset,
extent and end.





32 BMD stations Oldest -1948 With frequent missing data

Other than those NARS BWDB Universities

SPEI based Drought Severity Index

Range	Condition
SPEI≤-2	Extreme dry
-2 <spei≤-1.5< td=""><td>Severely dry</td></spei≤-1.5<>	Severely dry
-1.5 <spei≤-1< td=""><td>Moderately dry</td></spei≤-1<>	Moderately dry
-1 <spei≤1< td=""><td>Near Normal</td></spei≤1<>	Near Normal
$1 < SPEI \le 1.5$	Moderately wet
1.5 <spei≤2< td=""><td>Severely wet</td></spei≤2<>	Severely wet
SPEI≥2	Extremely wet

SPEI analysis based on SPEIbase

Climatic Research Unit of the University of East Anglia

spatial resolution of 0.5°lat x 0.5°lon 1901-2011





Monthly residual Rainfall of Mymensingh



year

Regional drought scenario 1994





Standard Precipitation-Evapotranspiration Index (z values)

Data Min = -3.7, Max = 3.6

October

November

2.3

Standard Precipitation-Evapotranspiration Index (z values)

Data Min = -3.4, Max = 3.7

0.9

-0.5

-2.0

Country scale drought scenario 2009



June 2009

January 2009

Image: space of the space of

Number Drought at Different lag (6, 24, 48 month)



Drought Management Planning (adaptation)

Limits: Climate change induced dry spell
 Barrier:

- Technological
- Economic
- Social

There are scopes

1. Drought monitoring in agricultural land of MSDP

1. Relevant authority might arrange and share SPEI data with water, fire, drainage...dept.

2. SPEI has potential to integrate with other layers of information for spatial planning



Thank you....

It is a simple multiscalar drought index (the SPEI) that combines precipitation and temperature data.

The SPEI uses the monthly (or weekly) difference between precipitation and PET

This represents a simple climatic water balance (Thornthwaite 1948) that is calculated at different time scales to obtain the SPEI. The PET calculation is difficult because of the involvement of numerous parameters eg. surface temperature, Iand use and land cover ✤air humidity, ✤soil incoming radiation, water vapor pressure, and ground-atmosphere latent and sensible heat fluxes (Allen et al. 1998). Different methods have been proposed to indirectly estimate the PET from meteorological parameters measured at weather stations. According to data availability, such methods include physically based methods (e.g., the Penman–Monteith method; PM) and models based on empirical relationships, where PET is calculated with fewer data requirements.

- The PM method has been adopted by
- International Commission on Irrigation and Drainage (ICID),
- ➢Food and Agriculture Organization of the United Nations (FAO), and
- ➤American Society of Civil Engineers (ASCE) as the standard procedure for computing PET.
- ➤The PM method requires large amounts of data because its calculation involves values for solar radiation, temperature, wind speed, and relative humidity.
- ➢In the majority of regions of the world, these meteorological data are not available. Accordingly, alternative empirical equations have been proposed for PET calculation where data are scarce (Allen et al. 1998).

The purpose of including PET in the drought index calculation is to obtain a relative temporal estimation, and therefore the method used to calculate the PET is not critical.

Mavromatis (2007) recently showed that the use of simple or complex methods to calculate the PET provides similar results when a drought index such as the PDSI, is calculated.

Therefore, Vincent followed the simplest approach to calculate PET (Thornthwaite1948), which has the advantage of only requiring data on monthly-mean temperature.



