Drought forecasting systems

Challenge: Disaster preparedness **Adaptation response:** Early warning

Description

Drought forecasting systems use models fed by climatic and atmospheric data (historical/seasonal weather patterns, real-time meteorological monitoring, and weather forecasts) to predict the probability of a drought occurring in a region or area of interest in the future (up to approximately three months). Drought forecasting systems are an important part of early warning systems, as they provide lead-time to planners for threat responses, which helps minimize drought impact risk. Drought forecasting has great impact on agricultural activity and water availability, and is therefore particularly important for ensuring food and water security. Effective forecasting systems can give enough lead time to adequately plan for water storage, identify alternative sources of freshwater, implement new (water-saving) agricultural practices, and import food and water, if necessary.

Implementation

Hydrological indicators (e.g. soil moisture index), real-time meteorological observations, and meteorological forecasts, coupled with historical weather patterns, provide input data to models used to forecast the hydrological conditions in a specific area, and determine whether there is an increasing risk of drought. There are various methods that can be used in drought forecasting, including those based on historical correlations between key variables and model simulations. Machine learning methods have also been used recently to forecast droughts, using drought indicators such as the Standardized precipitation Index (SPI) as data input. Main stakeholders that implement communication and emergency drought response plans include meteorological organizations, decision-makers, disaster planners and relief organizations.

Environmental Benefits

- Provides timely measures to minimize impacts such as land degradation and desertification.

Socioeconomic Benefits

- Anticipates and mitigates the drought effects by providing lead-time for response measures, especially to ensure food and water security (water conservation, soil conservation techniques, etc.).
- Reduces famine risks and ensures economic activity continues to the extent possible during droughts.

Opportunities and Barriers

Opportunities:

- Technological advances and new research are improving accuracy of forecasting systems
- Promotes a collaborative approach among stakeholders
- Serves as an important component of drought early warning systems, which can improve drought preparedness and increase resilience to drought impacts

Barriers:

- Long range drought forecasts have a high degree of uncertainty

- The effects of climate change result in increasingly unpredictable weather patterns, making forecasts less precise
- Models may produce a wide range of probabilities, with a healthy level of uncertainty
- Some systems, such as model simulations, require a high level of technical expertise to install and operate

Implementation considerations*

Technological maturity:	2-4
Initial investment:	2-3
Operational costs:	2-3
Implementation timeframe:	2-3

* This adaptation technology brief includes a general assessment of four dimensions relating to implementation of the technology. It represents an indicative assessment scale of 1-5 as follows:
Technological maturity: 1 - in early stages of research and development, to 5 – fully mature and widely used
Initial investment: 1 – very low cost, to 5 – very high cost investment needed to implement technology
Operational costs: 1 – very low/no cost, to 5 – very high costs of operation and maintenance
Implementation timeframe: 1 – very quick to implement and reach desired capacity, to 5 – significant time investments needed to establish and/or reach full capacity
This assessment is to be used as an indication only and is to be seen as relative to the other technologies included in this guide. More specific costs and timelines are to be identified as relevant for the specific technology and geography.

Sources and further information

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