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Extended Abstract (Technical Note)

Development of Indicators and Triggers for Drought Plans; A Review

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Introduction

Development of drought plans is an efficient approach to reduce the consequent damages and improve responses. The effectiveness of these plans depends on the indicators and triggers that determine the timing and type of management actions (Steinmann and Cavalcanti, 2006). There are yet many questions about appropriate indicators, their combination, and threshold levels to define triggers.

Objectives

This paper attempts to describe some of the important points about indicators and triggers and how they have to be manipulated while applying them for drought plans.

Methodology

Drought indicators are variables that describe the magnitude, duration, severity, and the spatial extent of drought. Indicators are typically based on meteorological and hydrological variables such as precipitation, streamflow, and groundwater. The most applied among these is precipitation. Many indices are based on only precipitation such as DI, SPI, and EDI and can be calculated using DIP software (Morid, et al., 1385). However they do not show the consistent behavior during a drought course (Morid et al., 2005). Some research has attempted to compare drought monitoring by single and multiple indicators. For instance, Morid and Paimozd (2007) evaluated drought severity in Tehran province, using EDI and Chang methods, as single and multiple indicators, respectively. The results showed that the sensitivity of the multiple indicators method to drought severity and onset of drought is more significant.

Drought triggers are threshold values of an indicator that detect a drought level and determine when management actions should begin and end (Steinemann, 2003). To develop indicators and triggers of a drought plan, it is necessary to consider cases such as temporal and spatial consistency, temporal and spatial specificity, statistical consistency among triggers, and statistical consistency among categories.

The process of combining indicators and triggers can be considered in two ways. The first is when several indicators are synthesized into one indicator (e.g. SWSI). The second approach is to define drought levels and transferring indicators to the one percentile scale based on defined levels.

Simultaneous monitoring of the supply and demand is recommended for drought monitoring. The Days of Supply Remaining is suggested as an index to account for the effect of the operating rules, allocation and management decisions in the beginning of drought. The index includes inputs such as reservoir storage, forecasted future inflows from precipitation, snowmelt, and streamflow and predicted demands. This index needs long-term forecasting that limits its applications.

Conclusion

This review paper attempted to show weaknesses of the conventional drought indices as a trigger to activate drought mitigation measures. It emphasizes on the development of the new multi-period indicators and triggers, which include hydrological and consumption components, too. Finally, the significant role of expert

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assessment to finalize the selected approach is highlighted and discussed.

Keywords: Drought, Indicator, Trigger, Water Management.

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