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Shahid Chamran University of Ahvaz

EXTENDED ABSTRACT

Evaluation and Comparison of Drought in West Azerbaijan Using the SPI, CZI, PNI Iindices and Geographic Information System (GIS)

T. Aligolinia[1*], N. Rasouli Majd[2] and A. Hezar Jaribi[3]

1*- Corresponding Author, Ph.D. Candidate, Department of Water Engineering, Gorgan university of Agricultural Sciences and Natural Resources, Gorgan, Iran. (*tohid323@yahoo.com*).

2- Ph.D. Candidate, Department of Water Engineering, Urmia University, Urmia, Iran.

3- Associate Professor, Department of Water Engineering, Gorgan University of Agricultural Sciences and Natural Resources, Gorgan, Iran.

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Introduction

Recognizing and studying the drought phenomenon with regard to the affecting factors led to better understanding of this phenomenon and paved the way for short-term and long-term planning in relation to encountering, controlling and predicting of this phenomenon.Since to determine the severity, duration, and frequency of drought, is need to determine the drought by using indicators, drought monitoring is essential and researchers have always followed the use of indicators for drought monitoring as a management and planning tool. Drought monitoring is one of the prime factors in drought management. Monitoring systems have important roles in creating the drought plans and its management. Therefore, due to this importance and taking into account the ecological and geographical conditions of Lake Urmia during recent years, the study and monitoring of drought for the above area is necessary. Therefore, the purpose of this study was to investigate the drought characteristics and calculate the three (SPI, PNI, CZI) drought indexes and comparing their efficiency and accuracy in the Western Azerbaijan province, as well as evaluating the time trends of their changes over the entire province.

Methodology

To evaluate and study droughts, the synoptic meteorological data from 6 stations in West Azerbaijan province during the period of (1990-2009) was used. Also, based on the available data, the component of rainfall, including mean, skewness, standard deviation and variance, were analyzed from the amount of annual precipitation of synoptic stations in West Azerbaijan province. In order to investigate the drought, three drought indices including the SPI, PNI and CZI indices were used. The GIS was also used to study the drought trend and spatial zonation. In order to evaluate the efficiency of drought indices in West Azerbaijan province the R^2 coefficient between pairs of drought indices SPI-CZI, SPI-PNI and CZI-PNI was used.

Results and Discussion

The results of the survey on the efficiency of the indicators showed a relatively high correlation between SPI and CZI indices. Also the results showed that for the most stations, in ($p < 0.01$) confidence level, pairs of profiles were correlated to each other. However in the frequency analysis

of drought indices, PNI index in normal years and SPI index in the wet years have more efficiency. Also between low and moderate droughts every 3 indices showed almost identical results and efficiency. Finally, an experimental equation was developed based on the relative spur height and length and riprap size, which can be applied for the riprap size designing. The results of drought analysis showed that there were relatively normal years in the province between 1990 and 2009, that the PNI indicator showing well, and a few weak points were observed that its SPI index shows. Also, the results showed that there were weak to moderate drought in the studied area during the years of (1990-2009) that in this case, all three indicators of the CZI, PNI and SPI showed almost identical results.

Conclusion

Drought indicators represent the natural limits of droughts, making it possible to evaluate it at different time and space scales. For this purpose, rainfall data of different stations in West Azerbaijan province were analyzed. The results showed that precipitation in this province is very irregular and highly variable, that indicates the probability of occurrence of drought in the region. Therefore, in order to study this phenomenon, PNI, CZI and SPI indexes were analyzed and compared. The results showed relatively high correlation between the CZI and SPI indices. However, the PNI index shows different results in spatial zoning. Therefore, in the study area where the most severe drought has occurred, the PNI index shows the highest amount of drought with the 1286.95 sq. Km. Also, in the drought frequency analyze and mildew occurrence in the province, the PNI was the most frequent index of normal drought, and the SPI index showed the highest frequency.

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