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Socio-economic Vulnerability Assessment of Drought Using Information Theoretic Approaches

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Droughts are resulted from the deficit of precipitation over an extended period of time, and cause serious damage to socio-economic and environmental systems, mainly due to their insidious onset and often long persistence. Therefore, it is necessary to assess drought vulnerability taking into account the impacts of socio-economic factors. Drought vulnerability is a quantitative value of the socio-economic impacts of drought that is calculated as the weighted sum of the socio-economic factors. Thus, it is very important to determine the appropriate weights for assessing drought vulnerability in practice. The objective of this study is to evaluate the regional socio-economic drought vulnerability using information theoretic approaches. To do this, we selected six factors such as population, farmland area, industrial complex area, domestic water uses, agricultural water uses, and industrial water uses from comprehensively reviewing previous studies. We also investigated the applicability of two information theoretic approaches such as Principal Component Analysis and Entropy method to calculate appropriate weights, as an alternative of the Analytical Hierarchy Process (AHP) method. Finally, we calculated the vulnerability index to evaluate the vulnerability of Geum River Basin in South Korea. Although the detailed results were different, two weighting methods provided the clear identification of vulnerable areas within the study basin; Hongseong-gun hongseong-eup and Yesan-gun yesan-eup were most vulnerable areas, and Boryeong-si jupo-myeon and Cheongyang-gun mok-myeon were less vulnerable area. In conclusion, Hongseong-gun hongseong-eup and Yesan-gun yesan-eup are very vulnerable to drought and need to prepare future drought countermeasures.

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