以遺傳演算法探討考量河川自然流量變化之最佳攔河堰生態流量

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This study aims to evaluate the impacts on natural flow variability caused by flow diversions. Restoration of altered hydrologic regimes and the associated effects on water-supply reliability by instream flow releases are also explored. This study employs the Range of Variability Approach (RVA) to quantitatively assess alterations of the natural flow variability. Thirty-two hydrologic parameters, called Indicators of Hydrologic Alteration (IHA), associated with the degree of hydrologic alteration are used to assess the hydrologic alteration of streamflows. Since water-supply reliability and sustaining natural flow variability are conflicting, the multiobjective optimization model is needed to solve these conflicting objectives in weir operation problem. Shortage ratio is used to evaluate the operation performance of the water-supply weir. The resulting degrees of hydrologic alterations for 32 IHAs are combined into a single index, called the overall degree of hydrologic alteration, to represent sustention natural flow variability objective. The non-dominated sorting genetic algorithm II (NSGA-II) is adopted in this study to solve the multiobjective weir operation problem. The proposed methodology is applying to Chi-Chi diversion weir, which is located at the midstream of the Chou-Shui River, Taiwan. The daily flow records prior to weir construction from 1951 to 1993 are used to establish RVA targets. A weir operation simulation model is established to derive the post-diversion flows for various operating schemes. In this study, various operating schemes, including constant, semi-annually varying, quarterly varying, and monthly varying instream flow release, are evaluated to determine corresponding impacts on shortage ratio and hydrologic alteration. The methodology proposed in this study could serve as a useful quantitative evaluation tool for the decision makers of the water-supply systems.