

Evaluation of ecological instream flow of the Pearl River basin, South China

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Abstract The Pearl River basin is characterized by humid climate and the water resources are abundant, but it suffers from water deficit due to heavy water pollution. Alteration of the hydrological cycle due to climate changes may cause alterations of hydrological processes, so has the potential to negatively influence the ecological environment of the Pearl River basin. In this paper, the monthly runoff data at 11 major hydrological stations are analysed to evaluate ecological instream flow of the Pearl River basin using five hydrological methodologies: the minimum monthly average flow method, the improved 7Q10 method, NGPRP method, the monthly minimum ecological flow calculation method and the monthly frequency calculation method. The results show that the monthly minimum ecological flow estimation method and the monthly frequency calculation technique are the right choice in terms of computation of minimum ecological flow and optimal ecological flow respectively of the Pearl River basin. The estimated ecological streamflow can be classified as the medium or optimum ranges when compared to those determined by the Tennant method. In addition, the results indicate that the probability of 50% that the ecological streamflow is satisfied should give environment-friendly streamflow variations. Furthermore, this study also provides a reference technical framework with respect to the evaluation of ecological water requirement based on monthly runoff data, and is also of scientific and practical merits in basin scale water resource management in the Pearl River basin.

Key words minimum ecological flow; optimal ecological flow; probability-based ecological water evaluation method; probability distributions; Pearl River basin