认识生态流量方法应用现状研究

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摘 要：水资源是制约国家经济社会发展的重要因素。长期以来，水资源的过度开发利用直接影响了流域的生态保护和高质量发展。生态流量（Ecological Flow）是保障流域水生态环境可持续发展和管理的重要指标。然而当前研究方法众多，尚未进行系统性梳理。以生态流量为出发点，归纳总结国内生态流量评估的最新进展，系统地对水文学法、水力学法、生境模拟法和整体分析法等四大类共 17 种方法进行对比总结，评述其优缺点及适用条件，并根据国内流域的生态流量评估现状，建议在我国流域水系庞杂且气候、水文地质、下垫面和水资源开发利用等条件差异较大的情况下，因地制宜地选择生态流量评估方法。未来的生态流量研究和流域水生态管理应综合考虑气候、水文条件变化和人类活动的影响，依据生态流量目标制定、水利水电工程调度、生态流量监测、流域制度法规建设等方面系统性完善生态流量管理与研究，实现流域水资源的高质量发展。

关键词：生态流量；水资源；流域生态；流域管理；可持续发展

Progress and Perspectives on Ecological Flow Assessment Methods in China

Abstract: Water resource is a limiting factor of economic and social development. The overexploitation and utilization of water resources have significantly affected ecological protection and high-quality development in a region. Ecological flow has been treated as an effective and critical index to ensure the sustainable development and management of the ecological environment in a basin. Thus far, numerous research frameworks and methods have been developed and applied across the globe. Yet, they have not been systematically reviewed and compared in China. This paper summarized the latest progress in domestic ecological flow assessment and systematically compared and summarized 17 ecological flow methods within four categories, including the hydrology method, hydraulic rating, habitat simulation modelling, and holistic frameworks. We reviewed their advantages and disadvantages, and their prerequisite for practical application. Based on the current situation of ecological flow assessment in domestic river basins in China, we suggested that the ecological flow assessment method should be selected based on local conditions when the water system was under complex climate, hydrogeology, underlying surface, and water utilization and allocation. Future ecological flow research and watershed water ecological management should comprehensively consider the influences of climate, hydrological conditions, and human activities to improve watershed management and research. To achieve sustainable and high-quality development of water resources, water conservancy, hydropower engineering scheduling, ecological flow monitoring, watershed system and regulations construction should be fully considered in setting the ecological flow of a watershed.

Key Words: ecological flow; water resource; ecology of watershed; watershed management; sustainable development