

Computational study of hydro-environmental processes of Poyang Lake, China

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## **Abstract**

Poyang Lake, the largest freshwater lake in China, plays a key role in regulating the hydrology, water quality and ecosystem in the middle reaches of the Yangtze River. Recent industrial development and urbanization in Jiangxi province have driven rapid increase in water consumption and deterioration of water quality, exerting pressure on water utilization in the Poyang Lake basin. In order to set up an integrated water management framework for the protection of Poyang Lake's ecosystem and surrounding communities, an accurate and representative evaluation of the hydraulic and environmental challenges is vital. In this research, a numerical model is developed and utilized to simulate the hydrodynamics and water quality of Poyang Lake and its surrounding river networks. The study couples an in-house 1-D river network hydrodynamic and mass transport model together with a 2-D MIKE hydrodynamic and water quality model. The model is validated against field-measured data from the local water authorities. The impact of the proposed downstream barrage on Poyang Lake's hydrodynamics and water quality is then investigated. It is concluded that: the established integrated model is capable of simulating the hydrodynamic and water-quality processes of the Poyang Lake to satisfactory degrees; and the operation of proposed barrage has large effects on the nutrients distribution and water resources availability. The findings of the study contribute to a better understanding of the fate of Poyang Lake's pollutants and the influence of the proposed hydraulic projects on the lake's flow and ecosystem. Many of these findings are relevant to large freshwater lakes in other developing countries and could contribute to the fields of water engineering and water management.