

Optimization-based equilibrium analysis for direct and indirect socio-economic and environmental benefits of large-scale hydro-engineering projects

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At the Yangtze River, there has been a number of large-scale hydraulic projects (LHPs). Among them are 5 top-12 LHPs over the world, including the Three Gorges Project. These LHPs have been of significant strategic effects for socio-economic development of the river basin. In evaluating these effects, there have been significant under-estimations in terms of their flood prevention/control benefits. This is particularly true in analyzing the indirect parts of such benefits as transmitted through production, supply and consumption chains at multiple layers. Therefore, the objective of this study is to develop a general equilibrium inventory analysis Model (GEIA) to comprehensively analyze both direct and indirect flood prevention/control benefits attributed to the Three Gorges Project and other LHPs along the Yangtze River. It is found that the indirect flood prevention/control benefits of the Three Gorges Project in 2020 amounted to over 700 billion yuan, accounting for over 0.15% of the total GDP from the Yangtze River Economic Belt. These benefits were generally ignored or significantly under-estimated in the past. Therefore, our research results will help provide bases for assessing the effectiveness of LHPs within the Yangtze River Basin and improving the robustness of the basin's flood prevention/control policies.