

## Assessment of river flow impacts of hydropower development in the Mekong River Basin

*Timo A. Räsänen (Aalto University), H. Lauri, J. Koponen, P. Someth, J. Sarkkula & M. Kummu*

The transboundary Mekong River is undergoing extensive hydropower development to satisfy increasing energy demand and to promote economic growth, but at the same time the development affects water-related livelihoods and food security of millions of people. For example, the Mekong River is one of the world's richest inland fisheries and its productivity is at risk. The hydropower operations generally increase river flow variability and affect the seasonal distribution of the river flows and water levels, and these changes affect negatively the aquatic and riparian ecosystems. In the case of hydrological processes mathematical models provide effective means for impact assessment as they allow the analysis and estimation of observed historical and future impacts. This work presents modelling tools used in the assessment of the river flow impacts of hydropower development, and three impact assessment research case studies from the Mekong River. The models include a distributed hydrological model and linear and dynamic programming tools. The first case study estimates the future river flow impacts of Lancang-Jiang hydropower cascade in the Upper Mekong Basin before its completion, and the second case study analyses the observed river flow impacts of the same cascade after its completion. The third case study estimates the cumulative future river flow impacts of basin-wide development of 126 large hydropower projects. The research findings are consistent: the dry season flows increase and become more variable, and the wet season flows decrease. In the case of Lancang-Jiang cascade the model-based predictions of river flow impacts are well in line with the observed impacts. These research findings call for improved transboundary cooperation to mitigate and manage the negative effects of the ongoing development. In addition, more research is needed to understand better the river flow-ecosystem linkages in the Mekong River.