

Supporting water infrastructure investment planning with hydroeconomic models

The industrial PhD project, "Supporting water infrastructure investment planning with hydroeconomic models", is carried out as a collaboration between COWI A/S, the Technical University of Denmark (DTU) and the Massachusetts Institute of Technology (MIT) for the period 2017-2020. The PhD candidate, Raphaël Payet-Burin, completed a shared degree between EPFL and DTU as an environmental engineer and has worked as a research assistant at DTU in this research field.

The goal of the project is to develop an open-source decision support tool for basin-scale water infrastructure investment planning. Water infrastructure investments have to be analysed taking into account the complex water-energy-food nexus relations, considering uncertain future climates, transboundary cooperation, and various stakeholders with conflicting interests. Hydroeconomic optimization models, that link the natural resource system, the hydraulic infrastructure as well as the water users (hydropower, agriculture, ecosystems, etc.), their demands and willingness-to-pay, can be used to evaluate potential investments, considering interactions between individual projects. The project proposes to develop a new hydroeconomic optimization model, building on existing databases and tools, including tools developed at COWI, benefiting from the expertise of DTU, MIT and COWI in this field.

Because many countries and river basins around the world are now planning to formulate water infrastructure development plans, the open-source tool developed here, should support national and local governments, international financing institutions and water resources consulting engineering companies in finding more sustainable investments and therefore benefit society. The value of the tool will be demonstrated in the Zambezi River basin, a major African basin which is shared by eight countries, in which multiple investment opportunities exist including new hydropower plants, new or resized reservoirs, development of irrigation agriculture, investments into the power grid. The PhD project is also expected to explore innovative ways to represent willingness-to-pay of water users and benefit the hydroeconomic research community.