Improving a flood forecasting system for north-eastern Thailand

Using Model Predictive Control to optimise real-time operational flood control

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Real-time optimisation of multi-reservoir systems

Decreasing flood peaks significantly

Calculation of optimal releases from reservoirs in 20 – 30 seconds

Challenge

The Chi River is one of the major river basins flowing through Thailand. Because of today's changing climatic conditions, flooding happens frequently, which has a great effect on economy, human life and properties in the area. Therefore, finding efficient ways of managing floods to reduce impacts is an important priority at national as well as regional levels. As such, HII needed insights of real-time control to optimise discharges from EGAT's (Electricity Generating Authority of Thailand) and RID's (Royal Irrigation Department) two major dams, Ubonrat and Lampao, in order to provide decision support to the National Water Resource Committee of Thailand.

Solution

To manage real-time control of releases from the two dams located upstream of the Chi River system, DHI applied a Model Predictive Control (MPC) framework. The method combines a fast-solvable optimisation model with evaluation and realignment by a hydrodynamic flood model created in MIKE HYDRO River. Using MIKE OPERATIONS to run the hydrodynamic flood model automatically, dam releases and downstream discharges can be controlled in real-time.

By using the MPC framework, the downstream discharge peaks were reduced with up to 300 m3/s when releases from the Ubonrat and Lampao dams were controlled in combination.

This research project—made possible with support from EGAT and RID—tests the MPC approach and does not include factors such as side flow from other small rivers and other impact.

'Collaborating since 2012, DHI has supported HII with cutting-edge technology and capacity building of the real-time flood forecasting system. As a result of this partnership, HII has become a national expert within flood forecasting. Thanks to DHI for the support on this excellent outcome.'

Dr Piyamarn Sisomphon, Head of Hydroinformatics Modeling System Section
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