



Simulation and optimisation modelling approach for operation of the Hoa Binh reservoir

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Mitigation of flood damages is one of the highest priorities for water resources management in the Red River Basin, Vietnam. A comprehensive river basin plan was proposed in the 1960s according to which a cascade reservoir system should be built in the basin including the Hoa Binh reservoir that has been operated since 1990. Because of its multi-purpose character, conflicts and disputes in managing the reservoir have been ongoing since then, particularly in the flood season. Therefore, it is important and desirable to improve the current operational regulation of the Hoa Binh reservoir.

This paper proposes to optimise the control strategies for the HoaBinh reservoir operation by applying a combination of simulation and optimisation models. The control strategies are set up in the MIKE 11 simulation model to guide the release of the reservoir system according to the current storage level, the hydro-meteorological conditions, and the time of the year. A heuristic global optimisation tool, the Shuffled Complex Evolution (SCE) algorithm, is adopted for optimising the reservoir operation. This algorithm conducts an efficient and robust search of the parameters space. First, different decision parameter sets that define the control strategies are generated. For each trial parameter set the simulation model is used to evaluate the performance of the system with respect to different objectives. Then, the parameter set is modified toward optimality by using the optimisation algorithm. The optimisation puts focus on the trade-off between flood control and hydropower generation for the Hoa Binh reservoir operation in the flood season and the reservoir level at the beginning of the dry season.