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Climate change impacts on the water quality: A case study of the Rosetta Branch in the Nile Delta, Egypt

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A physico-chemical water quality model has been developed for the Rosetta Branch in the Nile Delta, making use of the MIKE11 river modelling software of DHI Water & Environment (DHI, 2002). The physico-chemical water quality (WQ) module of MIKE11 was linked with a detailed full hydrodynamic (HD) model developed for the same Rosetta Branch, and also implemented in the MIKE11 modelling system. The WQ model aims to describe and predict concentrations of dissolved oxygen (DO), biochemical oxygen demand (BOD) and nitrogen in the form of ammonia (NH4-N) and nitrate (NO3-N), taking into consideration advection, dispersion and the most important biological, chemical and physical processes. All significant pollution sources along the Rosetta Branch were considered. A simplified model was calibrated against a relatively more complex model with the objective to achieve simulations with the simplified models. This could only be achieved by implementing the detailed and the simplified model in a complementary way. The simplified model was used to simulate 3 different scenarios to study the effect of the water temperature rise (in the Rosetta branch) on the DO concentrations. The results indicated that Global warming might increase the stress on Rosetta Branch and decline its water quality. Higher water temperatures reduce dissolved oxygen levels, especially for low concentrations (<5 mg/l) which could affect the aquatic life. If this effect was accompanied by flow reduction, deterioration in the quality status of the branch might be severe.