APPLICATION OF ECOLOGICAL MODELLING TO INVESTIGATE THE IMPACT OF DOMESTIC WASTE WATER TO ONE NATURAL RIVER SYSTEM IN TROPICAL AREA (THE NHUE RIVER, OUTSKIRTS OF HANOI, VIETNAM)

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Water quality modelling has been employed as an effective tool to investigate the ecological situation of surface water sources. Within a researching collaboration of Vietnamese and French scientists, one portion, 40 km, of the Nhue river, outskirts of Hanoi city, northern Vietnam, has been investigated since the river has been highly impacted from anthropogenic activities and one 1-D ecological river model was formed based on the investigation. In this paper, biochemical process equations integrated with hydraulic conditions and human alterations are presented as the basis for ecological variation of this river system. Investigation showed that at the origin the river water remains untouched (nutrients are low in natural tropical water) while downstream the river is full of domestic pollutants (organic materials and nutrients). From the hydraulic, biological, chemical data and fieldwork experiments, the sensitivity analysis and parameter estimation have been carried out to verify the biochemical processes and optimise this model. Most calculations (simulation, sensitivity functions and parameter estimation) were performed with AQUASIM, a computer program designed for simulation and data analysis of 1-D river and other aquatic systems. The other supporting calculations for system analysis were implemented with IDENT based on output of a sensitivity analysis carried out with AQUASIM. The simulation results accomplished with available data indicate that the sediment exchanges and biodegradation processes emerge as the most important features that influence the water quality
of the river where water is usually overloaded by domestic wastewater and where hy-
draulic characters are less pronounced. The model construction and simulation results
have also pointed out that the river water quality has been spoiled dramatically after
the main open-air sewer of the Hanoi city, the To Lich river, excesses to the Nhue. Be-
side, a metal speciation module was proposed to integrate with existing biochemical
model in order to simulate the metal fractions in water column and metal exchange
between river water and sediment.