Abstract

In determining a proper waste load allocation for a river, in addition to the relation between pollution sources and the receiving water body, factors such as land uses, catchment areas and population density should also be considered. In this study, the equity and effectiveness of waste load allocations based on different factors were evaluated by the proposed optimization models . The QUAL2E model was used to simulate the water quality variation of the river water body. The Genetic Algorithm was used to calibrate model parameters for improving the quality of simulation. Several waste load allocation optimization models were developed based on the impact coefficients determined by the water quality model and several equity factors. Allowable total waste loads were calculated by the optimization models with consideration of various equity factors to avoid possible discharge bias favored to any single area. A web-based decision support system (DSS) was developed to facilitate the analysis and decision for a proper waste load allocation. The DSS has been made available on the Internet and can be accessed from any where and any time on the network. The DSS has six major modules including a database, a data analysis, the water quality simulation model, an optimization, a web-based geographical information system (GIS) and a decision support modules. The database module manages the data collected for water quality, hydrology and point source pollutants. The data analysis module produces various statistical charts. The water quality simulation model module provides a friendly interface to simulate the water quality. The optimization module generates various waste load allocation alternatives. The web-based GIS module illustrates spatial results by graphical map layers. The decision support module integrated all other modules to facilitate the analysis of waste load allocation alternatives. A case study for Wu River was implemented to explore and demonstrate the applicability and effectiveness of the DSS.

Keywords: waste load allocation, decision support system, water quality management, environmental systems analysis, optimization.