Using a systematic approach to develop water quality management strategies in the Nankan River, Taiwan

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ABSTRACT

The Nankan River, located in northern Taiwan, is one of the most contaminated rivers in Taiwan. The pollution of this river causes odor problems and affects use of the water resources. In this study, a systematic river basin water quality management strategy was developed to simulate water quality, evaluate wastewater management alternatives, and cost-effectiveness strategy plans for the Nankan River restoration and its water quality improvement. The main tasks consist of river water sampling and analysis, water quality modeling, total maximum daily load (TMDL) calculation, river pollution index (RPI) evaluation, and cost-effectiveness analysis (CEA). The QUAL2K model, developed by US Environmental Protection Agency, was adopted as the river water quality modeling framework in this study. The modeling effort was supported including four water quality data-sets of the river. Results of the water quality modeling show that the calculated TMDL for biochemical oxygen demand (BOD) and ammonia loading were 1,334 and 889 kg/day, respectively. Approximately, 1,334 kg/day of BOD and 889 kg/day of ammonia needed to be reduced to improve the RPI from “serious pollution” level to “moderate pollution” level. Results also reveal that the odor problem caused by dimethyl sulfide and dimethyl trisulfide could be removed after the water quality improvement. Results from the CEA show that an annual cost of US$ 8 million is required to reach the acceptable RPI level (moderate pollution). The developed strategies can be used as decision-making tools for water pollution control and river basin water quality management for the Nankan River and other similar rivers.

Keywords: Cost-effectiveness analysis; Key performance indicators; Point sources pollution; QUAL2K; River basin management; Total maximum daily load

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