

Emergency material warehouse location planning based on TOPSIS and multi-objective programming approach for river chemical spills

Jie Liu (1), Jiping Jiang (1), Dexun Jiang (3), Peng Wang (1,2)

(1) School of Municipal and Environmental Engineering, Harbin Institute of Technology, Harbin 150090, China, (2) State Key Laboratory of Urban Water Resource and Environment, Harbin Institute of Technology, Harbin 150090, China, (3) Software School, Harbin University, Harbin 150086, China

In order to minimize the negative effects caused by river chemical spills, it is imperative to carry out a contingency plan in a quick response in emergency situations and crisis. In this study, an effective two-stage evaluation and selection system applying improved AHP, fuzzy TOPSIS and the multi-objective programming methods is proposed to identify the optimal emergency material warehouse (EMW) locations in pre-accident phase for emergency rescue dealing with river chemical spills. The two-stage system is based on an integration of a fuzzy MCDM framework for EMW location evaluation and a multi-objective optimization model for EMW location selection. First, improved AHP is applied to assess the environmental impacts of risk sources and fuzzy TOPSIS is applied to identify relative closeness of the feasible location alternatives. Second, a multi-objective optimization model is developed to obtain optimal EMW location scheme in pre-accident phase guaranteeing adequate stockpile and effective allocation of emergency materials. The two-stage evaluation and selection system is then applied in Jiangsu province for environmental emergency management. The results demonstrate that the developed two-stage system could identify optimal EMW location scheme, guarantee all the potential risk sources can be covered by the selected EMWs and enhance the emergency rescue efficiency for river chemical spills.