Optimal Allocation of Multiple Emergency Resources for a Single Potential Accident Node: A Mixed Integer Linear Program

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Abstract : Optimal allocation of emergency resources before a disaster is of great importance for emergency response. In reality, the pre-protection for a single critical node where accidents may occur is common. In this study, a model is developed to determine location and inventory decisions of multiple emergency resources among a set of candidate stations to minimize the total cost based on the constraints of budgetary and capacity. The total cost includes the economic accident loss which is accorded with probability distribution of time and the warehousing cost of resources which is increasing over time. A ratio is set to measure the degree of a storage station only serving the target node that becomes larger with the decrease of the distance between them. For the application of linear program, it is assumed that the length of travel time to the accident scene of emergency resources has a linear relationship with the economic accident loss. A computational experiment is conducted to illustrate how the proposed model works, and the results indicate its effectiveness and practicability.

Keywords : emergency response, integer linear program, multiple emergency resources, pre-allocation decisions, single potential accident node

Conference Title : ICDEM 2020 : International Conference on Disaster and Emergency Management

Conference Location : Zurich, Switzerland

Conference Dates : January 13-14, 2020