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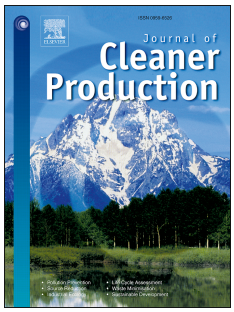

A novel multi-objective programming model of relief distribution for sustainable disaster supply chain in large-scale natural disasters

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A novel multi-objective programming model of relief distribution for sustainable disaster supply chain in large-scale natural disasters

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Abstract To save lives and reduce suffering of victims, the focus here is to design the strategies of relief distribution regarding beneficiary perspective on sustainability. This problem is formulated as a multi-objective mixed-integer nonlinear programming model to maximize the lowest victims' perceived satisfaction, and minimize respectively the largest deviation on victims' perceived satisfaction for all demand points and sub-phases. Then, genetic algorithm is proposed to solve this mathematical model. To validate the proposed methodologies, a case study from Wenchuan earthquake is illustrated. Computational results demonstrate genetic algorithm here can achieve the trade-off between solution quality and computation time for relief distribution with the concern of sustainability. Furthermore, it indicates that the methodology provides the tools for decision-makers to optimize the structure of relief distribution network and inventory, as well as alleviate the suffering of victims. Increasingly, this paper expects to not only validate the proposed model and method, but highlight the importance and urge of considering beneficiary perspective on sustainability into relief distribution problem.

Keywords: Relief distribution; Sustainable disaster supply chain; Victims' perceived satisfaction; Multi-objective programming model; Genetic algorithm

1. Introduction

The International Disaster Database (EM-DAT) indicates the total number of both natural disasters and the affected people have steadily increased since 1900s. Such natural disasters pose serious threats to sustainable development of society, economy and ecology, as well as place populations at risk. Particularly, large-scale natural disasters have occurred frequently, resulting in tremendous