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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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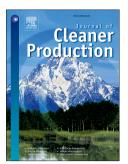
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1 A novel multi-objective programming model of relief distribution for sustainable disaster

2 supply chain in large-scale natural disasters

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9 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 10 multi-objective mixed-integer nonlinear programming model to maximize the lowest victims' 11 perceived satisfaction, and minimize respectively the largest deviation on victims' perceived 12 satisfaction for all demand points and sub-phases. Then, genetic algorithm is proposed to solve this 13 mathematical model. To validate the proposed methodologies, a case study from Wenchuan 14 earthquake is illustrated. Computational results demonstrate genetic algorithm here can achieve the 15 trade-off between solution quality and computation time for relief distribution with the concern of 16 sustainability. Furthermore, it indicates that the methodology provides the tools for decision-makers 17 to optimize the structure of relief distribution network and inventory, as well as alleviate the suffering 18 19 of victims. Increasingly, this paper expects to not only validate the proposed model and method, but 20 highlight the importance and urge of considering beneficiary perspective on sustainability into relief distribution problem. 21

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

24 1. Introduction

25 The International Disaster Database (EM-DAT) indicates the total number of both natural disasters 26 and the affected people have steadily increased since 1900s. Such natural disasters pose serious 27 threats to sustainable development of society, economy and ecology, as well as place populations at 28 risk. Particularly, large-scale natural disasters have occurred frequently, resulting in tremendous

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