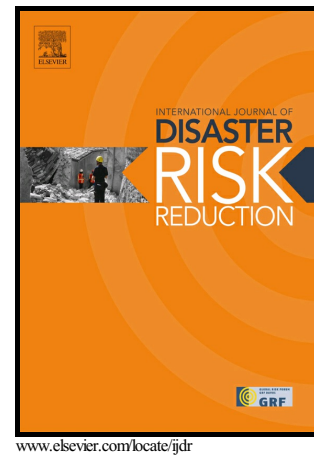


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A robust model for a humanitarian relief network with backup covering under disruptions: a real world application

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Abstract

In this paper a reliable and robust model for the humanitarian relief supply chain has been presented to deal with the risk of facility disruptions after an earthquake. Assignment of backup suppliers for affected population centers is considered in order to improve the reliability of the model. Employment of public local centers and defining a two-level structure for rescue centers was considered to raise the accessibility to population centers. A four-step methodology was suggested to define the input parameters of the model which were affected by the uncertainty associated with the magnitude of an earthquake. To investigate this uncertainty, the potential epicenters of probable earthquakes and their magnitudes were assumed as uncertain parameters and estimated with a set of scenarios. A scenario-based robust optimization approach was used to sweep over the uncertain parameters. In the proposed methodology, a practical three-factor function was described to determine the impact of an earthquake on rescue centers and demand points. A solution method was proposed based on Lagrangian relaxation method, whose computational efficiency was also examined. A case study in Tehran was used to show the performance of the model in addition to determine whether the proposed methodology was efficient and practical. The computational results revealed the efficiency of the proposed model and sensitivity analyses indicated that the proposed model could be useful in conditions where budget constraints exist.

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