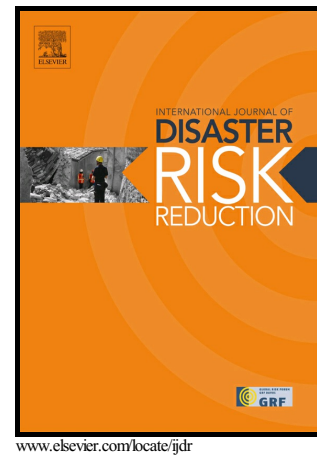


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Coordination of relief items procurement in humanitarian logistic based on quantity flexibility contract

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Abstract

Nowadays, coordination of relief items procurement in humanitarian logistics has become one of the main challenges of disaster management. In this paper, we utilize a quantity flexibility contract (QFC) to coordinate ordering activities in a three-echelon relief chain. This multi-echelon supply chain consists of a relief organization (i.e., NGO), one relief item supplier, and affected areas. In the proposed QFC, initially, the relief organization places an order before the disaster strikes and is committed to purchasing the initial quantity no less than a previously agreed amount. On the other hand, the supplier is committed to providing up to a certain amount above the initial order, if needed. Expected profit functions of relief chain members include transportation cost, inventory cost, the manufacturing cost of relief items, shortage cost, salvage value, and satisfaction level of affected areas. Our findings show that, under demand uncertainty, the proposed QFC not only prevents significant losses at relief organization but also enhances satisfaction level of the affected areas. Finally, the performance of the proposed coordination model is examined via various numerical experiments and managerial insights are extracted.

Keywords: Disaster relief chain, Coordination, Quantity flexibility contract, Relief items procurement

1. Introduction

When a disaster occurs in a certain part of the world, many organizations come forward to provide necessary relief items (e.g. medical kits, blanket, food, water, shelter, etc.) to the affected people. In such situations, coordination between different members is crucial and it is difficult for a single organization to undertake all the necessary activities such as repairing damaged infrastructures and providing all the relief items. Humanitarian logistics is a complex network with different actors including international or local non-governmental organizations (NGOs), governments, donors, armed forces, local or regional relief organizations and private companies. Each of these actors has different and sometimes conflicting interests, obligations, capacities, budget allocation structure, and logistical skills [1]. Therefore, coordination of relief operations offered by these different members is very

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