An Efficient Post-Disaster Relief Supply Chain: Variable Fixing-Based Heuristic Approach

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Abstract:

A well-organized post-disaster relief supply chain is essential for a swift and efficient response to affected regions. In this work, we focus on supply chain network planning and scheduling during the post-disaster phase, where supply capacity is uncertain. The challenge lies in making coordinated decisions regarding post-disaster procurement, scheduling, processing and distribution, and establishing temporary emergency processing centers, all while considering direct allocation and social costs. To address this, we propose a mixed-integer linear programming (LP) model, along with an efficient approach based on LP relaxation and variable fixing schemes. We conduct computational experiments to assess the algorithm's performance, taking into account network size, demand variability, and social costs. Our comparative results with the Genetic Algorithm, a widely used method in disaster relief operations planning, demonstrates that our approach is highly effective in designing large-scale supply chains.