Design and Incentive Decisions in Humanitarian Supply Chains

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Abstract

During humanitarian relief operations, designated facilities are established by the authorities (for example, cities or local communities), to which the affected population will arrive to receive relief goods (water, food, etc.). The authorities typically instruct the affected population regarding which facility they should visit. However, at times of crises, uncertainty and lack of information, these instructions are often not followed, which may cause some facilities to be congested, while others to be under-utilized.
In this work, we investigate how the authorities should invest in incentivizing the population to follow their instructions. These decisions need to be combined with those concerning the supply chain design, i.e., which facilities to establish, and how to allocate existing resources to them. A key factor in deciding on such investments is the population behavior, and in particular its cooperation level, which may vary between communities. We model this behavior and incorporate it in a mathematical formulation, building on previous research on humanitarian supply chain design which includes a humanitarian objective function as well as equity constraints.
We develop solution methods to solve the resulting problem. Our preliminary results concerning the level of investments that are needed to provide an efficient supply chain design indicate that a small investment in some communities is typically sufficient to significantly improve the overall system performance.

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