Policy Analysis of Material Convergence Challenges During Disasters

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Material convergence, also known as the overwhelming quantity of unsolicited in-kind donations arriving at a disaster site, poses significant challenges for disaster response operations. The inflow of material has both positive effects – such as making much-needed material available – and negative ones – such as jamming the supply chain and duplicating resources. Especially detrimental, though, is the fact that much of the material is not useful for the beneficiaries: it could be culturally inappropriate; in the case of food, it can be past the expiration date; in the case of clothes, they may be dirty; or the material does not lessen urgent needs. Yet, human resources are allocated to handle this material even though it is never distributed to beneficiaries. There are two reasons for this: incoming material is not always properly identified, so the boxes or containers have to be inspected before any conclusion of material usability can be made; and non-priority material occupies space, which has to be cleared so that high-priority material can be processed and distributed.

While other studies have investigated supply chains overwhelmed by unsolicited donations, ours is the first to map the feedback processes influencing its overall dynamics and to offer a comprehensive analysis on how different policies affect the system. We focus on the response phase of a disaster and divide the material flows into non-priority and high-priority. Human resources are allocated to the different stages of the material process according to material availability and the needs assessment conducted by the disaster response team. From the base case scenario, it becomes evident that, if no active measure is taken, human resources concentrate on handling non-priority material which results in delaying the distribution of high-priority material.

We propose ten policies, categorized according to the characteristics of the material flows, to minimize the negative effects of material convergence. Nine of these policies are drawn from the literature and at least five of them have been implemented independently in several disasters. The first set of policies deals with the quantity of material entering the system: these include policies that impose an acceptance threshold for non-priority materials, constrain storage space, increase humanitarian organizations' budget for material acquisition, and pre-position materials. The second set of policies regulate the proportion of high-priority to non-priority materials; these include policies that increase donor education, increase coordination among humanitarian organizations, and withhold non-priority materials at the warehouse. The third set of policies regulate the speed of the material flows and include policies that increase humanitarian organizations' human resources, increase the number of points of distribution, and improve capacity allocation decisions.

The effectiveness of the ten proposed policies are compared according to three performance criteria: the time required for a fraction of beneficiaries to be assisted; the number of people assisted up to a specific day; and the rate of assistance to beneficiaries per day. The different metrics show that one policy is not necessarily better than the others in every aspect. Our analyses

show that the unintended consequences of some of the policies offset their intended rationality, leading to undesirable outcomes. Overall, the policies that – directly or indirectly – changed the human resources allocation performed better, while policies that introduced more material did not show significant improvements in the disaster response. Finally, we combined policies according to five categories: resource centered, planning centered, society centered, relief centered, and global effort. All categories performed significantly better in every aspect than the base case scenario.

Our research sheds light on ways to address the challenges presented by material convergence during disasters. The implementation of policies, though, must still consider other aspects that we point out in a subjective analysis: actors required for implementation, institutional barriers, time to implement, time to achieve results, and cost of implementation.

Future research can expand on our model and findings in several ways including monetary donations, customs procedures, and transportation capacity. The problem can also be analyzed using optimization models and adding economic information to the scope of the research.

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