

Smeal research helps assess humanitarian response capacity in disasters

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Immediately following a natural disaster that outpaces a community's ability to respond, various outside organizations rush to provide life-saving commodities to meet health, water, food, shelter or other needs. That response is expedited by inventory prepositioned independently by governmental and non-governmental organizations.

Research co-authored by Jason Acimovic, assistant professor of supply chain and information systems at the Penn State Smeal College of Business, would help these disparate organizations better coordinate and locate stockpiles while at the same time saving as much as 20 percent of current costs.

The complex current [system](#) consists of dozens of government and non-governmental organizations (NGOs) that manage hundreds of distinct items in dozens of warehouses globally in order to respond to events that vary in location, type and size. Thus, there are currently no ways to measure system-wide stockpile capacity in real time, even though combined efforts across organizations determine the extent to which needs are met following a disaster.

"Our goal is to both assess this complex landscape as a whole and guide individual decisions toward system improvement. To this end, we propose new metrics based on optimization models. These metrics assess the quality of the allocation inventory among warehouses with respect to objectives that are important to stakeholders, namely, time- and cost-to-respond. While based on sophisticated models, the metrics themselves

are easy-to-interpret and can aid rather than replace expert decision making," said Acimovic, whose first experience in humanitarian logistics was in Liberia with Doctors Without Borders.

"These metrics help organizations (NGOs, donors and governments) understand how their isolated inventory decisions affect the response capacity for the system as a whole. Thus, organizations can weigh internal objectives (e.g., procurement and warehousing costs, organizational mission, etc.) with contribution to system capacity."

Using algorithms previously developed for an online retailer, Acimovic and his co-researcher, Jarrod Goentzel from the Massachusetts Institute of Technology, utilized data gathered from the United Nations Humanitarian Response Depot, the Centre for Research on the Epidemiology of Disasters, and other publicly available data.

"We show that the current allocation of inventory can be improved significantly. By repositioning inventory already deployed, the system could respond to disasters in the same expected time with a range of 7.4-percent to 20-percent lower cost for the items in our sample. Those savings would enable organizations to buy more supplies with the same donation budget," Acimovic said.

After circulating initial drafts of the research, the authors were invited to join a new formed Working Group on Emergency Supply Pre-positioning Strategies. This group is facilitated by the emergency services branch of the United Nations Office for the Coordination of Humanitarian Affairs and involves representatives from various UN groups and NGOs.

The paper, titled "Models and Metrics to Assess Humanitarian Response Capacity," was published in the *Journal of Operations Management*.

More information: Jason Acimovic et al. Models and metrics to assess humanitarian response capacity, *Journal of Operations Management* (2016). [DOI: 10.1016/j.jom.2016.05.003](https://doi.org/10.1016/j.jom.2016.05.003)

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