

## Team Designs Optimal Supply Chains for Disaster Relief

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Newswise — A major new study on the most efficient design of supply chains for products needed in disasters, major emergencies and pending epidemics has been published by a team of researchers at the Isenberg School of Management at the University of Massachusetts Amherst.

The team includes Anna Nagurney, the John F. Smith Memorial Professor of Operations Management, and Min Yu, a doctoral student in management science at the Isenberg School. Nagurney says the research was inspired by Hurricane Katrina in 2005 and the Haitian earthquake of 2010. In both cases, getting humanitarian relief supplies of water, food, medicines and needed services to the victims was a major challenge because of the absence of well planned and coordinated logistics.

These problems are uniquely challenging since the needs of the affected population should be met as closely as possible. An undersupply of food, water and medicines quickly leads to loss of life and at the same time, an oversupply of products may also carry costs, due to unnecessary waste and even, possibly, environmental damage.

To address these issues, the research team developed a computer-based mathematical model that allows for the optimal design of such supply chain networks at minimal total cost and with the satisfaction of the product demands at the demand points, as closely as possible under conditions of uncertainty. The model also enables the evaluation of trade-offs associated with in-house production versus outsourcing. The research has relevance to organizations from government-based agencies to humanitarian groups that are involved in decision-making in disasters, emergencies, and pending epidemics.

Nagurney says, "A company can, using our model, prepare and plan for an emergency such as a natural disaster in the form of a hurricane or earthquake and identify where to store a necessary product such as food packets, water and medicines, so that the items can be delivered to the demand points in a timely manner and at minimal total cost."

She notes that in the case of Wal-Mart and Hurricane Katrina, Wal-Mart had existing capacity in the form of its large distribution center and numerous stores in the southern U.S. where Katrina had its greatest physical impact. "It was able to distribute needed supplies and, in addition, achieved an enormous amount of goodwill," she says.

The paper, "Supply Chain Network Design for Critical Needs with Outsourcing," was co-authored by Patrick Qiang of Pennsylvania State University Malvern. Qiang earned his doctorate from the Isenberg School in 2009. It is available online from the publisher, John Wiley & Sons, in the journal *Papers in Regional Science*.

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