

TALKING POINTS

Nagurney leads study of disaster supply chain logistics

A major study on the optimal design of supply chains for products needed in disasters, major emergencies and pending epidemics has been published by a team of researchers including Anna Nagurney, the John F. Smith Memorial Professor of Operations Management, and Min Yu, a Ph.D. student in Management Science.



Their research was inspired by such disasters as Hurricane Katrina in 2005 and the Haitian earthquake of 2010. Getting the humanitarian relief supplies of water, food, medicines and associated services to the victims had been a major challenge with the absence of well planned and coordinated logistics. There was no central and coordinated control of the distribution of relief supplies for weeks following these disasters. According to the researchers, it is clear that a better-designed supply chain would have facilitated relief efforts and resulted in less suffering and lives lost.

Their paper, "Supply Chain Network Design for Critical Needs with Outsourcing," co-authored by Patrick Qiang of Pennsylvania State University Malvern, who received his Ph.D. from the Isenberg School of Management in 2009, has been made available online by the publisher, John Wiley & Sons, in the journal *Papers in Regional Science* and will be published this year.

With the number of disasters growing over the past decade as well as the number of people affected by disasters, the design of supply chain networks for critical needs products, such as water, food, vaccines, and medicines, is of paramount importance, say the researchers. Such problems are uniquely challenging since the needs of the affected population should be met as closely as possible with the undersupply of food, water and medicines leading to loss of life. At the same time, the oversupply of products may also carry costs, due to unnecessary waste and even, possibly, environmental damage.

In the paper, the researchers 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 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 ones to humanitarian ones that are involved in decision-making in disasters, emergencies, and pending epidemics.

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More Information

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