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Quantifying Communication Effects in Disaster Response Logistics: A Multiple Network System Dynamics Model.

Complementing the importance of adequate relief supplies and transportation capacity in the first two weeks of post-disaster logistics, efficient communication, information sharing and informed decision-making play a crucial yet often underestimated role in reducing wasted material resources and loss of human life. We propose a discrete dynamical systems model to model the transportation of different commodities from multiple relief suppliers to disaster sites across a network of limited capacity. The physical network is overlaid with the communication network to model information delays and communication breakdowns between agents. The cost in human lives and the monetary cost are measured separately. Simulation results highlight quantitatively how communication deficiencies and indiscriminate shipping of resources result in material convergence and shortage of urgent supplies observed in actual emergencies. The model provides an example of a simple, objective, quantitative tool for decision-making and training volunteer managers in the importance of a smart response protocol. (Received September 19, 2016)