

## **Matching System of Disaster Relief Supplies and Users' Incentives**

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### **Abstract**

After a large scale disaster happens, a massive amount of and enormous relief goods are transported all at once in a short period of time. This causes confusions in the affected area and imposes a huge burden on staff members handling the situation. Such phenomenon is named as “material convergence problem” by Holguin-Veras et al. (2014). The major causes of material convergence are the lack of an information sharing mechanism among various agents involved in humanitarian logistics and the lack of an effective matching mechanism between the survivors' needs and the supplies provided by various supporters.

To solve the problem, Fukumoto et al. (2018) proposed a matching system of relief supplies and formulated matching methods as mathematical programming problems. The system is intended to operate via an Internet site where civic organizations serving disaster victims, supporters, and inventory managers can each input needs, available supplies, and the level of inventory at the collection facility, respectively. Based on this type of data, the matching system outputs allocation plans, transshipment plans, and storage plans.

If all the agents involved in the humanitarian logistics use the matching system, in principle, the material convergence problem never occurs. However, if all the agents had accessed to the system, it risks management cost of the system increase to an unacceptable level. In reality, after disaster happens, many supporters transport relief supplies to the affected area at their cost. It is natural to impose a small cost of managing the system to users (especially, supporters). Therefore, at first, we propose a cost allocation rule that is combined with the allocation mechanism used in the matching system. If users were required to pay some cost for using the system, some of them may lose incentives to use it. Therefore, secondly, we investigate potential users' incentives for using the system. We formulate a game theoretic model, and through an equilibrium analysis, show some conditions necessary for the system to be used even if users were required to burden management cost of the system.

### **References**

J. Holguin-Veras, M. Jaller, L. N. Van Wassenhove, N. Perez, and T. Wachtendorf, “Material convergence: Important and understudied disaster phenomenon”, *Natural Hazards Review*, Vol.15, 1-12, 2012.

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