Creating a Framework for a Humanitarian Response Capacity Index

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Summary: Analysis of inventory stock levels, supplier contracts, and supplier manufacturing capacity can provide insight to humanitarian organizations on their capacity and ability to respond to disastrous events. To organizations this information can aid in determining adequate inventory levels and negotiation of supplier contracted transportation times in order to maximize response capacity. The insights could also be used to create a framework for an index of response capacity.

KEY INSIGHTS

1. Incorporating supplier capacity into a response capacity framework gives a view of the capacity of the entire supply chain of humanitarian organizations supply chain to respond to disasters.

2. Faster supplier contracted lead times can allow for lower inventory levels in humanitarian organizations.

3. Evaluating supplier manufacturing capacity for multiple organizations can indicate multi-jurisdictional reliance on one supplier.

Introduction

Humanitarian response is conducted by various organizations: not-for-profit organizations, governmental agencies, and private companies. These agencies receive funding from donors to purchase and mobilize relief items to victims of disastrous events in various countries or regions. They then conduct a rapid needs assessment immediately after a disaster and request much-needed livelihoods items from their organization. These items typically include water and sanitation items, food items, sheltering items, health and hygiene items, and other non-food items.

Humanitarian logistics describes the specific aspect of humanitarian response that coordinates the shipment and delivery of relief goods to the organizations and people that need the goods. Logistics plays a crucial part of humanitarian response efforts, and without efficient logistics processes, lives can be lost waiting on much-needed supplies. Humanitarian logistics is primarily responsible for procuring items from the supplier, whether that is a product manufacturer or distributor, to the warehouse, and from the warehouse to the distribution point in the event response region. Depending on the location of the warehouse, also known as a distribution center (DC), and on the location of the event response, items may travel by airplane, by truck, by rail, by ocean, or by animal.
Challenges in Humanitarian Logistics

Logistics in humanitarian response is different than logistics in the normal business environment. In a normal business environment, companies can somewhat predict the time and amount of product their customers will want. In a humanitarian response, there is little or no warning of when an event will occur and, when the event occurs, how many people will be in need of relief efforts. This makes holding the right amount of inventory, especially items with expiration dates, very tricky. If there is too much inventory, donors feel they are wasting funds on storage; yet if there is too little inventory, organizations receive criticism for not being prepared for a disaster.

In addition to very uncertain demand, humanitarian supply chains must operate in a different transportation context. Most companies have relatively stable shipment times and mostly secure, stable transportation infrastructure. Humanitarian logistics, however, typically requires short lead times, in order to get supplies to the disaster-affected regions quickly, and works in settings with insecurity and unstable infrastructure. Roads and airports may be in poor condition depending on the level of investment of the government and may be affected by the disaster event.

Since humanitarian response efforts happen quickly after a disaster is identified, most humanitarian logistics efforts center on getting the right items to the people in need as fast as possible. Thus far there has not been a general, easy measurement for all organizations to measure their capacity to respond to disasters. The lack of consistent measuring methodology has left organizations to guess at their capacity to respond to a disaster and their efficiency in responding to a disaster. In this research, capacity is meant as the ability and quantity of organizations to respond to a disaster event with goods.

Methodology and Results

In order to measure capacity, we needed inventory stock levels and supplier information from different organizations. We gathered inventory stock information from the United Nations Humanitarian Response Depots (UN HRD) and inventory information and supplier contracts from the New York City Office of Emergency Management (NYC OEM). We attempted to collect manufacturing and distribution capacity information from select suppliers, but were unable to do so within the timeframe of the project. We used the collected inventory stock levels and supplier transportation contracts to build four disaster deterministic simulations for the organizations: a hurricane in the Caribbean (UNHRD), a drought in Northern Africa (UN HRD), a flood in Southeast Asia (UN HRD), and a hurricane in New York City (NYC OEM).

1. Scenario Assumptions - We used data from the EM-DAT database on the average number of people affected by different disasters in different regions of the globe and on the average number of disaster occurrences in those regions.

2. Average Need – We used appeals to donors made by the International Federation of the Red Cross (IFRC) for disaster relief items in order to determine the items required per person or family during the response phase of a disaster.

3. Comparison to Inventory – We compared the average need of each item to the inventory of the organization to determine the level of ability of the organization to meet the need.

4. Replenishment Integration – We added in replenishment of items to an assumed base stock level over a replenishment lead time. For the UN HRD this lead time is assumed, but for the NYC OEM this lead time is based on supplier contracts.

5. Response Capacity and People Served – The combination of current inventory and replenishment lead times gave a response capacity, from which we calculated the percentage of people served.

The response capacity shows the ability of the organization to respond to a disaster or another disaster if the organization is currently responding to a disaster. As you can see in Figure 1, which is an example of the response capacity for an item, after a disaster the response capacity decreases immediately and increases over the replenishment lead time.
In addition to determining the response capacity for each item for each disaster, we found the percentage of people served for each item for each disaster. As Figure 2 shows, some items can fulfill the entire need for the simulated flood in Southeast Asia, while most items can fulfill less than half of the need for the flood. The UN HRD can use this to reevaluate the inventory base stocking levels and policies for the items with a low percentage of the population served.

Further research will include integrating supplier manufacturing and distribution capacity as well as incorporating transportation cost into the index. Supplier capacity information will provide a broad view of supply availability, identify key supplier-organization relationships, and show any multi-organizational reliance on one supplier or region. Adding in a cost aspect will help organizations further realize and evaluate the cost of transportation decisions involving mode of transportation or destination.

After a supplier capacity and a transportation cost are added to the analysis, more organizations can be analyzed, and an aggregate of the organizations can be made into a sector-wide index to measure response capacity.

As focus on humanitarian logistics increases, an index created with this research will become more useful in aiding decisions about inventory stockpiling and response methods. Using an index to compare response strategies of organizations can lead to better response decisions and, ultimately, more lives saved through faster delivery of essential goods.