



# KNOWLEDGE NOTE 3-3

**CLUSTER 3: Emergency Response**

## Logistics Chain Management for Emergency Supplies





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**In response to the Great East Japan Earthquake (GEJE) disaster, relief goods were distributed and delivered through prefectural- and municipal-level depots. This delivery system faced several problems including fuel shortages, interruption of telecommunication services, and supply and demand mismatches, resulting in stockpiling of the goods in depots and delayed delivery to the people in need. Several measures can be taken to address these issues, including prior surveys of depot facilities, estimating in advance the quantities of emergency goods that will be required, enlisting the support of professional logistics specialists, and promoting logistics information management in unaffected areas, among others.**

## FINDINGS

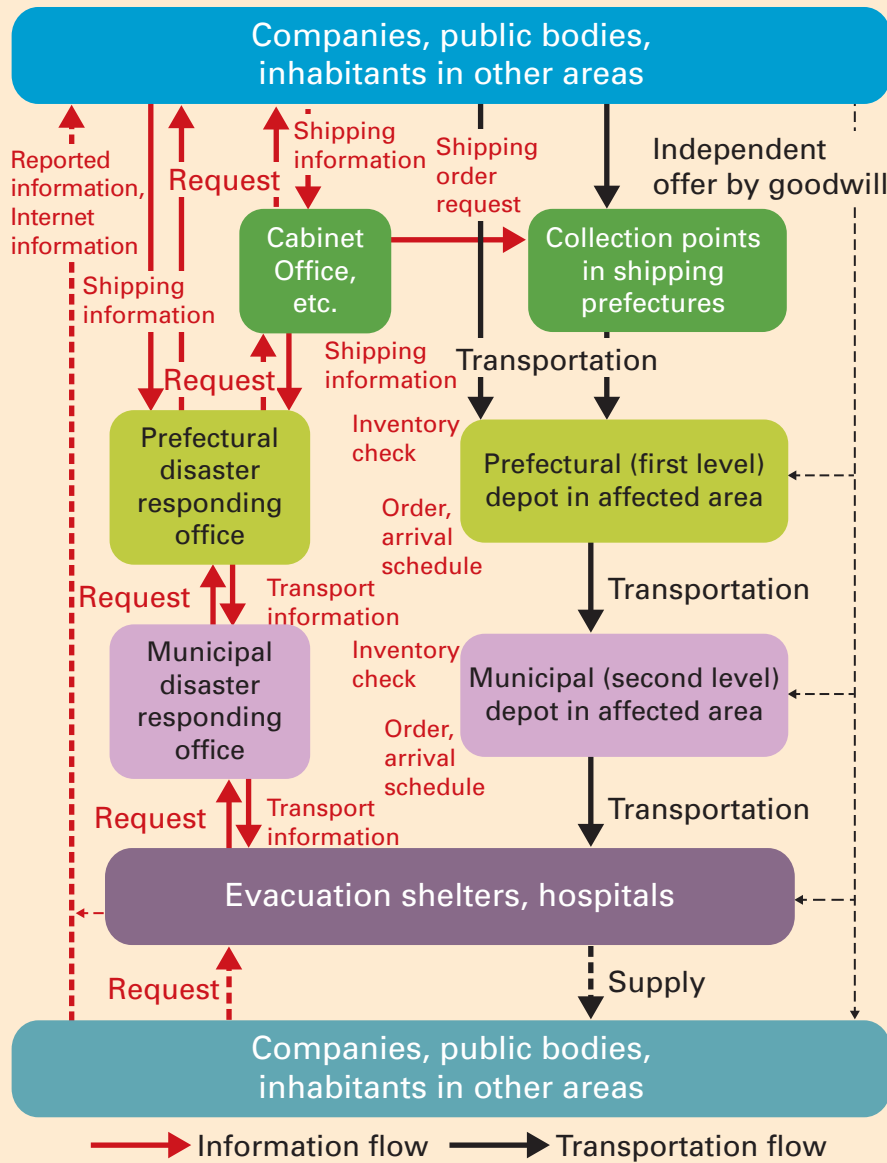
The damage from the earthquake and tsunami was enormous; over 120,000 houses were totally damaged, and more than 470,000 people had to leave their home and evacuate to over 2,400 shelters.

Delivery of relief goods was planned to be executed through depots at two levels—prefectural and municipal. Especially in the first two weeks, fuel shortages made downstream deliveries from prefectural depots very difficult. Also, manpower shortages and the inconvenient building specifications of depots were the main causes of unnecessary stockpiling in depots. Telecommunications disruptions furthered mismatches between real needs and supplies. But the professional support of logistics specialists was effective in relieving the bottlenecks in depots.

## THE RELIEF GOODS DELIVERY SYSTEM IN JAPAN

In Japan delivery of relief goods is the responsibility of the prefectural governor, who responds to requests from the municipalities. According to the postdisaster plan, delivery of relief goods was to be executed using depots at two levels: prefectural and municipal, as shown in figure 1. As illustrated in green in the figure, the national government

FIGURE 1: Information and transportation flows in the official relief goods delivery system



**FIGURE 2: Badly organized inventory in an initially assigned depot (Iwaki Civic Hall, March 23, 2012)**



(cabinet office) was also included in the plan to facilitate nationwide distribution. By April 20, the national goods distribution component had mobilized 26 million meals, 8 million bottles of beverages, and 410,000 blankets using 1,900 trucks, 150 aircraft, 5 helicopters, and 8 ships.

Delivering several kinds of goods, such as food, drinking water, clothing, and bedding, either to people's homes or to more than 2,000 shelters, was a challenge, especially in the first several weeks when fuel was in short supply. This was especially true for the smaller local transport companies that did not have their own storage facilities. By the end of June, 1,800, 1,400, and 2,400 trucks were dedicated to transporting goods from prefectural depots to municipal depots in Iwate, Miyagi, and Fukushima, respectively. Fuel shortages combined with power outages and telecommunications failures hampered local government efforts to meet emergency needs.

Although many believe that transportation problems were the critical factor, several other forces were at play. The workload spiked at the same time that many staff were being lost to the disaster. Moreover, while the disaster countermeasure manuals state that the economic or industrial support branch of the local government is responsible for the delivery

system, workers in that section did not have enough knowledge or experience with logistics and supply chain management. They simply stored the goods in public buildings, with no logistics management plan, so the space was quickly filled (as shown in figure 2).

The building specifications and design of the depots was also a contributing factor. The depots require large storage and handling capacity as well as easy access to expressways, especially prefectural depots. Privately owned warehouses would have been ideal if they had not been damaged. The space under viewing stands in athletic fields, race courses, and indoor gymnasiums also served well as depots (figure 3). In Miyagi Prefecture, large warehouses located near Sendai Port were severely damaged by the tsunami.

Neither Yume Messe Miyagi, the convention complex at Sendai Port, nor the Miyagi Prefectural Sports Park could be used as depots since they had already been designated as mortuaries.

## **TELECOMMUNICATIONS DISRUPTIONS AND INFORMATION BOTTLENECKS**

The disaster disrupted business operations such as information aggregation; meanwhile, the failure of some communications systems hampered the evacuation of people to safe areas. Very little of the real-time information that was needed to ensure timely and accurate procurement of goods was available: including the location of the shelters, the correct addresses of the recipients of goods, or information about the type and amount of assistance that communities needed. Information about whether relief goods had actually been received could not be easily communicated among depots for several weeks after the earthquake.

### **BOX 1: The negative effect of goods sent with goodwill**

The demand for different kinds of emergency supplies continued to change over time. There were many instances where in a certain area emergency goods were in high demand one day, and no longer needed after a few days.

Relief goods resulting from a spontaneous outpouring of goodwill but sent without making any prior arrangements with the recipient municipal bodies and without clearly marked declarations of contents did not meet people's needs and further burdened an already strained distribution network with dead stock and inventory.

Unpacking and sorting the emergency supplies sent by goodwill alone was an enormous amount of work. As these kinds of donations mounted, they clogged and undermined the efficiency of the distribution depots.

Many such goods arrived in Onagawa City, in Miyagi Prefecture. Used clothing was sent to the temporary shelters; however, 80 percent of the clothes, or 200 cartons, were returned to the gymnasium of the junior high school, which was the distribution center. About 7.7 tonnes of donated goods had to be recycled.

**FIGURE 3: Badly organized inventory in an initially assigned depot (Iwaki Civic Hall, March 23, 2012)**



## LESSONS

- Suitably designed depots with cargo-handling equipment such as forklifts are needed, along with the support of logistics professionals.
- Information on arrival times at each depot is crucial for planning storage and location management.
- Prior quantitative estimates of urgently needed goods should be carried out based on regional demographic statistics. This helps arrange “push delivery”, supply-driven deliveries, in the first few days after the disaster.
- Emergency delivery systems should be closed down as soon as feasible to allow normal commercial distribution systems to take over. They are capable of serving a variety of consumers, and are more flexible and demand driven.
- At the intermediate stage, logistics management is best delegated to designated municipal authorities in unaffected areas.

## THE NEED FOR SPECIALIZED SUPPORT

As stated earlier, local government officials without sufficient knowledge, training, or experience in logistics management performed the specialized functions of receiving, sorting,

and dispatching emergency supplies at distribution depots. This resulted in confusion and massive congestion of the delivery networks.

In large-scale disasters, local government staff are called upon to discharge a variety of functions related to emergency management. The government should enlist business logistics professionals and draw on the capacity of the private sector as much as possible, to ensure properly integrated management of the distribution depots. Many local public bodies hesitated to hire private companies for relief goods distribution and management because they were not sure that they would be able to pay them under the Disaster Assistance Law. In future, a case can be made for putting in place agreements and contracts with the private sector for specialized logistics management services.

### **GETTING INFORMATION FROM UPSTREAM**

For distribution depots to operate smoothly, local decision makers need to have real-time information about the kinds of goods being transported and the timing of shipments. This information enables them to arrange for the personnel and space needed to accommodate consignments. In normal times, this information can be obtained from, for example, point of sales (POS) systems.

In the aftermath of the disaster, this kind of information about the emergency goods ordered by the national government was not available to prefectures and municipalities in time. In addition, relief goods often arrived unexpectedly from various private companies, nonprofit organizations, and individuals with no prior information, which seriously reduced the processing capacity of distribution depots.

### **PREPARING A “PUSH” LOGISTICS PLAN**

Since it is impossible immediately after disaster to collect information about affected populations and the extent of damages and loss, it is helpful to design simulations of different scenarios to generate data on the expected number of victims, including data on vulnerable groups such as the elderly, disabled, women, children, and so on. Based on these simulations, contingent emergency stocks of basic goods—packages of water, food, household goods (such as tableware, kitchen wrap, tissues, towels, toothbrushes, masks, and blankets) and emergency medicines for the first three days following the disaster should be stored locally, typically at community-level schools and centers.

Since the initial disaster response is invariably carried out rapidly without geographical or population information from the affected areas, data need to be gathered or forecast in advance and stored in databases to implement “push delivery” of first-response aid.

### **SWITCHING BACK TO COMMERCIAL SYSTEMS**

National and local governments should use supply chain and logistics management as they respond to victims’ changing needs. As many victims move from shelters into temporary housing, and as normal distributors such as shops, supermarkets, and convenience stores



gradually recover, national and local governments should facilitate the return to normal commercial supply.

More specifically, the early restoration of commercial demand and supply chains, the rapid restoration of market dynamics, and the speedy distribution of donations to increase local purchasing power and liquidity should be a priority for municipal and local authorities. Job creation and conditional or unconditional cash transfers are highly effective short-term post-disaster measures, and are often more important than continuing the supply and distribution of relief goods by public agencies.

The speed and manner of the transition from public to private supply logistics should be determined by how dependent the affected population is on relief supplies, and on the robustness and speed with which the private sector networks can restore commercial operations. In the case of the GEJE, delivery of relief goods lasted for 40 to 50 days after the disaster. Commercial businesses reappeared in about a month.

## **RECOMMENDATIONS FOR DEVELOPING COUNTRIES**

- Public facilities, such as gymnasias and community halls, can be used as logistics depots as they are well designed with strong-enough floors, wide-enough entrances and exits, and good accessibility for cargo handling.
- Prior agreements can be put in place between the government and logistics companies specifying the terms and conditions and payment methods for hiring logistics professionals, machinery, and depot facilities.
- There should be prior identification and training of local government staff who will be tasked with responding to large-scale disasters.
- There should be prior formulation of a list of goods and a standard format for shipments and orders for smooth and seamless activation of the disaster response.

### **PLANNING PUBLIC FACILITIES**

Building specifications for new public facilities, such as gymnasias and meeting halls, should take into account their possible use as relief goods distribution depots. Floor strength, entry and exit widths, accessibility for cargo handling, as well as their geographical locations should be assessed. If private sector warehouses already exist in the region, agreements for diverting their use in case of disaster, as well as for the provision of labor and for allocating costs, should be signed in advance.

### **BUILDING A RESILIENT INFORMATION SYSTEM**

Information on the needs of affected populations must guide procurement agents in purchasing the right goods and quantities to be delivered to distribution depots. In the wake of a disaster, communication must be maintained between municipal offices, prefectural

offices, and the national government. Communication networks can be made more resilient by using satellite communication systems and on-site power generation equipment. Communication networks also need to support two-way connectivity between distribution depots and those facilities that can be used as evacuation shelters.

With respect to reliable road transportation, road status information gathered by probe cars linked to a global positioning system (GPS) is very helpful in determining delivery routes. To provide real-time information for emergency administrative and service-truck drivers, a system should be designed to integrate road status information from probe vehicles, road opening status from each road management authority, and traffic regulations from the police.

### **MULTIPLE EXECUTION SYSTEMS AND PAIRED ADMINISTRATIONS**

In the aftermath of the GEJE, the national government formed a special team to take charge of the logistics of relief supplies. Ideally, every disaster response unit—at the national, prefectural, and municipal levels—should do the same.

Since the affected regions cannot be expected to provide sufficient information after large-scale disasters, municipalities outside the disaster area should initiate the information management functions for relief logistics. When municipalities are matched up in predetermined pairs based on their disaster profiles and spatial distribution, there are more chances of success.

### **THE NEED FOR INFORMATION SHARING AND COORDINATION**

Information about goods, such as the volume, size, and weight of unit packages; number of individual items packed in a unit package; and the need for temperature control is indispensable for logistics managers to calculate the type and number of trucks required and to determine where and how to store the cargo in the distribution depots. Thus, it is important to create a mechanism for responsible parties to properly collect and share this essential information.

There is an equal case to be made for adopting universal definitions of various items and ensuring accurate and smooth information exchange about logistics by determining corresponding units among national and local government agencies, logistics operators, providers of goods, and so forth. As the first step, standard order forms, transportation request forms, and cargo transportation certifications should be prepared and adopted across the board.

In each region, the division of roles, cost-sharing arrangements among the related organizations, as well as appropriate workflow should be discussed in an interdepartmental council. In addition, training in logistics management should be conducted regularly to make sure that the workflow is smoothly implemented in the wake of disaster.

## KEY REFERENCES

Caunhyea, A. M., X. Niea, and S. Pokharelb. 2012. "Optimization Models in Emergency Logistics: A Literature Review." *Socio-Economic Planning Sciences* 46 (1): 4-13.