

How Humanitarian Logistics Information Systems Can Improve Humanitarian Supply Chains: A View from the Field

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ABSTRACT

Humanitarian logistics represents a broad range of activities taking place within humanitarian organizations, the bulk of these activities are also components of a broader humanitarian supply chain - the network involved with providing physical aid to beneficiaries. Humanitarian logistics information systems improve information flows, which integrates logistics units more efficiently with non-logistics units within the humanitarian supply chains and provides better feedback to donors, ensuring more effective operations. Humanitarian logistics activities occur across the disaster management cycle. Humanitarian logistics information systems not only improve logistics activities in each phase, but can improve the continuity of humanitarian operations by sharing information throughout the transition of different disaster management cycle phases. Through collaboration between organizations, humanitarian logistics information systems also have the potential to reduce corruption and the market distortion which can occur during humanitarian operations.

Keywords

Humanitarian Operations, Logistics, Supply Chain Management, Information Systems, Disasters, Disaster Management

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Michael Howden completed a Bachelor of Computer Systems Engineering from the University of Auckland and originally worked as a software engineer in New Zealand. He has worked for International Rescue Committee in Indonesia, Pakistan and Uganda developing and implementing their global logistics database ProLogs and for Save the Children US in Indonesia, developing logistics software and systems which were components of a broader supply chain management system.

INTRODUCTION

Within humanitarian operations logistics is required to procure, store and distribute supplies for the assistance of beneficiaries. In order to function effectively humanitarian logistics must coordinate with other actors and be considered throughout the lifespan of humanitarian operations. This paper will explore how humanitarian logistics information systems can:

1. Integrate logistics units into the broader humanitarian supply chain throughout the organization.
2. Enhance logistics activities and provide continuous support across the preparedness, response, transition, recovery and mitigation phases of disaster management cycle.
3. Create new possibilities for collaboration between humanitarian organizations.

In these ways humanitarian logistics information systems can also improve the efficiency and effectiveness of humanitarian operations.

HUMANITARIAN LOGISTICS INFORMATION SYSTEMS IN THE HUMANITARIAN SUPPLY CHAIN

Humanitarian Logistics

Humanitarian organizations can include government agencies such as United States Agency for International Development (USAID) and the United Kingdom's Department for International Development (DFID), multilateral agencies such as the United Nations Children's Fund (UNICEF) and the World Food Program (WFP), non-government organizations (NGOs) such as Save the Children and Medecins Sans Frontieres (MSF) and members of the International Federation of Red Cross and Red Crescent Movement. Many humanitarian

organizations will engage in long term development activities as well as disaster management activities supporting people affected by disasters. This paper will only discuss humanitarian logistics as it is applied in disaster management.

Humanitarian organizations usually include logistic units which can have different functions depending on the organizations or even the disaster and can include:

- Procurement
- Warehousing
- Fleet Management
- Transportation (of both supplies and people)
- Asset Management
- Building Management
- Security
- Information Technology (IT)
- Radio Communications

Humanitarian operations consist of a diverse range of activities, therefore logistics in this context can have a broader scope than in the commercial sector. Areas such as security and IT may be considered under logistics due to respective military or technical experience of logisticians, either currently or historically within an organization.

Humanitarian Supply Chains

In this paper a humanitarian supply chain refers to the network created through the flow of supplies, services, finances and information between donors, beneficiaries, suppliers and different units of humanitarian organizations for the purpose of providing physical aid to beneficiaries (Mentzer et al. 2001). Humanitarian supply chains include functionalities which do not typically fall into the field of humanitarian logistics. Managing relationships with donors, performing needs assessments, planning for supplies required and monitoring and evaluating the impact of distributed supplies, are usually the responsibility of non-logistics program units. Figure 1 presents a summary of the major flows within both humanitarian supply chains and humanitarian logistics.

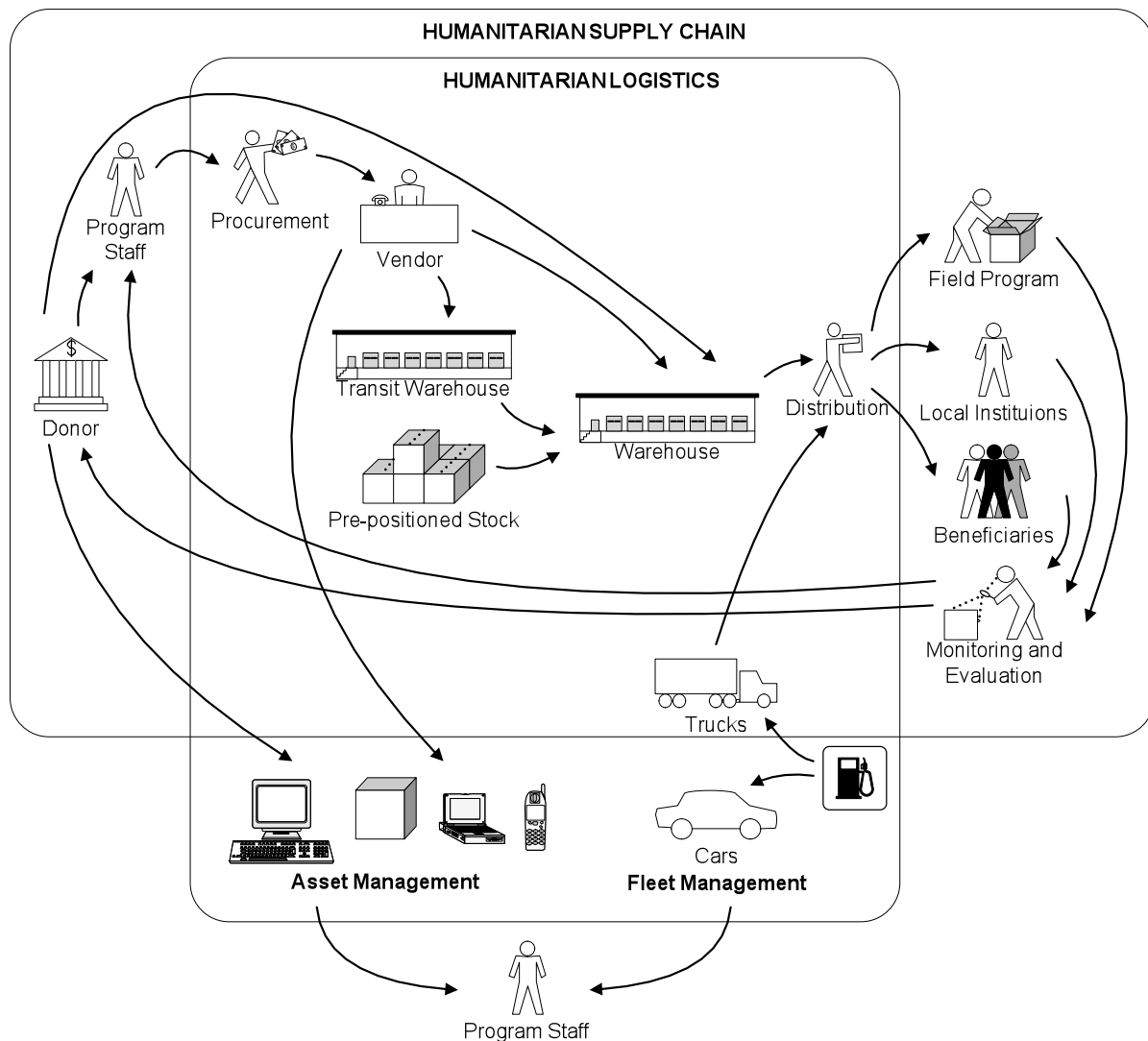


Figure 1. Humanitarian Logistics and Humanitarian Supply Chain Flows

This paper will focus on the value of information systems for logistic units of NGOs within the humanitarian supply chain.

Integrating Logistics into Supply Chain Management

With the exception of organizations which specialize in disaster response or distribution, such as Medecins Sans Frontieres (MSF) and World Food Program (WFP) respectively, the core business of humanitarian organizations tend towards health, education, protection and economic development. Logistics units are only considered as a function to support these activities of humanitarian organizations. Logistics units have traditionally been marginalized within organizations (Rickard, 2003) and logisticians have been “pigeonholed” in the field, making it hard to move into management positions (Chaikin, 2003). This has contributed to a silo mentality in regards to logistics within humanitarian organizations. Better integrating logistics with other units within the organization will form stronger humanitarian supply chains.

In order to integrate logistics into broader humanitarian supply chains, a clear distinction is required between the two. In Indonesia, one major NGO moved all logistics functionality into a supply chain management unit. In the terms logistics and supply chain management are used interchangeably (Rickard, 2006) and personal discussions with humanitarian professional have revealed the there is not a clear distinction between the terms logistics and supply change management, and some have regarded any differences are semantics. In literature on humanitarian organizations there is a shift from logistics to supply chain management (Thomas and Kopczak, 2005) Humanitarian supply chains include units implementing programs, managing grants with donors, controlling budgets and monitoring activities which must coordinate with logistics units. Humanitarian supply chains cannot be built by solely increasing the capacity or responsibility of individual units, but are formed by

the creation of stronger links between units within the supply chain. Humanitarian logistics information systems can improve the flow of information with other units, in a mutually constructive manner, improving the effectiveness of the humanitarian supply chain.

Humanitarian logistics information systems can:

- Enhance needs assessments by ensuring that field staff know what supplies are available for beneficiaries, either in local warehouses, pre-positioned emergency stocks or from local and international markets.
- Share lists of supplies available in both local and international markets, including prices and lead times, logisticians to empower program staff to better plan their procurement activities.
- Keep program staff informed of procurement activities will help to develop an understanding of the constraints within logistics and create trust.
- Provide budget holder more accurate financial information regarding funds which are committed within the procurement process, to avoid the over or under spending of budgets.
- Provide warehouse inventory reports to program staff to allow them to take more responsibility for their supplies, and ensure that they are utilized effectively.
- Share information on the distribution of supplies to allow program staff to better monitor and evaluate activities and avoid the need for duplicate record keeping between logistics and programs.
- More accurately divide logistics overhead costs such as warehouse rental, transportation and logistic staff wages into program budgets according to the activities logistics is supporting.

Information empowers program units to become more engaged consumers of logistic services. In this way information systems can integrate logistics into humanitarian supply chains and improve the effectiveness and efficiency of humanitarian operations. The improved information flow from humanitarian logistics information systems will also contribute to the overall effectiveness of the humanitarian operation.

The Value of Information in the Humanitarian Supply Chain

Information plays a significant role in humanitarian supply chains. In humanitarian supply chains is that the end recipient of aid (the beneficiary) is decoupled from the commercial transaction and has no direct influence over what supplies they receive (Gray and Oloruntob, 2006). The key decision makers within the humanitarian supply chain are the donors who are funding the operation and many NGOs regard the donor as the customer in the humanitarian supply chain (Beamon and Balci, 2006). In commercial supply chains, the end recipient decides what supplies they require, and fulfillment can be easily evaluated by monitoring the receipt of these supplies. In humanitarian operations as supplies are determined by external assessments of the needs of the beneficiary, evaluating fulfillment become more difficult, as additional analysis must be done to determine if these needs have been met by the supplies.

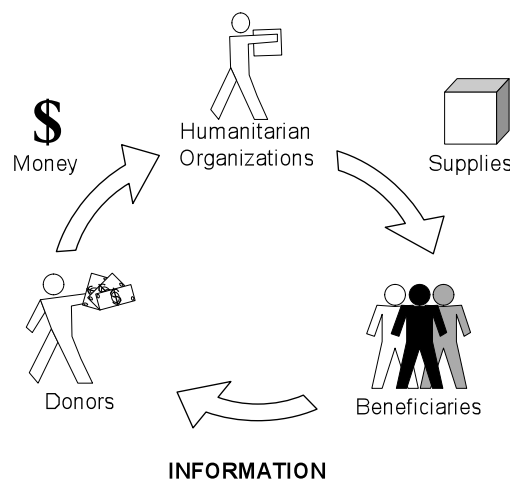


Figure 2. Donors, Humanitarian Organizations and Beneficiaries within the Humanitarian Supply Chain

Humanitarian logistics information systems can provide accurate and timely information on what supplies are required, what supplies have been delivered to beneficiaries and in which locations. With this information

evaluation units should be able to determine if those supplies have met the needs of the beneficiary. This feedback ensures that donors and humanitarian organizations are engaged and responsive to the beneficiaries, and supporting aid according to the beneficiaries needs.

HUMANITARIAN LOGISTICS IN THE DISASTER MANAGEMENT CYCLE

Response, Transition, Recovery, Mitigation and Preparedness

The operations of humanitarian organizations in disaster management can be separated into four major phases: response, recovery, mitigation and preparedness (Haddow and Bullock, 2004). During humanitarian operations there will be overlap between activities from different phases, and a separate transition phase can be considered between the response and recovery phase (Asian Development Bank, 2004). Humanitarian supply chains must provide supplies to beneficiaries in each of these phases (Kovács and Spens, 2007) and these activities require logistic support (Perry, 2007), although the volume, variety of supplies and urgency will change according to the phase. Humanitarian logistics information systems improve the effectiveness of logistics units throughout the disaster management cycle and can provide continuity throughout the phases.

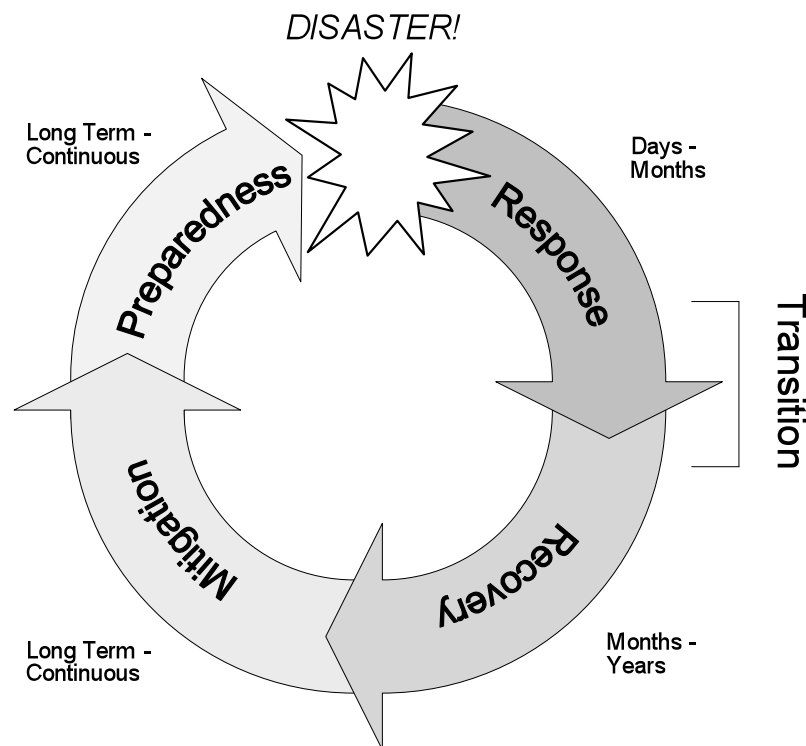


Figure 3. Disaster Management Cycle (Haddow and Bullock, 2004).

Preparedness

The preparedness phase involves building the capacity to respond to a disaster, such as working with communities to ensure they know evacuation options, pre-positioning emergency response supplies and building organizational capacity to respond to disasters. These activities are ongoing and are implemented prior to the onset of a crisis.

Pre-positioned emergency response supplies tend to be less varied, as they are specific life supporting items, such as food, medical supplies, water and sanitation equipment, shelter, household kits, etc. The necessities of life are less dependent on the social, cultural or economic context of the disaster, therefore it is easier to standardize the supplies required. Also, because it is not known if these supplies will be available in local markets, or if markets may be disrupted by the disasters, they will need to be procured internationally. Both Medecins Sans Frontieres and the Red Cross have standard catalogues of items for emergency response. These items can be procured internationally, with pre-existing arrangements with vendors, and are also pre-positioned in warehouses globally, ready to be deployed. (Chomilier, Samii van Wassenhove, 2003; Coyne, 2006).

Organizationally NGOs need to ensure that they not only have staff trained to respond to emergencies, but that they have the systems and process in place to support these staff. 80% of the disaster response phase consists of

logistics activities (Kovács and Spens, 2007) therefore in the preparedness phase organizations should focus on building the capacity of logistics units.

Response

The response phase occurs immediately after the disaster, and activities are focused primarily on saving lives and preventing further damage. Humanitarian operations are most reliant on logistics during the response phase as they distribute food, medical supplies and other necessities of life to affected populations, and lives will be dependent on the speed of logistics activities. The response phase may last from days to months, depending on the scale of the disaster. While the humanitarian logistics is most significant during the response phase, it is important to consider its role throughout the entire disaster management phase.

Transition

During the transition phase NGOs begin to look at providing ongoing assistance, such as temporary shelter and revitalizing basic social services (ref ADB). NGOs will also plan strategically to transition from implementing response activities to longer term recovery and mitigation programs. Logistics activities, such as identifying suppliers to in either local or international markets to provide supplies for longer term programs, ensure a smooth transition.

Recovery

The recovery phase involves aiding communities to return to their conditions prior to the disaster. These activities may include training people and distributing supplies for livelihood building, reconstructing houses, buildings and infrastructure and may be carried out over a period of months to years.

Across both the recovery and following mitigation phases the supplies are no longer essential for the lives of affected population and are therefore no longer required at such a high rate or with such short lead times. The activities across these phases are largely dependent on the social, cultural, economic and geographical conditions of the affected communities. These may vary hugely between different disasters. Humanitarian organizations supported fishermen affected by 2004 Indian Ocean Tsunami by distributing new boats and fishing equipment whereas the needs of landlocked communities recovering from 2005 Kashmir Earthquake were quite different. Humanitarian organizations will also attempt to procure supplies locally in order to support local communities and avoid flooding local markets through the influx of external supplies.

The recovery phase represents a significant proportion of the duration and funding of a humanitarian operation and may last from 5-10 years (ADB reference). In April 2005 the Government of Indonesia established a 5 year time frame for reconstruction after the Indian Ocean Tsunami, and activities are still ongoing at the start of 2009, indicating the long duration of the recovery phase. Recovery phase activities such as reconstruction and distributing supplies are essential for restoring the lives of affected people and require significant logistic support.

Mitigation

Mitigation involves increasing the resilience of communities to natural hazards to reduce the impact of disasters they cause. According to the specific vulnerability of the community these activities may include planting mangroves to protect coastlines against cyclones, constructing dams and reinforcing buildings. Humanitarian organizations implementing these activities will require logistics support, although not typically at as large a scale as in the other phases.

Summary

<i>Phase</i>	<i>Preparedness</i>	<i>Response</i>	<i>Transition</i>	<i>Recovery</i>	<i>Mitigation</i>
Period	Long Term - Continuous	Days – Months	Months – Years	Long Term - Continuous	Long Term - Continuous
Logistics Volume	Low	High	Medium	Low	Low
Supplies Required	Specific standard supplies pre-positioned for disaster response	Specific standard supplies: Food, medical supplies, water and sanitation equipment, shelter, household kits, etc.	Varied supplies depending on the context of the disaster: reconstruction material, livelihoods equipment	Varied supplies	Varied supplies
Urgency	Low	High: Lead times for supplies can make the difference between life and death.	Medium: There may be government and donor pressure to complete recovery activities	Low	Low
Procurement of Supplies	Local	International	Local-International	Local	Local

Table 1. Humanitarian Logistics Throughout the Disaster Management Cycle

Humanitarian organizations are required to provide physical aid to beneficiary throughout the disaster management cycle. Although these activities differ in volume, variety of supplies and urgency, there is enough commonality that standard processes and systems can be used by logistics units throughout the disaster management cycle. This avoids the overhead of developing multiple standards and implementing new systems when transitioning between phases. It is therefore important to consider humanitarian logistics as operating in each of the phases of the disaster management cycle.

Humanitarian Logistics beyond the Response Phase

A large amount of literature on humanitarian logistics and supply chain management focuses on the response phase of a disaster and pre-positioning of supplies done in the preparedness phase (Beamon, 2004; Beamon and Balcik, 2008; Maspero and Ittman, 2008; Oloruntoba, 2007; Rodman, 2004; Thomas, 2003; Thomas et al, 2005). This could be influenced by a number of factors:

- This is the phase in which logistics plays the largest role in proportion to the humanitarian operation.
- The key focus of the response phase is the preservation of lives therefore improved logistics can be directly linked to lives saved. During other phases of disaster management, the outputs become more varied, such as providing trainings to teachers and medical professionals. Therefore impacts, such as better education levels and healthcare in communities harder to measure.
- The disaster response is the phase that creates the most media coverage, therefore may be the phase which experts outside of the humanitarian domain get the most exposure to and are most familiar with. Media coverage could also create a perception of more status with disaster response.

This paper has shown that the field of humanitarian logistics is more broadly focused than just disaster response. More focus needs to be placed on the role of humanitarian logistics in the transition, recovery and mitigation phases of disaster management. It could be argued that humanitarian organizations already have a higher capacity for disaster response than for disaster recovery. In Indonesia the Reconstruction and Rehabilitation Agency (BRR) claimed that in the response to the 2004 Indian Ocean Tsunami: “No one died of starvation, there were no deaths due to a lack of medical care or disease, law and order was maintained and major infrastructure—including telecommunications and electricity—was restored within a few weeks time.” In contrast during the recovery phase there have been delays, underperformance and corruption.

Humanitarian logistics information systems can improve logistics activities in each of the phases of disaster management and also help to provide continuity to logistics operations throughout the disaster management cycle.

Humanitarian Logistics Information Systems across the Disaster Management Cycle

Humanitarian logistics information systems must be able to operate across the entire disaster management cycle. In order to be applicable for all phases, they must be scalable to manage the large volumes of supplies during the response phase, as well as the high diversity of supplies across the recovery and mitigation phases and manage the flow of information from the preparedness phase to the response phase, and during the transition phase. A single humanitarian logistics information system which integrates information from all phases within the disaster management cycle will assist an organization in the complex task of transitioning their activities between the different phases.

Preparedness

NGOs prepare for disasters by pre-positioning emergency response supplies. It is equally important to implement humanitarian logistics information systems which can be utilized by logisticians responding to disasters. Logisticians must be trained to use these information systems and simulations should be run in preparation for their use in disaster response. Humanitarian logistics information systems should also be used to record what emergency response supplies are available at the onset of the disaster. In response to Cyclone Nagris in Myanmar one major NGO was better able to more efficiently send air shipment of emergency pre-positioned supplies by having maintained records of their volume and weight. This allowed the logistician to arrange the optimal charter flights required to transport the supplies.

Response

Humanitarian logistics information systems can eliminate the need for duplicate data entry and offer more timely and accurate information during the response phase (Lee and Zbinden, 2003). This not only increases the efficiency and effectiveness of the disaster response, but also assists in later phases of the disaster management cycle. After the response to the 2005 Kashmir Earthquake one NGO had a number of emergency response supplies remaining. However, due to a lack of proper information systems, it was unknown which donor funded the items, and what the donor's regulations were regarding their use. As a result, they were unable to be distributed in response to flooding in Pakistan the following year. Where warehouse inventory reports are not maintained, it is common for surplus stock from emergency response not to be utilized and to go to waste.

Transition

Once the response phase is complete, humanitarian logistics information systems will enable organizations to know what supplies have been distributed, and what supplies are remaining. This will allow them to utilize surplus supplies in recovery activities or return them to pre-positioned stock and know what supplies were required, to better plan for the next disaster response.

The transition phase will also typically involve the replacement of short term emergency response teams with longer term staff. If information regarding what supplies are currently stored in warehouses is not recorded, it may be forgotten as staff leave, and the supplies may remain unutilized. Humanitarian logistics information systems can ensure that new staff are aware of what supplies are currently available, so they are able to utilize them.

Recovery

The recovery phase takes place over a period of years, which offers enough time for conditions to stabilize, and also the availability of funding, for humanitarian organizations to plan strategically and develop information systems. During disaster response humanitarian logistics operate in a realm of uncertainties and rapidly changing conditions. This is not an appropriate environment to develop, test or implement new systems. There are already enough unknown variables present, without introducing new systems or software, which may contain bugs or functionality which needs refining. Implementing new systems requires the investment of time and resources, and doing this during a disaster response will detract from the primary goal of the humanitarian operation - saving lives. Developing humanitarian logistics information systems during the recovery phase provides the opportunity to involve the staff of the organization, which is essential, as the solution will be more appropriate to their needs and they will have ownership over it. New systems can be implemented through trainings and simulations, however it is more effective as having systems which have implemented within the operations of the organization and socialized with staff in the field. In this respect the recovery phase can offer a suitable environment to develop and test new information systems for humanitarian logistics which can then be applied to disaster response activities.

In 2007 one major NGO developed a warehouse database in Indonesia to support their recovery activities following the 2004 Indian Ocean Tsunami. In September 2007, they were able to deploy the same database in

response to an earthquake in Indonesia. A staff member who was already using the database to manage supplies for the tsunami recovery effort was then easily able to use it to manage the distribution of emergency supplies in the area due to their familiarity with the system.

Mitigation

Although logistics activities occur at a lower scale during the mitigation phase such as the procurement of supplies to reinforce buildings, it is important to ensure that humanitarian logistics information systems are still utilized by organizations, to ensure that they become standard practice with logistics units. This continuous use will institutionalize the systems within the organization and ensure the sustainability of their use across the disaster management cycle.

HUMANITARIAN LOGISTICS INFORMATION SYSTEMS BETWEEN ORGANIZATIONS

Humanitarian supply chains could be viewed more widely to include the multiple organizations providing physical aid to beneficiaries in the same region. Humanitarian logistics information systems have the potential to enable better information sharing between organizations which can enhance the overall humanitarian operation (King, 2005).

One area which could be improved by information systems is local procurement. Procurement is vulnerable to corruption through collusion between organization staff and vendors and the payment of bribes to choose specific vendors. Analysis of procurement data is capable of revealing trends and irregularities, indicative of corruption, such as consistently purchasing from specific vendors or certain purchasers always receiving higher than average quotes. This analysis would be more effective using procurement data from different humanitarian organizations in the same region, as comparisons could be made between prices, to monitor if one organization is paying significant more for similar items, which could indicate corruption within that organization.

Humanitarian organizations often rely on local markets to provide supplies, however the large amount of purchasing activity following a disaster can often lead to inflation over supply and stock-outs. Complex analysis of purchasing trends from multiple humanitarian organizations, and improved information sharing with local vendors, could mitigate this, by spreading requirements over multiple vendors and informing them of expected demand. This could also allow humanitarian organizations to sustainably support and stimulate local markets.

Although there are many challenges in encouraging collaboration between humanitarian organizations, better humanitarian logistics information systems could facilitate collaboration by creating more incentives to do so.

CONCLUSION

Humanitarian logistics units are actors in a broader humanitarian supply chain and information systems can help to build logistics capacity of while also building better links with other units, better integrating logistics in the humanitarian supply chain. Humanitarian logistics information systems can improve the effectiveness of humanitarian supply chains by providing timely and accurate information regarding what supplies are required and have been delivered, enabling donors to be more responsive to the needs of beneficiaries. Humanitarian logistics operates across the disaster management cycle. Humanitarian logistics information systems can improve logistics activities in each of the phases and also help to provide continuity to humanitarian operations throughout the entire cycle. Humanitarian logistics information systems could also provide opportunities for better corruption prevention and market control through collaboration between different humanitarian organizations. Humanitarian logistics information systems can strengthen logistics units and integrate them with other units and across to the disaster management cycle to create more efficiency and effectiveness of humanitarian supply chains

REFERENCES

1. Asian Development Bank (2004) Disaster and Emergency Assistance Policy, At: http://www.adb.org/Documents/Policies/Disaster_Emergency/Disaster_Emergency.pdf, accessed 20 February 2009
2. Beamon, B.M. (2004), Humanitarian relief chains: issues and challenges, *Proceedings of the 34th International Conference on Computers and Industrial Engineering*, San Francisco, CA.
3. Beamon, B.M. and Balcik, B. (2008) Performance measurement in humanitarian relief chains, *International Journal of Public Sector Management*, 21, 1, 4-25

4. Chomilier, B., Samii, R. and van Wassenhove, L. (2003) The central role of supply chain management at IFRC, *Forced Migration Review*, 18, 18-19.
5. Coyne, J. (2006) Humanitarian Logistics: Musing Aloud, *Monday Developments*, 24, 20, 12-13.
6. Gray, R and Oloruntoba, R (2006) Humanitarian aid: an agile supply chain?, *Supply Chain Management: An International Journal*, 11, 2, 115–120
7. Haddow, G. D. and Bullock J. A. (2004) Introduction to Emergency Management, Butterworth-Heinemann, Amsterdam
8. King, D. (2005), Humanitarian Knowledge Management, *Proceedings of the Second International ISCRAM Conference*, Brussels, Belgium, 1-6
9. Kovács, G. and Spens, K.M. (2007) Humanitarian logistics in disaster relief operations, *International Journal of Physical*, 37, 2, 99-114
10. Maspero, E. L. and Ittman, H. W. (2008) The rise of humanitarian logistics, *27th Annual Southern African Transport Conference 2008*, South Africa.
11. Mentzer, J.T., DeWitt, W., Keebler, J.S., Min, S., Nix, N. W. Smith, C.D. and Zacharia, Z.G. (2001) Defining Supply Chain Management, *Journal of Business Logistics* 22,2
12. Oloruntoba, R (2007) Bringing Order Out Of Disorder: Exploring Complexity in Relief Supply Chains, *Proceedings 2nd International Conference on Operations and Supply Chain Management: Regional and Global Logistics and Supply Chain Management*, Bangkok, Thailand.
13. Perry, M. (2007) Natural disaster management planning A study of logistics managers responding to the tsunami, *International Journal of Physical Distribution & Logistics Management*, 37, 5, 409-433
14. Rickard, J. (2003) A logistician's plea, *Forced Migration Review*, 18, 9.
15. Rickard, J. (2006) Humanitarian Logistics: Musing Aloud, *Monday Developments*, 24, 20, 6-7.
16. Rodman, W. K. (2004) Supply Chain Management in Humanitarian Relief Logistics, Thesis, Department of Operational Sciences, Air Force Institute of Technology, Air University
17. Thomas, A. (2003). Humanitarian Logistics: Enabling Disaster Response, The Fritz Institute.
18. Thomas, A. and Kopczak, L. (2005) From Logistics to Supply Chain Management: The path forward in the humanitarian sector, Technical Report, Fritz Institute, San Francisco, CA, USA.