

Emerging Issues and Opportunities in Disaster Response Supply Chain Management

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Abstract: *The world is facing an increasing frequency and intensity of disasters both natural and man-made that have devastating impact on life, livelihood and economy of the affected communities. In the context it is very important to plan for disaster response activities and preparedness to minimize the economic and human loss. In a post disaster situation various aid organizations and government agencies start supplying food, water, clothing, medicines and other emergency relief materials efficiently and quickly to maximize survival rate and continue normalcy. However, managing disaster response supply chain is not that straight forward. In most disasters, information is scarce (between the supplier and end users) and coordination rarely exists (Long & Wood, 1995) which creates disruption in flow of supply chain. Hence disaster response supply chain operates in a level of high uncertainty and is very different from what most supply chain managers perceive. This article describes the main characteristics of disaster response supply chain, particular issues faced by the managers and the opportunities on which the future strategy could be capitalized. It also suggests a model that captures the interaction between different components of supply chain and controls the flow of the commodities from the source through the chain to reach the end users.*

Keywords: *Disaster Management, Supply chain Management, Disaster Response, Disaster Preparedness*

1. INTRODUCTION

Usually 'disaster' is defined as a breakdown in the normal functioning of a community that has a significant adverse impact on people, their livelihood and their environment, overwhelming local response capacity. The situation may be the result of a natural

event such as a hurricane or earthquake; or it may be the result of human activities (PAHO 2001). Among different definitions of disaster the most accepted one given by World Health Organization (WHO), is any occurrences that causes damage, destruction, ecological disruption, loss of human life, human suffering, deterioration of health and health services on a scale sufficient to warrant an extraordinary response from outside the affected community or area. From the global as well as local perspective, the number of disasters is increasing every year and affecting more and more people with massive economic impact. (Figure: 1 & 2).

As per data of WHO Collaborating Centre for Research on the Epidemiology of Disasters (CRED), in the year 2011 more than 30,770 people were killed, 244.7 million people affected and the economic loss was US\$ 366.1 billion due to natural disasters. Looking at the geographical distribution of disasters, the Asian continent was most often hit by natural disasters in 2011 (44.0%) with 86.3% of global disaster victims [8].

Avoiding disaster impact completely is difficult as no communities are completely immune from the risk of the catastrophe. But with proper planning of response mechanism and preparedness, loss of life and livelihood could be limited to a great extent. Disaster response supply chain as a part of emergency management cycle helps the affected community to recover very quickly from the tragedy. Effective implementation of supply chain not only leads to better recovery but also helps in reducing the vulnerabilities of the affected communities to face future disasters. Disaster response supply chain is a function of the geographical location where disaster takes place, nature of disaster, suppliers, actual need of the community, organizations who are working

there, available information, government policies, local culture etc. The challenge is to delivery of right relief materials to right persons at right time with centralized control having decentralized execution mechanism at ground. This to increased demand during disaster can only be met with an efficient, well planned supply chain process.

To understand the issues involved in the disaster response supply chain the author search for scholarly journals yielded four articles. These notes describe that management of disaster relief and the logistics requires different techniques at different levels. The article have concentrated strategic planning stage and

provides specific recommendations to practitioners and have identified the important areas to be researched. It has identified four stages of relief logistics such as 1. Strategic planning, which concerns high level decisions of supplier selection and confirmation of communication protocol 2. Preparedness which concerns decisions regarding the amount and location of relief supplies to be stored 3. Pre event response which concerns decisions during those occasions when an approaching disaster has been detected 4. Post response which concerns what needs to be done immediately after a disaster has occurred (Altay et al.,).

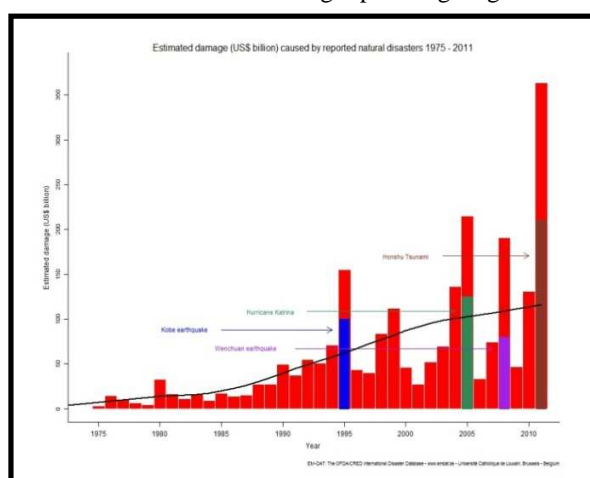
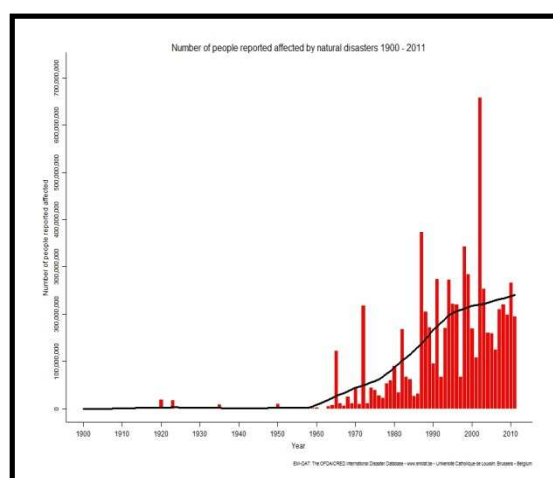


Figure 1: Economic impact of disasters Figure



2: Number of people affected by disasters

In another note the management challenges of disaster relief supply chain have been discussed. The paper has highlighted that the disaster relief supply chain is very much a product of its environment. It has discussed issues of command and control, supply chain formation, donor independence, high uncertainty level and changing operational needs. It concluded that the disaster relief supply chain operates in a different environment from the types of supply chains that are more widely known and researched. One obvious reason why studying disaster relief supply chain is important, is because of the potential to save lives and reduce suffering for those people affected by a disaster.

As per another study emergency supply chain is formed quickly and responds quickly. In this chain all parties may not be able to recognize other partners because the supply chain is formed randomly by private business agencies, donors, non profit

organizations etc. In disaster relief the eventual purpose of the emergency supply chain is to deliver the right products and services to the right people or destination at the right time. Cost and information confidentiality are both secondary. This makes the quick set up and quick response of an emergency supply chain possible [19].

In a paper “New challenges to emergency management of pharmaceuticals/ health care supply chain disruption”, the following list of issues are discussed as a response and recovery action of the disruption of supply chain. In case of an epidemic or a pandemic the dynamic forecast of demand, allocation of resources, inventory position for short shelf life products, information sharing and collaboration for vaccines or drugs may improve the process of supply chain. It has been suggested that the supply chain partners should work together to minimize the counterfeiting opportunities [14].

2. EMERGING ISSUES

Disasters, both natural and man-made, can strike anytime anywhere; without any warning or with very short notice. It disrupts the usual supply chain to the community either with minimum supply capacity, or a sudden surge of demand, or both. It leads to requirement of an alternative supply chain which is known as disaster response supply chain. With this background the supply chain set up in an emergency situation has two distinct characteristics. First, the disaster response supply chain needs to be set up with very short notice period with availability of limited resources, information, manpower etc. In case of requirement resource mobilization, information gathering and involvement of skilled manpower are to be built on slowly. Secondly, even if the supply quantity is heavy it should adopt effective temporary mechanism in which the fixed cost is minimum. On the basis of these assumptions, the following emerging issues come up for further discussion.

2.1 Preparation for formation of supply chain

Since forecasting disasters is difficult so the formation of supply chain involves a lot of issues at the initial level. When a disaster occurs the suppliers started holding the emergency relief materials and sell them in black market. There is hardly any legal mechanism to control such unfair practices. Further, since there is a high demand for the materials, the suppliers start supplying low quality materials at a very high cost. The aid agencies under intense pressure and to make their presence felt, compromise with the situation. They begin to procure low quality materials at a high price. In this context it is suggested that, the aid agencies should have a database of suppliers with a prior Memorandum of Understanding to avoid delay in setting up of the supply chain in an emergency. There should be a mechanism of quarterly monitoring of the stock situation and price of essential emergency commodities and the agency should not agree to the major price fluctuation. The data base of such suppliers will also help the agency to take immediate decision and compare the cost of different essential commodities.

2.2 Community at the center of supply chain

Successful implementation of disaster response supply chain is dependent on the satisfaction of the affected community. It is needless to mention that the people facing the crisis are the end users/ customers at the extreme point of the supply chain. The responsibility of the supply chain in this case is to prepare, support and rebuild the society in the face of natural or man made disasters. Most of the time it is a situation where the aid agencies have no presence at

the site of disaster occurrence or have limited knowledge about the affected communities. In case of unprecedented natural disasters like the Super Cyclone of 1999 in Odisha or 2004 Tsunami in South East Asia the time span of interaction between the aid agencies and the affected communities is very negligible. The supply chain set up and materials supplied have hardly met the critical needs of the end users. A case in point is about the supplies sent to the Tsunami affected communities of Andaman and Nicobar Islands. Aid agencies started supplying food and clothes including sarees for the women of Nicobari community affected by Tsunami. The sarees distributed were of no use to the women as they were used to wearing Nicobari Lungis. None of the agencies were concentrating on distribution of women undergarments which were a critical need after one month of Tsunami. The fisher folk communities were supplied with fibre boats which are not suitable at all for stony embankments in Andaman Sea. This explains the necessity of involvement of local communities in the supply chain to take decision about the procurement. Some times aid agencies also take decisions of supplies based on the donor priorities and area of their interest. They restrict where and how their resources can be used. There are also instances where the donors have sent a truck load of materials simply because it is in their store, which never satisfies the need of the recipient.

2.3 Logistic challenges

Emergency relief operation is dynamic and time sensitive- every hour of delay in supply of materials is a question between life and death of the affected population. The speed and efficacy of disaster response depends on severity of the event, location, nature of disaster and availability of alternative channels. In an emergency situation, the existing logistic network is disrupted to a great extent and there is a need to establish an alternative mechanism to deliver the supplies. After the devastating earth quake in 2006 the State of Jammu and Kashmir and the Koshi flood in 2008 in Bihar, logistics was the biggest challenge as the roads were cut off and communities were marooned. Air dropping was the only option to provide the affected communities with their basic emergency needs. It was not only time consuming but also a costly affair to reach the targeted population. In the State of Jammu and Kashmir, the cargo security was also a significant issue and logistic alternatives were limited due to hilly terrain and remote locations. There are also instances when due to severe damage of infrastructure, storage of materials is a big challenge to the supply chain managers.

2.4 Supply quality assurance:

Receiving quality relief materials is a right of the affected community. It is very important when the magnitude of the disaster is severe, and has great health implications. Most of the time, the supply chain managers do not concentrate on standards and quality. In disaster response number of standards and quality control theories are in practice. One of them is sphere standard for quality humanitarian response. It is an internationally recognized set of common principles and universal minimum standards covering four primary life saving areas of humanitarian aid: water supply, sanitation and hygiene promotion; food security and nutrition; shelter, settlement and non food items; and health action. In the supply chain the product quality is the result of a series of sound purchasing practices, following ethical norms, ensuring professionalism and accountability that links to critical needs of the customers. In other words, if the voices of the end users are effectively integrated into the process of disaster response plan, then it become easier to establish quality norms of the supply chain.

2.5 Changing needs at ground

In a post disaster scenario the need of the community changes very frequently with a highly dynamic ground situation. Day by day as the situation improves, it demands different responses, different levels of capabilities and skills to deal with the situation. It is evident from different major disasters that during the initial days the aid organizations take a decision of huge procurement which may not be required at the later stage of recovery process. For example, initially the dry foods are very useful for saving the lives until the community is prepared to cook food. As the ideal principle of recovery is to minimize the period of relief with an extended period of livelihood support, so it is logical to procure relief materials in small quantities in phased manner. In some cases, due to distressed situation and insecure future the community tries to grab relief materials

3. Emerging Opportunities

While some aspects of commercial logistics and supply chain management (during normal time) are similar to disaster response supply chain, many components are not directly transferrable. However managers of both operations could learn from each other and supplement for best practices. One obvious reason for opportunities of studying disaster response supply chain is to provide relief during increased number and intensity of disasters and save millions of valuable lives. The second area of opportunities of

even if there is no actual need. It creates situation of tension and at times law and order challenges. It is very important to understand the local dynamics, political situation and power structure before intervening at the ground.

2.6 Supply chain risk:

Disaster is a supply chain risk in itself. It is a risk because the supply chain operates under an extreme supply chain disruption. As an example in case of Tsunami 2004 in Andaman and Nicobar Islands the airport was not operational and the life line of transportation to different islands i.e. Ships and jetties were completely damaged. The supply chain of this disaster response was relying on this totally destroyed infrastructure. On the other hand this operation was viewed as a supply chain operating with extreme flexibility and agility, where it was an alternative process to address the emerging need of the community. However in the process it is very important to deal with the situation with professionalism and utmost accountability. The professionalism helps the managers to address the changing situation in an efficient manner and accountability respects the ethical norms and minimizes fraud risk.

2.7 Use of Technology

It is hardly observed that the humanitarian agencies rely on improved technology in managing the supply chain operation. Very limited numbers of software are also in place to use during the disaster response initiatives. It is very important to develop a standardize methodology and maintain coordination to manage relief supplies and equipment efficiency. This can trigger urgent needs, prevent unsolicited interferences, strengthen centralized data base, help in visibility and transparency. Owing to the complexity of the sourcing processes and uncertainty of demand, technological improvement will help to smoother movement of supply chain to a great extent.

study is to develop strategy for improving the performance of disaster response supply chain. One

way is to integrate across various functional areas within the relief organization and networking with different stakeholders. Finally, in case of a disruption in the disaster supply chain, the discussions are on specific stages like pre-disaster response or post disaster phases. But since three phases are interrelated (each one has effect on other) and so a comprehensive model integrating multiple disaster stages is needed.

Disasters are often associated with vulnerability, dependence and marginalization and arise largely as a consequence of socio-economic rather than natural factors (Winchester, 1992; Susman et al, 1983; O'Keefe et al, 1976). Understanding the 'natural' hazard trigger is just the first step and not necessarily the most important one. This is also clearly demonstrated through the 'pressure and release model' (PAR) (Blaikie et al 1994; Wisner et al 2004) which shows how: "...`underlying factors' and root causes [such as limited access to power and resources] embedded in everyday life give rise to `dynamic pressures' [such as a lack of institutions or training or rapid population growth] affecting particular groups, leading to specifically `unsafe conditions' [such as unprotected buildings or low

income or lack of disaster preparedness]. This concept should be the corner stone for developing a disaster response supply chain.

A long-term, strategic coordination and management of disaster response supply chain has challenging problems. The supply network is remote and complicated with numerous players (donors, NGOs, government, military, and suppliers), and it is difficult to coordinate all of them along with all the items that need to be delivered. However collaboration, coordination, professionalism and accountability are important factors on which the performance of the supply chain relies on. Based on the above principles the following model is suggested instead of conventional function based system.

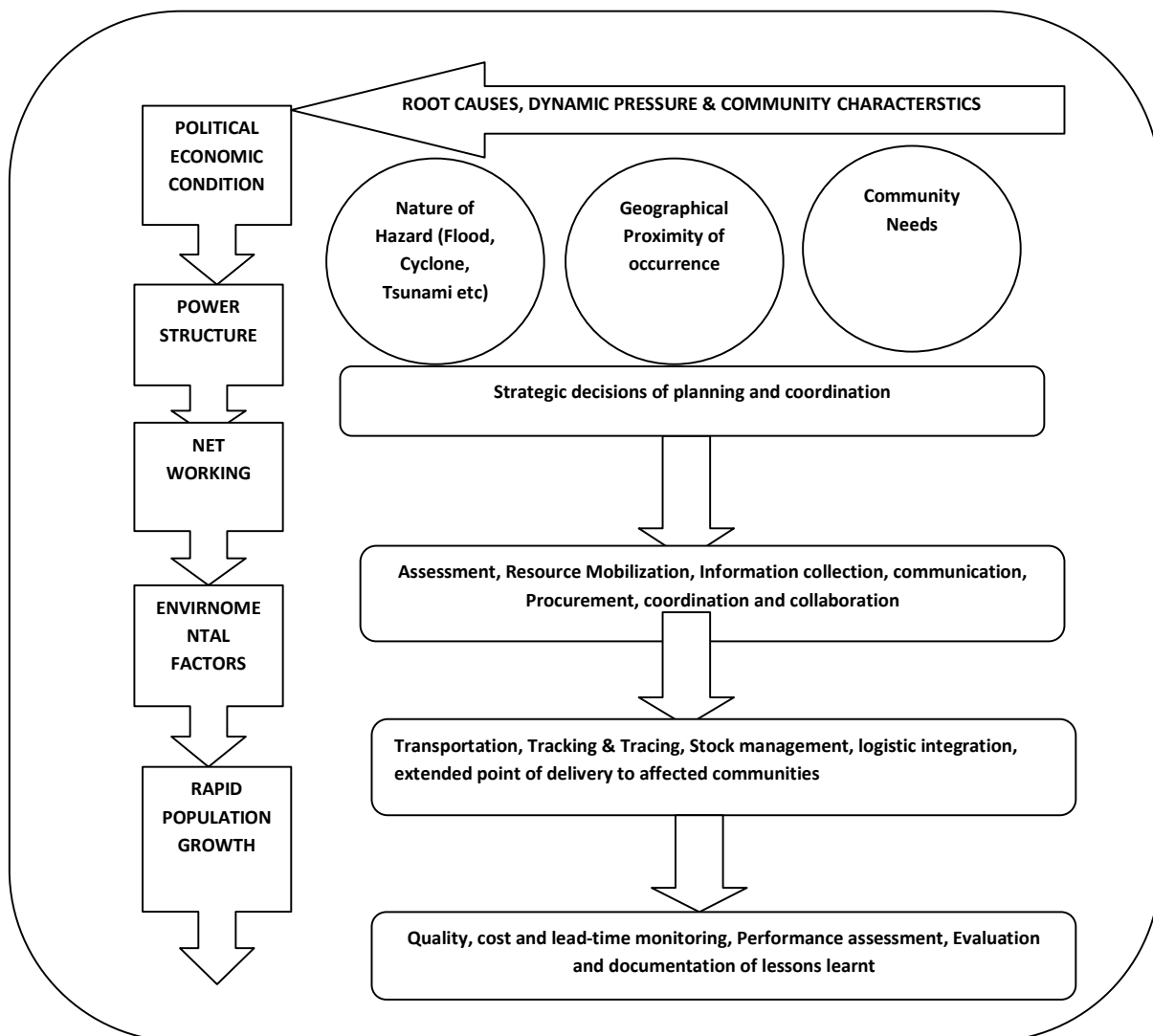


Figure 3: Suggested disaster response supply chain model

4. Managerial implications:

In business logistics, over decades, a number of useful and innovative tools have been developed, experimented and proved to be successful. Some of these tools might be useful in implementation of disaster response supply chain, provided they are carefully translated and taken in to account the complex characteristics of emergency logistics. Similarly now more and more business organizations are responding to disasters to establish their social responsibility. Even if the business organizations are mature in managing supply chain during normal time, it is a tough task for them to oversee the success of emergency supply chain. So the business organizations should also learn from the best practices of humanitarian organizations to improve their performances in volatile economic environment. However, it is still a distance dream because of general lack of appreciation for each other's work and collaboration.

In the field of disaster response supply chain very few comparative studies are available as to be able to draw on commonalities and to learn from previous disasters. Further research work will strengthen the evidence base of developing a generic framework and

documenting best practices in the field of inter-organizational or inter-agency coordination, partnership between humanitarian organizations, logistics service providers, suppliers, and even affected communities.

5. Conclusion

In today's society disaster is striking in all corners of the globe. Hence the importance of emergency management is undeniable. With a proper supply chain management loss of human and property could be avoided. During the emergencies various aid organizations often face significant problems of transporting large amounts of many different commodities to save lives of the affected communities, which should be done quickly and efficiently to maximize the survival rate of the affected population. This research has suggested a comprehensive model that describes the integrated supply chain operations in response to disasters. It shows that disaster response supply chain management is an emerging field and there are great potentials for research in emergency logistics and disaster response initiatives.

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