ID: 2016-ISFT-388

# Identification and Analysis of Key Performance Indicator of Humanitarian Logistics – Case Study

**Vartika Shivaji[1], Parvesh Kumar[2], Mohit Tyagi[3], R.S. Walia[4], Subhash Kumar[5]**

[1,2,3,4,5]*GNIT, Greater Noida*
[1]*vartika_shivaji@yahoo.com*

***Abstract:*** *A disaster is a serious disruption of functioning of society involving widespread human, material, economic and environmental losses. There are various obstacles in solving this problem but the major challenges are proper coordination, unclear strategic direction and time management. A prime focus is now being given on disaster management as people have been experiencing huge loss of life and infrastructure due to these natural and men made disasters. A disaster response operation involves trade-offs of speed, cost and accuracy with regard to the type of goods delivered and their quantities. Balancing these trade-offs requires a means of measuring supply chain performance. The objective of disaster response in humanitarian relief chain is to rapidly provide relief to areas affected by such disasters.*

*In current research the instances of flood in Jammu and Kashmir and Nepal Earthquake have been considered. There has been a huge loss of living beings, damages to infrastructures and risk of various water borne diseases. The research focuses on key performance indicators in humanitarian logistics, which have been identified using factor analysisreferring to various case studies and discussion with experts in field of supply chain and logistics, for a responsive humanitarian supply chain and try to develop a structured plan to mitigate losses in such disasters.*

***Keywords****: humanitarian supply chain, key performance indicators (KPIs), factors analysis, humanitarian logistics.*

## 1. INTRODUCTION

The disaster can be defined differently by different people depending upon the scope being considered. For instance for an agencies or an organizations it is defined according to the circumstance. Red Cross consider, a disaster is any occurrence like hurricane, tornado, tidal wave, drought, earth quake, famine, explosion, fire, flood, eruption in volcanic, attack by terrorist, collapse of building, wreck of transportation or any other situation that leads human to suffer or creates human needs that the victims cannot alleviate without assistance (Red Cross) [1]. The WHO defines, a disaster as any occurrence that causes disruption in ecology, damage, human life loss, relapse of health and health services on a scale sufficient to warrant an extraordinary response from outside the affected community area [1-2].

Disaster management is aimed to minimize and mitigate the disaster effect. During pre-disaster phase, effects by disaster and events followed are studied and corresponding planning is done to fight against disaster of similar kind in future [1-2]. In disaster phase, main concern is to reduce the loss from the loss caused by disaster hence activities regarding this are practiced during this phase. Finally, in the post-disaster phase, neutralization efforts are made to neutralize disaster's long-term effects as well as to establish real-time response to decrease the unwelcome aftermath of disaster [3].

Generally humanitarian organizations perform certain operations in disaster management. These can be divided into four major parts or phases known as humanitarian supply chain cycle: response, recovery, mitigation and preparedness [4]. These phases are characterized by individual activities, which may overlap with activities of other phases [2]. The response phase is initiated soon after disaster, with activities that focus primarily on saving human lives and preventing any damage further. Response phase provide vital stats to Humanitarian operations on logistics as they distribute food, provide medical supplies and other necessities of life to affected people, speed of logistics activities therefore decides lives saved in the crises. Recovery phase is responsible to attain status quo i.e. to help people get the same life that was before crisis[4]. The activities involved include training people recover their basic belonging and supplies distribution for livelihood, houses reconstruction or building a new one, Recovery is not a short term phase instead is again dependent on severity of the crisis.A transition phase is observed between response and recovery phases in which NGOs providing ongoing support monitoring mark start of the phase, support include assistance of as temporary shelter provision and stimulating basic social provisions [5]. Mitigation involves empowering the spirit of communities to natural hazards and to reduce the influence of adversity they cause.The capability to response to the situation is improved in thepreparedness phase, for example holding surveys with communities that

the know how to evacuate, plan to position the supplies at required place before the situation arise commonly known as prepositioning of supply, and having organizational level capability to response to the situation [4].

Humanitarian supply chain is defined as the relief aid flow and the information relation between the disasters affected population supplies recipient and the benefactor so as to minimize human sorrow and life [5].Humanitarian relief-operation administration slot in very different players, who may have towering degree of variety in terms of traditions, principle, curiosities, consents, abilities, and logistics proficiency. Key players can be classified as: governments, the military, aid agencies, donors, non-governmental organizations (NGOs), and private sector companies—among which logistics service providers are finest bearing in mind the whole players and association among them, the humanitarian relationships model definition is made [1-3, 5].

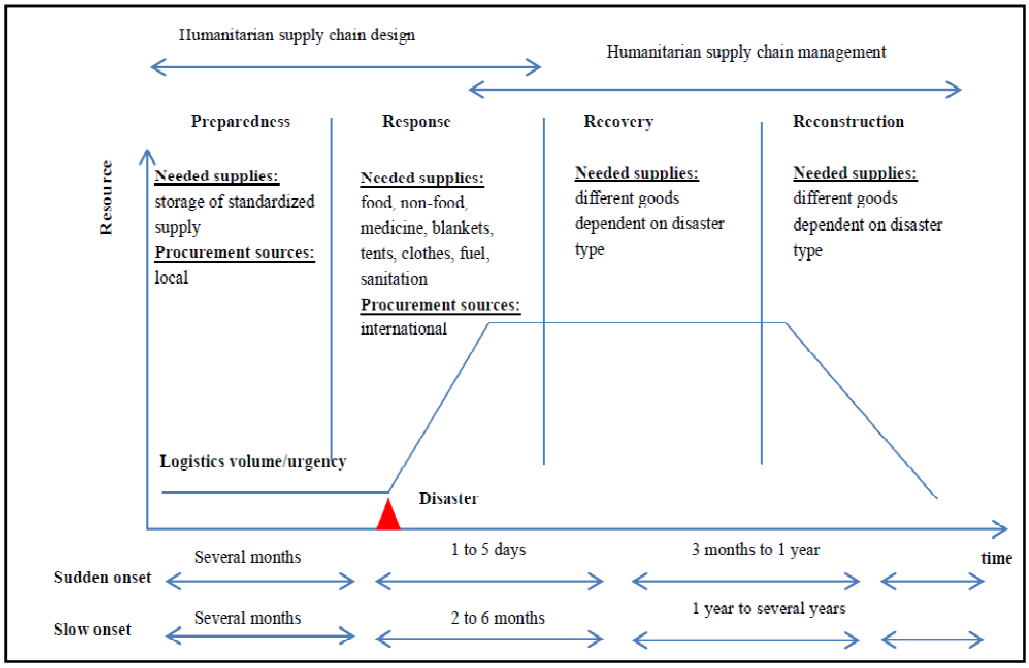


**Fig. 1. Disaster Management Cycle [4]**

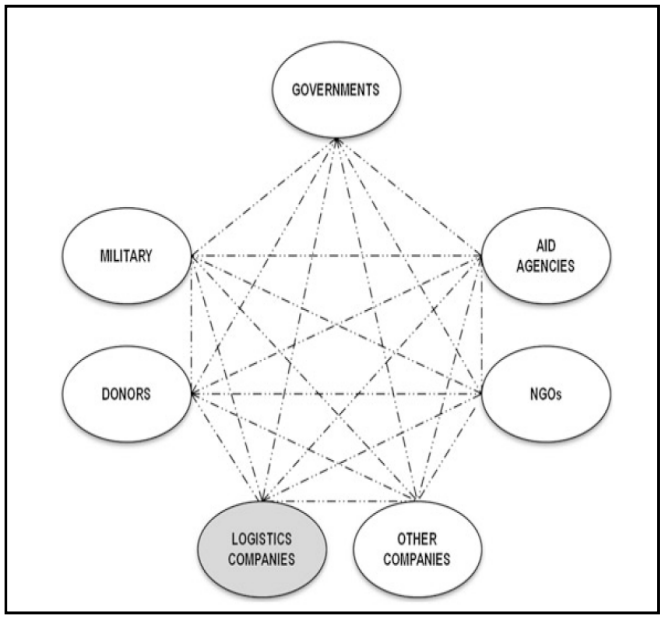


**Fig. 2. Major Player: Humanitarian Logistic [4]**

## 2. LITERATURE REVIEW

A humanitarian supply chain targets to reduce or avoid the probable losses from disasters, through appropriate assistance to sufferers and offers rapid and effective recovery. Activities and measures taken in advance to ensure effective response to the impact of disasters, including the issuance of timely and effective early warnings and the temporary evacuation of people and property from threatened locations. It has been found from literatures and discussion with humanitarian experts that effective response during a disaster depends upon various factors [1-6].

Pettit et al [6] suggested that for a supply chain to succeed strategic planning addressing long-term decision making is vital and will therefore need to be dealt with at the utmost level of an organization. Disaster management is a key factor that drives the successful execution of relief efforts, and it begins with strategic process design.

Kovacs et al [7] reported about humanitarian operations largely use road and air transport. However, we must

evaluate how best to use other modes in order to efficiently support the distribution activities in both the strategy of shipment and logistical support for the operations. Inadequate infrastructure is identified as a major challenge of disaster relief activities and infrastructure repair and construction of hospitals and shelters are treated as critical activities.

Heaslip et al. [8] investigated the coordination is a practice of individual understanding towards a common goal to avoid communication and information within and among organizations. Cozzolino[4p] examined various coordination practices, and provide an overview of coordination issues associated with humanitarian logistics operations. A road network management model was proposed to generate information for the improvement in its resilience to natural and man-made disasters.

Long et al. [9] suggest that the management of information during a crisis "is the single greatest determinant of success." as it assists in integrating activity and providing information to allow the supply chain to operate more effectively. Communication is an important aspect of any aid operation and utilizing the existing telecommunications infrastructure is as important as other communication methods.

Seaman et al. [10] reported that the media is often a critical factor affecting relief operations.Relief organizations seek visibility to potentially attract moreresources from major donors and the public. Towill[11]suggested that in a seamless supply chain, it isnecessary to provide undistorted and up to datemarketing data at every node within the supply chain.

## 3. DISASTER ASSESSMENT FROM THE PERSPECTIVE OF THE HUMANITARIAN LOGISTICS

An analysis of major natural disasters was performed to identify the key processes and/or actions taken in the context of the humanitarian logistics for secondary purposes.The study identifies the profile of the operations, their points of success and difficulty, and the search forsimilar and complementary points between needs and actions taken [4]. The result indicates the critical points ofdecision-making process with lessons learned, and proposes a set of best practices that can be adopted by themanagers of humanitarian aid operations [7-9].

### 3.1 JAMMU & KASHMIR FLOOD 2014 (SOURCES: [13-16])

In September 2014, the Kashmir region witnessed disastrous floods across majority of its districts caused by torrential rainfall. The Indian administrated Jammu and Kashmir, as well as Azad Kashmir, Gilgit-Baltistan and Punjab in Pakistan, were affected by these floods. By September 24, 2014, nearly 277 people in India and 280 people in Pakistan had died due to the floods.

The Jammu and Kashmir state and adjoining areas received heavy rainfall from 2 September 2014 onwards, during last stage of monsoon in India. This triggered flooding and landslides in India and the adjoining areas of Pakistan. On 5 September, the Jhelum River in Srinagar was reported to be flowing at 23.40 feet (6.83 m) which was 4.40 feet (1.34 m) above the danger mark and at 33 feet (10 m) at Sangam in Anantnag district above the danger mark. The discharge rate in the river was recorded as 70000 m3/s against the normal discharge of 25000 m3/s.

The Chenab River was also reported to flow above the danger mark by which hundreds of villages were affected in Pakistan. These rivers flooded into the streets causing heavy casualties and loss of property. On September 8, in many parts of Srinagar's neighborhood, the water was about 12 feet (3.7 m) deep, submerging entire houses. Stranded residents left their homes to move in with friends or relatives in safer areas. The death toll till September 10 had crossed 190 in Kashmir valley and areas affected by the floods were mostly districts in South Kashmir. In Srinagar, most of the city areas were submerged under water. The river Jhelum spilled over submerging Sonwar, Rajbagh, Jawahar Nagar, GogjiBagh and WazirBagh neighborhoods of city. The first and the second storey of the houses and hotels in Rajbagh that were packed with tourists were submerged. According to the Omar Abdullah, the Chief Minister of Jammu and Kashmir, boats had been brought from Delhi to help with evacuations, and the air force had begun rescue operations in the city.

50 bridges were reported to have been damaged across the state. The preliminary assessment of damages to property was estimated between INR 5000 cr to INR 6000 cr. The state government requested the central government for 25, 000 tents and 40, 000 blankets for the affected people. There was a total estimated loss of 1 trillion to Kashmir division alone.

In the Jammu Division, landslides triggered by heavy rainfall had damaged roads, dozens of bridges, buildings and crops. Vehicular traffic had been stopped on the Jammu-Pathankot highway. Katra-bound trains were halted. Haj flights scheduled up to 12 September, were postponed. The Jammu-Pathankot national highway was opened on September 8, after the water level receded. Srinagar-Leh Highway reopened for traffic on 9 September. The Prime Minister of India NarendraModi called it a "national calamity".

Loopholes in disaster management during Jammu and Kashmir flood 2014.

- No proper drainage system in flood affected areas, lack of technical equipments.
- Lack of planning of relief activities after disaster.

- Lack of co-ordination and integration between players of humanitarian supply chain.
- Donations for relief activities by NGOs, individuals etc. took more than expected time to reach victims of Jammu and Kashmir flood victims.
- Lack in infrastructure.
- Lack of sustainability.

**Fig. 3. Jammu & Kashmir flood 2014**

### 3.2. NEPAL EARTHQUAKE 2015 (sources: [17-20])

The April 2015 Nepal earthquake (also known as the Gorkha earthquake) killed more than 8, 800 people and injured more than 23, 000. It was the worst natural disaster to strike Nepal since the 1934 Nepal–Bihar earthquake.

The earthquake triggered an avalanche on Mount Everest, killing at least 19 making it the deadliest day on the mountain in history. It triggered another huge avalanche in the Langtang valley, where 250 people were reported missing.

Hundreds of thousands of people were made homeless with entire villages flattened, across many districts of the country. Centuries-old buildings were destroyed at UNESCO World Heritage sites in the Kathmandu Valley, including some at the Kathmandu Durbar Square, the Patan Durbar Squar, the Bhaktapur Durbar Square, the Changu Narayan Temple and the SwayambhunathStupa. Geophysicists and other experts had warned for decades that Nepal was vulnerable to a deadly earthquake, particularly because of its geology, urbanization, and architecture.

Continued aftershocks occurred throughout Nepal within 15–20 minute intervals, with one shock reaching a magnitude of 6.7. The country also had a continued risk of landslides.

A major aftershock occurred on 12 May 2015 at 12:51 NST with a moment magnitude of 7.3. The epicenter was near the Chinese border between the capital of Kathmandu and Mt. Everest. More than 200 people were killed and more than 2, 500 were injured by this aftershock.

Helping hands from all over the world raised for rescue operation, India also deployed its army men and rescue equipment in the rescue operation.

**Fig.4. Nepal Earthquake 2015**

## 4. METHODOLOGY

This paper does not claim to make very accurate predictions, but it does investigate some of the important factors and trends that may help to shape the future of the humanitarian logistics sector.

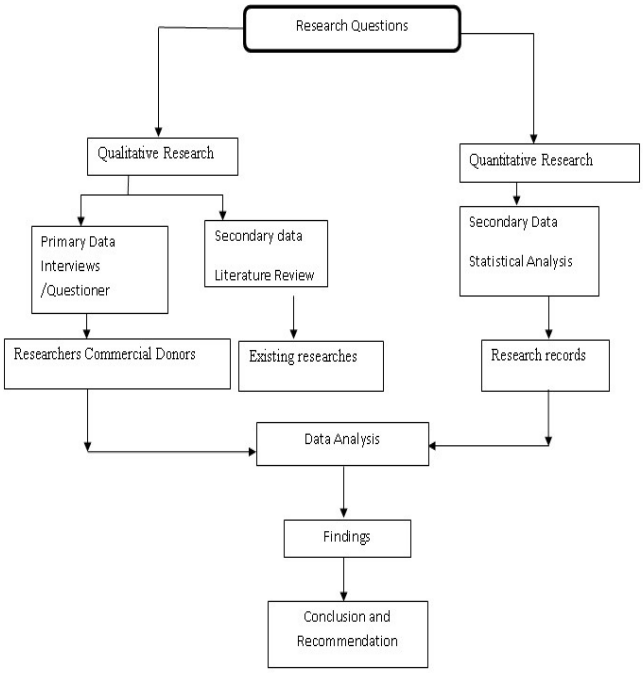


**Fig. 5. Flow Chart for Methodology**

After formation of the key questions, the appropriate primary and secondary sources of data were identified. The secondary data were obtained from the literature review and the primary data were collected from the interviews/questioner conducted for this research. 16 key performance indicators were identified on the basis of literature review and interviews conducted with experts in this field.

### 4.1. PRIMARY DATA COLLECTION

Qualitative and semi-structured interview and questioner guidelines were applied during collection of the primary data. These guidelines were adapted slightly during the course of research because of successively gained insights and also to follow up on key points made during interviews. Three main sources were used:

- Research institutions, and strategists (NDMA)
- Large institutional donors.
- Supply chain students and faculties
- Commercial logistics firms or philanthropic foundations established by such firms.

A unique questionnaire was developed and respondent were asked to rate each key performance indicators on scale of 1 to 5. The respondent people were chosen on the basis of rigorous selection criteria.

### 4.2. SECONDARY DATA COLLECTION

Qualitative and statistical data were collected through a literature review in order to provide a baseline of the state of information on a topic and to encourage ideas, both substantive and practical. The review was conducted in three steps. First, publications were identified and selected from a range of sources, including the following:

- Operational evaluations and case studies, especially those that include details on volume/ throughput/timeliness and bottlenecks in supply chains and last-mile delivery.
- Studies and reports on the subject of humanitarian spending (preparedness and relief) and efficiency
- Annual reports and industry reviews of corporate logistics capacities, volumes, and costs
- Disaster management plan of India.
- Disaster Management system in Japan
- Other studies and reports on external stakeholders' expectations of humanitarian logistics

## 5. CONCLUSIONS

Humanitarian supply chain is gaining attention throughout the world due to its unpredictable nature and the complexity associated with it. Various types of disaster (flood, earthquake, cyclone, tsunami and hurricane) have been affected millions of lives in the recent years. Moreover, post disaster activities like relief, recovery, rehabilitation, also affect the economy of the particular country. In this context, this research makes an attempt to improve the humanitarian logistics by identifying its key performance indicators and mitigate losses.

Numbers of natural disasters and the people affected by disasters have increased over recent years. The objective of disaster response in the humanitarian relief chain is to rapidly provide relief (emergency food, water, medicine, shelter, and supplies) to areas affected by such disaster.

## REFERENCES

[1] Jin, B. Performance implications of information technology implementation in an apparel supply chain. Supply Chain Management: An International Journal, Vol. 11 (4), (2006), pp. 309–316.

[2] Thomas, A.S.; Kopczak, L.R. From Logistics to Supply Chain Management: The Path Forward in the Humanitarian Sector. Fritz Institute.(2005)

[3] Kovács, G.; Spens, K. Humanitarian Logistics in Disaster Relief Operations. International Journal of Physical Distribution & Logistics Management 2007; 37(2):99–114.

[4] Humanitarian Logistics Cross-Sector Cooperation in Disaster Relief Management http://www.springer.com/us/book/9783642301858.

[5] Pettit, S. J.; Beresford, A. K. Emergency relief logistics: an evaluation of military, non-military and composite response models. International Journal of Logistics: Research and Applications, (2005) vol. 8, no. 4, pp. 313-331.

[6] Pettit, S.; Beresford, A. Critical success factors in the context of humanitarian aid supply chains. International Journal of Physical Distribution & Logistics Management, (2009), vol. 39, no. 6, pp. 450-468.

[7] Kovács, G.; Spens, K. Identifying challenges in humanitarian logistics. International Journal of Physical Distribution & Logistics Management, 2009, vol. 39, no. 6, pp. 506-528.

[8] Taniguchi, E.; Ferreira, F.; Nicholson, A. A conceptual road network emergency model to aid emergency preparedness and response decision-making in the context of humanitarian logistics. Procedia-Social and Behavioral Sciences, 2012, vol. 39, 307-320.

[9] Heaslip, V.; Hewitt-Taylor, J.; Rowe, N. Reflecting on nurses' views on using research in practice. In: British Journal of Nursing, January 2013, 9 (22), 1341-1344.

[10] Long, E. R.; D. D. MacDonald. Recommended uses of empirically derived, sediment quality guidelines for marine and estuarine ecosystems. Human and Ecological Risk Assessment, 1998. 4(5): 1019-1039.

[11] Seaman, J. Malnutrition in emergencies: how can we do better and where do the responsibilities lie? Disasters, 1999. 23 (4), 306–315.

[12] Towill, D.R. The seamless chain- the predator's strategic advantage, " International Journal of Technology Management, (1997), Vol. 13 (1), pp. 37–56.

[13] https://en.wikipedia.org/wiki/2014_India%E2%80%93Pakistan_floods.

[14] http://www.hindustantimes.com/india/in-50-pics-this-happened-when-a-flood-ravaged-j-k-in-2014/story-kxHtVyDRh5shLa8Oz86vAJ.html.

[15] https://en.wikipedia.org/wiki/Indian_Armed_Forces_and_the_Jammu_and_Kashmir_Floods, 2014.

[16] http://reliefweb.int/report/india/unprecedented-flood-havoc-jammu-kashmir-report.

[17] https://en.wikipedia.org/wiki/April_2015_Nepal_earthquake.

[18] http://www.dec.org.uk/appeal/nepal-earthquake-appeal.

[19] http://www.icimod.org/nepalearthquake2015.

[20] https://www.gov.uk/government/topical-events/nepal-earthquake-april-2015.