

A Major Project Report
On

“Identification of Key Performance Indicators in Humanitarian Logistics”

Submitted for the award of the degree of
Master of Business Administration (Executive)

by

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2K13/MBA/5022

Under the guidance

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DECLARATION

I hereby declare that the project report entitled "Identification of Key Performance Indicators in Humanitarian Logistics" is submitted by me to Delhi School of Management, Delhi Technological University in partial fulfillment of the requirement for the award of the degree Master of Business Administration (Executive) is a record of project work carried out by me under the guidance of Dr. R.S.Walia (Associate Professor) and Mr. Mohit Tyagi (Assistant Professor). I further declare that the work reported in this project has not been submitted for the award of any other degree in this institute or any other institute or university.

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ABSTRACT

This project report presents the key performance indicators in humanitarian logistics. Humanitarian supply chain is hot topic of discussion now days. A lot of focus is now being given on disaster management as we have been experiencing huge loss of life and infrastructure due to these natural and men made disaster, need of a well defined and structured rescue operation and loss mitigation plan can be experienced looking at several natural and men made disaster in past.

We all are aware of recent earthquake happened in Nepal. It resulted huge loss of life and economic loss, there was no adequate disaster management plan by Nepal government for such case.

This paper also identify performance indicators for a responsive humanitarian supply chain and tries to develop a structured plan to mitigate loss in such disasters.

Key performance indicators have been identified using factor analysis referring to various case studies, interviews conducted with experts in field of supply chain and logistics and questioner circulated to these experts and faculties and students of institute.

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

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CHAPTER 1: INTRODUCTION

1.1 DISASTER

When we talk about disaster, it 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). 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 (WHO).

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. 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.

1.2 HUMANITARIAN LOGISTICS IN THE DISASTER MANAGEMENT CYCLE

1.2.1 Response, Transition, Recovery, Mitigation and Preparedness

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. These phases are characterized by individual activities, which may overlap with activities of other phases. A transition phase is observed between response and recovery phases. It is the responsibility of Humanitarian supply chains to provide beneficiaries with the supplies in all the phases. Since supplies are introduced logistics tend to be important and association activities with logistic support follow the flow. The volume, variety of supplies and how urgent is the supply will change according to the phase in which it is required. Effectiveness of logistics units is improved by

Humanitarian logistics information systems improve the throughout the disaster management cycle and is continuous through different phases.

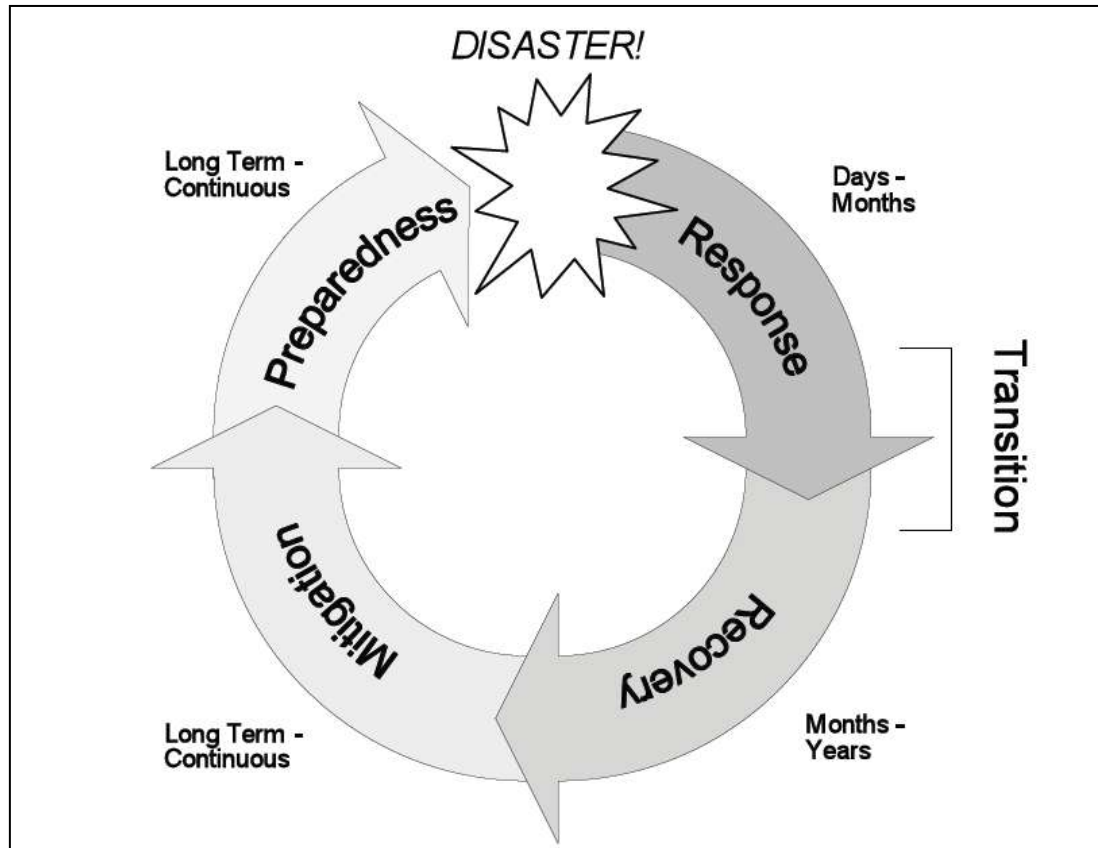


Figure1.1 Humanitarian Supply Chain Cycle

(Sourec: www.ijbmi.org)

1.2.2 Preparedness

The capability to response to the situation is improved in the 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 a organizational level capability to response to the situation. These activities discussed above are carried out throughout and are implemented before the disaster actually occurs.

Food, water, sanitization item, first aid/medical kit, a temporary shelter, kilts etc are considered to b emergency response supplies. The emergency response supplies tend to be less varied, as they are considered basics to sustain life.

Socio-cultural and economics play very less role when talking about Disaster management in comparison to human life so it becomes easier to define the above said emergency response Since intensity of damage by disaster cannot be evaluated before it is difficult to decide

whether procurement of supplies would be from local market or from some international market. The standardization of above items has done by both Medecins Sans Frontieres and the Red Cross. The warehouse can be created at some global centers or some pre-arrangement can be made from international vendors to have easy availability at crisis. Training of staff by the organization such as NGO to cope the situation, and a system that provides support to such staff and to place them required place becomes necessary. Majority of disaster response phase is held by activities of logistics and therefore this phase is responsible to improve the capability of logistic unit

1.2.3 Response

Soon after disaster response phase is initiated, 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. The duration response phase may vary from days to months, depending on the intensity of the disaster. Humanitarian logistics although plays vital role in this phase its impression in other phases cannot be ignored.

1.2.4 Transition

NGOs providing ongoing support monitoring mark start of the phase, support include assistance of as temporary shelter provision and stimulating basic social provisions. Strategic planning to move to transition from response activities implementation to longer term recovery and mitigation schedules is done by NGO's. the phase include activities, like suppliers identification to be either local or from international markets that provide supplies for longer period operations, ensure a smooth phase flow.

1.2.5 Recovery

This phase is responsible to attain status quo i.e. to help people get the same life that was before crisis. 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.

The supplies at this point are not that important as they were in previous phases. The scenario is same in mitigation phase. The activities for this phase are solely dependent on discretion of the local social-economic structure, which may vary hugely with different disasters for same area. New boats and equipment were distributed to fishermen by Humanitarian organizations

affected by 2004 Indian Ocean Tsunami whereas the needs of communities to recover from 2005 Kashmir Earthquake which is a landlocked area were quite different. Humanitarian organizations make sure procurement of supplies is done from local market in order to help local communities and avoid local markets being flooded with bulk of external supplies.

The recovery phase constitute a huge amount time when compare to other phases except preparedness which is ongoing process, and last for 5-10 years. The Indonesia government established a 5 year time duration plan for reconstruction after the Indian Ocean Tsunami, In April 2005 and activities for recovery are still ongoing in 2015, indicating the long time duration of the recovery phase. Logistic support is required during this phase for activities like supplies distribution and restoration of affected population lives.

1.2.6 Mitigation

Mitigation involves empowering the spirit of communities to natural hazards and to reduce the influence of adversity they cause. According to the precise susceptibility of the community these activities may include mangroves plantation for coastlines protection against cyclones, dams' construction and buildings reinforcement. Logistics support is required by Humanitarian organizations deploying these activities will , not on as large a scale as in the other phases.

1.2.7 Summary

Table 1.1 Depicts the comparison

| Phase | Preparedness | Response | Transition | Recovery | Mitigation |
|--------------------------------|---|---|--|----------|----------------------|
| Period | Long term-continuous | Days- months | Month- years | | Long term-continuous |
| Logistics volume | Low | High | Medium | | Low |
| Supplies required | Specific standard supplies pre-position for disaster response | Specific standard supplies: Water and sanitation equipments. Shelter, household kits etc. | Varied supplies depending on the context of the disaster: reconstruction material, livelihoods equipments. | | Varied supplies |
| Urgency | Low | High: lead time for supplies can make the difference between the life and death. | Medium: there may be government and donor pressure to complete recovery activities | | Low |
| Procurement of supplies | Local | International | Local – international | | Local |

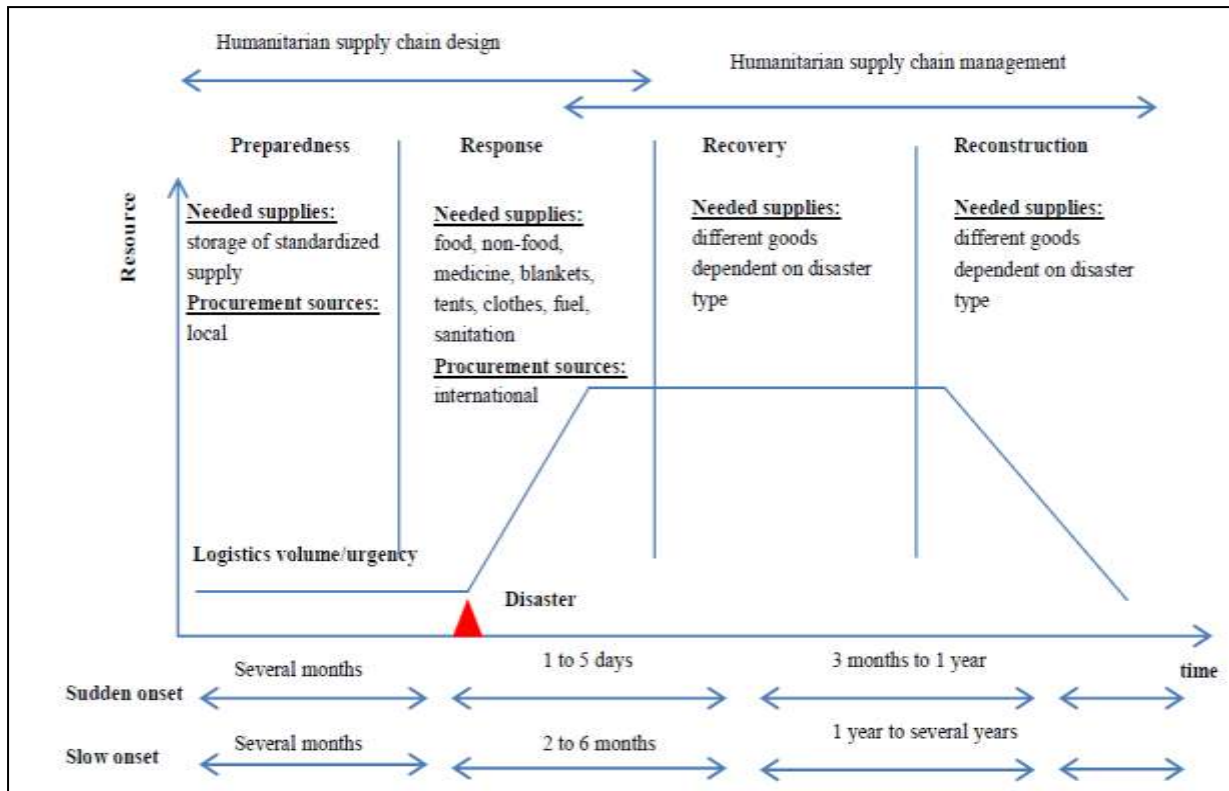


Figure 1.2 Disaster Management Cycle
 (Source: <http://www.springer.com/978-3-642-30185-8>)

1.3 HUMANITARIAN SUPPLY CHAIN

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. Humanitarian supply chain is generally characterized by low performance due to poor tactical planning that result its incapability to deploy the supplies and relief aid during crisis. Several past adversities have portrayed the triggering need for planning in humanitarian relief operation. Analytical Hierarchy Process (AHP) is used to build up an investigative framework that would assist the study of recognized criteria and sub criteria. The proposed framework would incorporate various outlook of humanitarian supply chain and assemble them into a hierarchical formation on based on priority. This hierarchical formation may provide a direction to people from academics and practices to offer better plan to mitigate and to attain quick relief to those made at risk.

1.4 HUMANITARIAN LOGISTS AND PLAYERS INVOLVED

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.

1.4.1 Governments

Local governments, adjoining country governments, and other country governments within the global society —are the triggers of humanitarian logistics rivulet after a disaster smack since they have the influence to sanction operations and activate supplies. In reality, without the local government approval, no other player—with the exclusion of national aid organization and the military—can function in the disaster drama. Local government approval is primary for the participation of other countries (neighbors or not). The involvement of other countries is a fragile matter since it can be assist or lump as a result of the relationship superiority between the local government and the international society (in many cases local countries do not enjoy good talks with their adjacent countries). Another significant role in the aid method can be contributed by international accords to which the local government pledges with other countries (e.g., the European Union, Asia–Pacific Economic Cooperation, North American Free Trade Agreement, Arab League, and African Union). Moreover, local governments have the liability to put into place code of behavior and take accomplishment to reduce the likelihood of disasters (mitigation).

1.4.2 Military

On many circumstances, the military has been a very significant actor since soldiers are called upon to offer primary support (i.e., hospital and camp instatement, telecommunications, and route revamp) thanks to their strategic planning and logistic potential.

1.4.3 Aid Agencies

Aid agencies are actors on account of which governments are able to assuage the suffering resulted by disasters. The leading agencies are global actors, but small provincial and national level aid agencies cannot be ignored.

1.4.4 Donors

Donors offer the mass of grant for major relief actions. Commonly, donations consist of offering monetary means (in-cash donations) to assist humanitarian operations or offering

supplies and/or services for free (in-kind donations) while making out logistics operations. Since each player within its own explicit role can give in-kind donations, in the humanitarian relationship model the term “donor” pass on to those who exclusively give monetary means to grant aid operations. Thus, in addition to national level granting offered by governments in past years, establishments, individual donors, and organization have become important sources of grant for aid agencies.

1.4.5 NGOs

NGOs include more than a few and dissimilar actors, varying from leading and international players, such as CARE (a leading humanitarian organization combating global poverty), to small and micro-organizations that build up within local communities but are also able to function at the international level. Some of these players are provisional, being formed just to deal with one particular disaster.

1.4.6 Private Sector Companies

The occurrence of private-sector companies (logistics and others companies) is progressively more in the humanitarian relief situation. In the humanitarian logistics, companies can play donors, collectors and/or providers.

As a donor, a company can assist humanitarian logistics by providing monetary donations (in cash) to grant operations. As a collector, a company can accumulate monetary means from its client, its members of staff, and its dealers in order to grant operations. As a provider, a company can provide its goods and services for free (in-kind donation) or as a result of a promotion action. In the humanitarian relationship model, when a company solely plays the role of donor and/or collector, it simply owes to the donors class. The model pass on to the company class only when the organization under consideration acts only or also as a provider.

Companies are able to provide technological assistance and logistics personnel and managers. They also provide explicit services that may no longer be accessible on the ground straight away after a disaster has happened, such as electricity supply, engineering elucidation, banking assistance, and postal services. To begin with, companies are stimulated to contribute in humanitarian attempt because they have pragmatic that gigantic losses are imposed when disasters break off the stream of their business; so they spend in re-establishing their business permanence. Working to assuage the monetary impact of such disturbance “makes good business sense”

Contained by the company class, logistics service contributors are outstanding contributors at each phase of a disaster-relief process through their logistics and supply chain organization core competence. Primary global logistics service contributors, such as Agility, Maersk ,DHL, UPS, FedEx , TNT have hoisted their capabilities in terms of the possessions, belongings, and knowledge collective with their humanitarian matching part. Thanks to their potential in improving the speed and competence of relief work, logistics companies are presuming a more important role as the partners of humanitarian organizations.

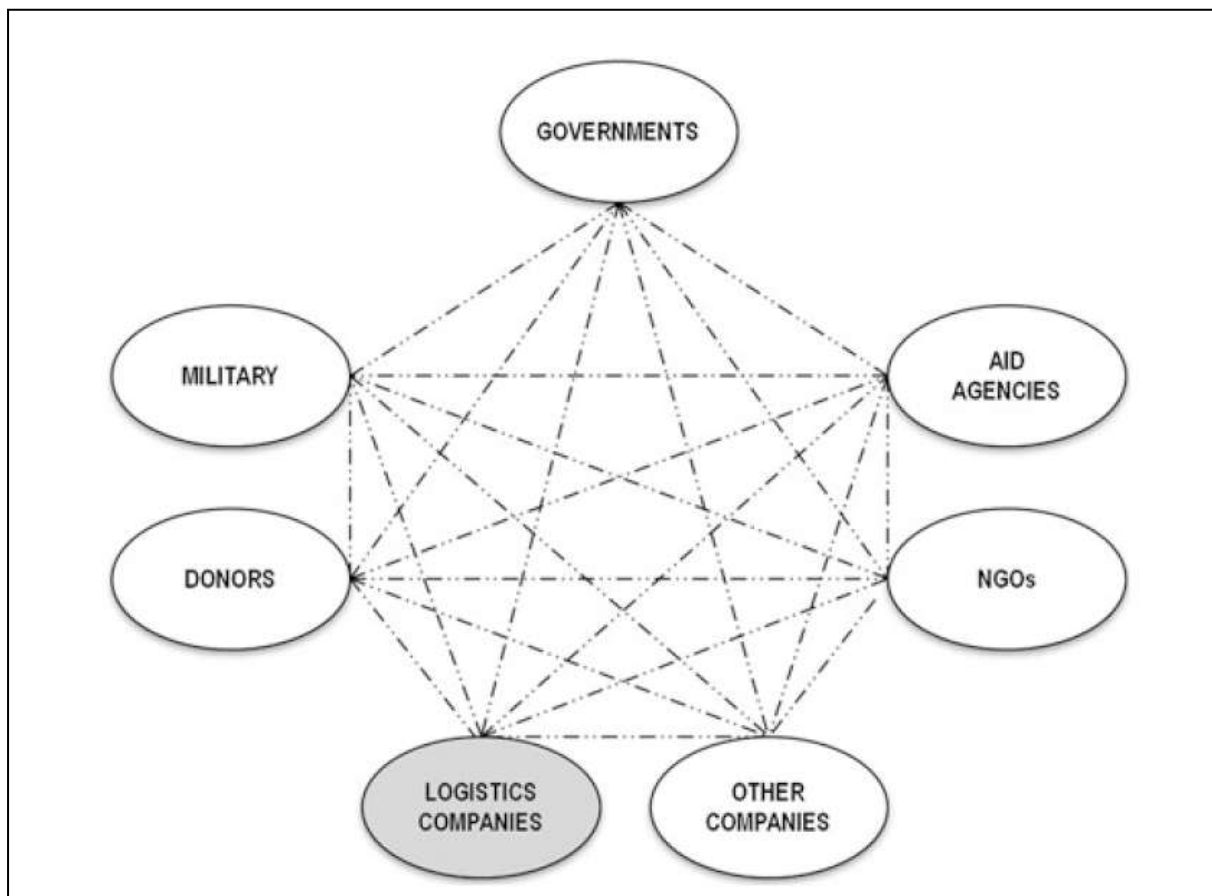


Figure 1.3 Major Player: Humanitarian Logistic

CHAPTER 2: LITERATURE SURVEY

2.1 RESPONSIVE HUMANITARIAN SUPPLY CHAIN

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. These various factors are categorized in this research as criteria and sub-criteria of an effective and responsive humanitarian supply chain are shown in figure, and also explained here in brief.

2.1.1 Strategic Planning

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 (Pettit and Beresford, 2009). Disaster management is a key factor that drives the successful execution of relief efforts, and it begins with strategic process design. It has been experienced that tsunami relief effort were adversely impacted by the lack of available trained and experienced humanitarians. Knowledge about the risk posed by identifying hazards becomes the basis of preparedness planning and mitigation actions. Strategic planning will also assist aid agencies in developing more effective inventory management and may lead to approaches such as pre-positioning.

2.1.1.1 Risk management

The concept of risk is a central issue for policy in areas as diverse as health, environment, technology, finance and security. Living with natural processes that are periodically hazardous means that people have choices to make, even though differences in social and cultural beliefs and characteristics may result in some communities and individuals having many more options open to them than others, and these choices can have consequences for themselves and others. It is because these consequences are uncertain, and may leave us better or worse off, that we talk about „risk. Disaster risk management is a broader concept and practices as a pre-disaster stage. The process of risk management in context for

humanitarian supply chain looks at how this value, human safety, which is threatened by disasters, and modified by vulnerabilities.

2.1.1.2 Advance Technology

Humanitarian needs robust equipment that can be set up and dismantled quickly. It's very unfortunate that logisticians often have to work with aged and fragmented i.e. poor early warning system. A warning system must empower individuals, communities and businesses to respond timely and appropriately to hazards in order to reduce the risk of death, injury, property loss and damage. Warnings must get the message across and stimulate those at risk to take action.

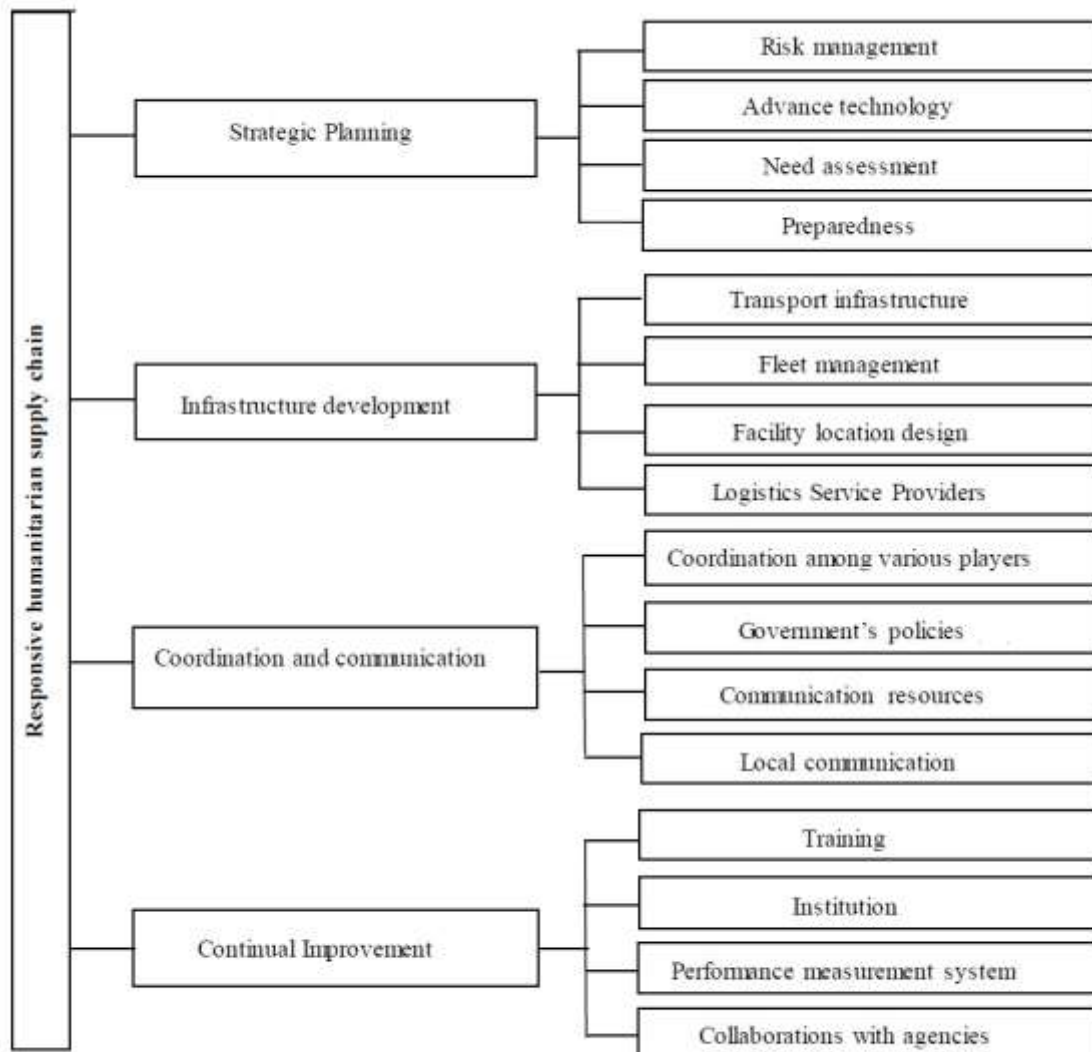


Fig. 3 Hierarchical model for the study of responsive humanitarian supply chain

2.1.1.3 Need Assessment

Need assessment after a disaster refers to identify and quantify the resources needed for rehabilitation, recovery and reconstruction. Proper needs assessment facilitates identification of existing opportunities for future development and charting a recovery strategy that goes beyond restoring what existed prior to the disaster.

2.1.1.4 Preparedness

Preparedness in the field of disaster management can best be defined as a state of readiness to respond to a disaster, crisis, or any other type of emergency situation. Preparedness consists of four basic elements: preparing a plan, acquiring equipment, training to the plan, and exercising the plan.

2.1.2 Infrastructure Development

In general, 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 (Kovács and Spens, 2009).

2.1.2.1 Transport Infrastructure

The disasters affect the infrastructure of transport, communications and logistical support, besides causing an interruption of fuel supply, a crucial factor for limiting all response activities. Sudden-onset disasters have a strong negative impact on the physical infrastructure of the region, destroying transport infrastructure such as bridges and airfields, electricity networks and communication infrastructure (Kovács and Spens, 2009).

2.1.2.2 Fleet Management

It is the selection, management and maintenance of vehicles and logistics assets with the aim of providing the effective and efficient movement of goods and personnel to achieve the operational goals of the delegation. Its aim in the context of the humanitarian supply chain is to transport of relief items in-country and to beneficiaries, transport of staff and materials related to development program.

2.1.2.3 Facility Location Design

Facility location and stock pre-positioning decisions in a humanitarian relief chain responding to quick-onset disasters. Facility location decisions affect the performance of relief operations, since the number and locations of the distribution center and the amount of relief supply stocks held therein directly affect the response time and costs. A demand point is treated as covered only if a facility, or a set of facilities, is available to provide the required service to the demand point within a required distance or time.

2.1.2.4 Logistics Service Providers

Logistics is an essential humanitarian supply chain activities for shipping goods and relief resources. Potential benefits like efficient shipping of relief resources can be achieved through cooperation between logistics service providers (LSPs).

2.1.3 Coordination and Communication

Coordination is a practice of individual understanding towards a common goal to avoid communication and information within and among organizations. Cozzolino (2012) 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 (Heaslip et al., 2012). Humanitarian logistics information systems improve the effectiveness of logistics units throughout the disaster management cycle and can provide continuity throughout the various disaster phases.

2.1.3.1 Coordination among Various Players

Despite various advantages the coordination among various NGOs, international organizations, donor governments, and military forces is often difficult (Cozzolino,2012). Because, in developing a disaster risk management system, no single agency can provide a fully comprehensive solution. It is essential that agencies work together and with stakeholders to narrow knowledge gaps and to advance disaster risk management plans using a coordinated attitude.

2.1.3.2 Government Policies

Policy decisions and actions taken during prevention and mitigation have enormous and far reaching impacts on all stages of post disaster management. The government should produce a long-term policy for monitoring disasters, risk analysis and procurement of latest equipment. Good governance is encouraged by robust legal and regulatory agenda and

reinforced by a long-term political commitment and effective institutional arrangements. Effective governance arrangements should encourage local decision-making and participation which are supported by broader administrative and resource capabilities at the national or regional level.

2.1.3.3 Communication Resources

A good communication and information system can play an important role in delivering the right information to support resource allocations by humanitarian (Taniguchi et al., 2012). Long and Wood (1995) 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. Real time communications are “the most important method of reacting quickly for effective coordination”. Achieving a balance in the use of communication systems is important.

2.1.3.4 Local Communication

The problems that arise during disaster relief operations may differ depending on various factors, such as the type, impact, and location of the disaster, and local conditions in the affected regions. As the disasters affect the infrastructure of transport, communications and logistical support, lack of knowledge about the local language and nearby safe place, causes a major challenge to relief agencies and NGO’s. Moreover, it has also become difficult to communicate the pre-disaster warning, as disaster affected area are hilly, coastal, and at remote locations.

2.1.4 Continuous Improvement

It is recognized that if commercial supply chain solutions are to meet the needs of the “market place,” organizations need to focus on having a holistic and continuous improvement approach to meeting the needs of the customer. There is no reason to believe that HA organizations could not learn from this approach like performance measurement system to measure the effectiveness of the whole supply chain. Establishing institutions, training to vulnerable communities and collaborations with other agencies help in order to improve the effectiveness of their distribution and response networks.

2.1.4.1 Training

Creating specific and standard disaster response training geared towards the higher perception of a Logistician's role in general. This consequently will help humanitarians to achieve the overall goal of humanitarian aid. The unpredictable nature of emergencies makes it difficult to retain well trained employees, and those who have been trained are often volunteers who can only work for short periods before they must return to their "real world" jobs.

2.1.4.2 Institutions

Natural calamities have a more devastating impact in various Asian countries due to inadequate policies and lack of institutions related to disaster management. Hence, disaster mitigation requires involvement of government institutions with operational planning, education and training.

2.1.4.3 Performance Measurement System

A performance measurement system plays an important role in managing a business as it provides the information necessary for decision-making and actions. Performance measurement for the humanitarian relief chain by comparing different organizations was developed by. The authors develop a simulation model and a relief-specific performance measurement system to identify system factors that contribute most significantly to overall performance.

2.1.4.4 Collaborations with Agencies

The Collaboration refers to work done along a single organization's supply chain or in cooperation with another agency. Collaboration within the HA supply chain can work in a number of ways. In the context of humanitarian supply chain, it is needed to expand the collaborations for sharing resources with or by other NGO's, INGO's, WHO, UNESCO, IFRC, and academia too. Aid agencies do collaborate with commercial logistics organisations in order to improve the effectiveness of their distribution network

CHAPTER 3:CASE STUDY

3.1 2001 GUJRAT EARTHQUAKE

A strong Earthquake of magnitude 6.9 on Richter-Scale shocked the Gujarat, India on the 26th January, 2001. It set off extensive widespread to life & possessions. This earthquake was so upsetting in its scale and anguish that the same of it had not been occurred in past 50 years. Leaving thousands critically wounded, hurt and handicapped; physically, sensitively and economically. The epicenter was at northeast of Bhuj Town ,Kutch district, Western Gujarat. 23 kms below surface of earth, this quake produce powerful trembling which was felt in 70% area of India and distant in adjacent Pakistan and Nepal too. Followed by severe aftershock that turn out to be continued source of concern for the general public.

The Seismicity of the exaggerated area of Kutch is identified for high prevalence of earthquakes not only in recent times but in historical past too. It falls in Seismic Zone V. The only such zone that doesn't lie in Himalayan Seismic Belt. In last 200 years important destructive earthquakes occurred in 1819, 1844, 1845, 1856, 1869,1956 in the same area as 2001 earthquake.



Figure 3.1 Damaged building in Gujrat Earthquake 2001

21 of the total 25 districts of the state was influenced in this quake. 18 towns, 182 talukas and 7904 villages in the influenced districts have seen large-scale damage. The influenced areas

even extend up to 300 km from the epicentre. In the Kutch District, four major metropolitan areas – Anjar , Bhuj, Rapar and Bachau endure near total damage. The rustic areas in the area are also very worse influenced with over 450 villages almost totally destroyed.

In addition, wide extended destruction also occurred in Surendranagar, Rajkot, Patan, Jamnagar and Ahmedabad districts. Other Urban areas such as Jamnagar, Rajkot, Ganhidham, and Morvi have also saw damage to major building, road and rail network and industrial setup. Ahmedabad the Gujrat's Capital was also adversely. Gujarat Earthquake is very important from the opinion of earthquake disaster mitigation in India. The tribulations faced in this disaster are no poles apart from other major past earthquakes in the world. The question in the recovery and reconstruction phase are: the appropriate comprehends risk among different people associated with situation, preparation and assurance housing among the experts and masons with suitable strategic development planning.

This quake has gave numerous illustration of geo-technical and structural malfunction. The cultural insight of design and construction exercise of engineered buildings widespread in this country came under censure for the first time. It has cause across-the-board knowledge on what needs to be done in this context.

Loop holes in disaster management during Gujrat Earthquake

- No or poor strategic plan for relief process after disaster.
- Lack of harmonization and incorporation between players of humanitarian supply chain.
- Lack of technical system- no alarming system to alert population before disaster as it is done in country like Japan.
- Donations for relief processes by NGOs, individuals etc. took more time than expected to reach beneficent.
- Lack of susceptibility.

3.2 TSUNAMI 2004

An undersea mega thrust earthquake occurred on 26 December 2004, with an epicenter of the west coast of Sumatra, Indonesia. The quake itself is recognized by the technical community the Sumatra–Andaman earthquake. This resulted in tsunami that was given various names, including the South Asian tsunami, 2004 Indian Ocean tsunami, the Christmas tsunami, Indonesian tsunami and the Boxing Day tsunami.

According to the U.S. Geological Survey a total of 227,898 people died. Considering in lives lost, this is considered one of the ten worst earthquakes that are recorded in past history. This

was also single worst tsunami in history. Indonesia was the worst influenced area, with highest death toll of about around 170,000. On the other hand, another report by Siti Fadilah Supari, the Indonesian Minister of Health at the time of crisis, anticipated the death toll to be as huge as 220,000 in Indonesia alone, and a total of 280,000 fatalities.



Figure 3.2 Tsunami 2004

The tsunami lead to severe destruction and deaths extended to the east coast of Africa, with the farthest recorded death that happens because of tsunami occurred at Rooi Els in South Africa, 8,000 km (5,000 mi) away from the epicenter. In total, 8 people in South Africa died due to peculiarly high sea levels and waves. The below table demonstrates Tsunami in various countries

Loop holes in disaster management during Tsunami 2004

- No or poor strategic plan for relief process after disaster.
- Lack of incorporation between players of humanitarian supply chain.
- Lack of technical system- no alarming system to alert population before disaster as it is done in country like Japan.
- Donations for relief processes by NGOs, individuals etc. took more time than expected to reach beneficent.
- Lack of susceptibility.

Table 3.1 Various Global Tsunamis

| Country where deaths occurred | Confirmed | Estimated¹ | Injured | Missing | Displaced |
|--------------------------------------|------------------|------------------------------|----------------|----------------|------------------|
| Tanzania | 10 | 13 | n/a | n/a | n/a |
| Bangladesh | 2 | 2 | n/a | n/a | n/a |
| South Africa | 2 | 2 | n/a | n/a | n/a |
| Yemen | 2 | 2 | n/a | n/a | n/a |
| Kenya | 1 | 1 | 2 | n/a | n/a |
| India | 12,405 | 18,045 | n/a | 5,640 | 647,599 |
| Sri Lanka ² | 35,322 | 35,322 | 21,411 | n/a | 516,150 |
| Indonesia | 130,736 | 167,799 | n/a | 37,063 | 500,000 |
| Maldives | 82 | 108 | n/a | 26 | 15,000+ |
| Thailand | 5,395 | 8,212 | 8,457 | 2,817 | 7,000 |
| Somalia | 78 | 289 | n/a | n/a | 5,000 |
| Malaysia | 68[66] | 75 | 299 | 6 | 5,000+ |
| Myanmar (Burma) | 61 | 400–600 | 45 | 200 | 3,200 |
| Madagascar | n/a | n/a | n/a | n/a | 1,000 |
| Seychelles | 3 | 3 | 5 | n/a | 200 |
| Total | 184,167 | 230,273 | 125,000 | 45,752 | 1.74 million |

3.3 UTTARAKHAND FLOOD 2013

In June 2013, a multi-day cloudburst centered on the North Indian state of Uttarakhand caused devastating floods and landslides becoming the country's worst natural disaster since the 2004 tsunami. Though some parts of Himachal Pradesh, Haryana, Delhi and Uttar Pradesh in India experienced the flood, some regions of Western Nepal, and some parts of Western Tibet also experienced heavy rainfall, over 95% of the casualties occurred in Uttarakhand. As of 16 July 2013, according to figures provided by the Uttarakhand

government, more than 5,700 people were "presumed dead. This total included 934 local residents.



Figure 3.2: Uttarakhand Flood 2013

Destruction of bridges and roads left about 100,000 pilgrims and tourists trapped in the valleys leading to three of the four Hindu Chota Char Dham pilgrimage sites. The Indian Air Force, the Indian Army, and paramilitary troops evacuated more than 110,000 people from the flood ravaged area. Landslides, due to the floods, damaged several houses and structures, killing those who were trapped. The heavy rains resulted in large flashfloods and massive landslides. Entire villages and settlements such as Gaurikund and the market town of Ram Bada, a transition point to Kedarnath, have been obliterated, while the market town of Sonprayag suffered heavy damage and loss of lives.

Pilgrimage centres in the region including Gangotri, Yamunotri, Kedarnath and Badrinath, the hallowed Hindu Chardham (four sites) pilgrimage centers, are visited by thousands of devotees, especially after the month of May onwards. Over 70,000 people were stuck in various regions because of damaged or blocked roads. People in other important locations like the Valley of flowers, Roopkund and the Sikh pilgrimage centre Hemkund were stranded for more than three days. National Highway 58, an important artery connecting the region was also washed away near Jyotirmath and in many other places. Because summers have more number of tourists, the number of people impacted is substantial. For more than three days, stranded pilgrims and tourists were without rations or survived on little food. The roads were seriously damaged at more than 450 places, resulting in huge traffic jams, and the floods caused many cars and other vehicles to be washed away. On 18 June, more than

12,000 pilgrims were stranded at Badrinath, the popular pilgrimage center located on the banks of the Alaknanda River. Rescuers at the Hindu pilgrimage town of Haridwar on the river Ganga recovered bodies of 40 victims washed down by the flooded rivers as of 21 June 2013. Bodies of people washed away in Uttarakhand were found in distant places like Bijnor, Allahabad and Bulandshahar in Uttar Pradesh. Searching for bodies who died during the extreme natural fury of June in Kedar valley continued for several months and even as late as September, 2013, about 556 bodies were found out of which 166 bodies were found in highly decomposed state during fourth round of search operations.

Gaps in disaster management during Uttarakhand Flood 2013

- Lack of vigilance by authorities, which resulted in illegal construction in prohibited areas (in valley near temple).
- No regulation on footfall of tourists, overcrowded place led to face difficulties in relief activities by army personals.
- Lack of planning of relief activities after disaster.
- Lack of co-ordination and integration between players of humanitarian supply chain.
- Lack of technical structure- no pre disaster alarm system to alert population.
- Donations for relief activities by NGOs, individuals etc. took more than expected time to reach victims of Uttarakhand flood victims.
- Lack in infrastructure.
- Lack of sustainability

3.3 JAMMU & KASHMIR FLOOD 2014

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 neighbourhood, 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, Gogji Bagh and Wazir Bagh neighbourhoods 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.



Figure 3.3: Jammu & Kashmir flood 2014

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 Narendra Modi 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.

3.4 NEPAL EARTHQUAKE 2015

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 equipments in the rescue operation.



Figure 3.4: Nepal Earthquake 2015

CHAPTER 4: RESEARCH METHODOLOGY

4.1 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.

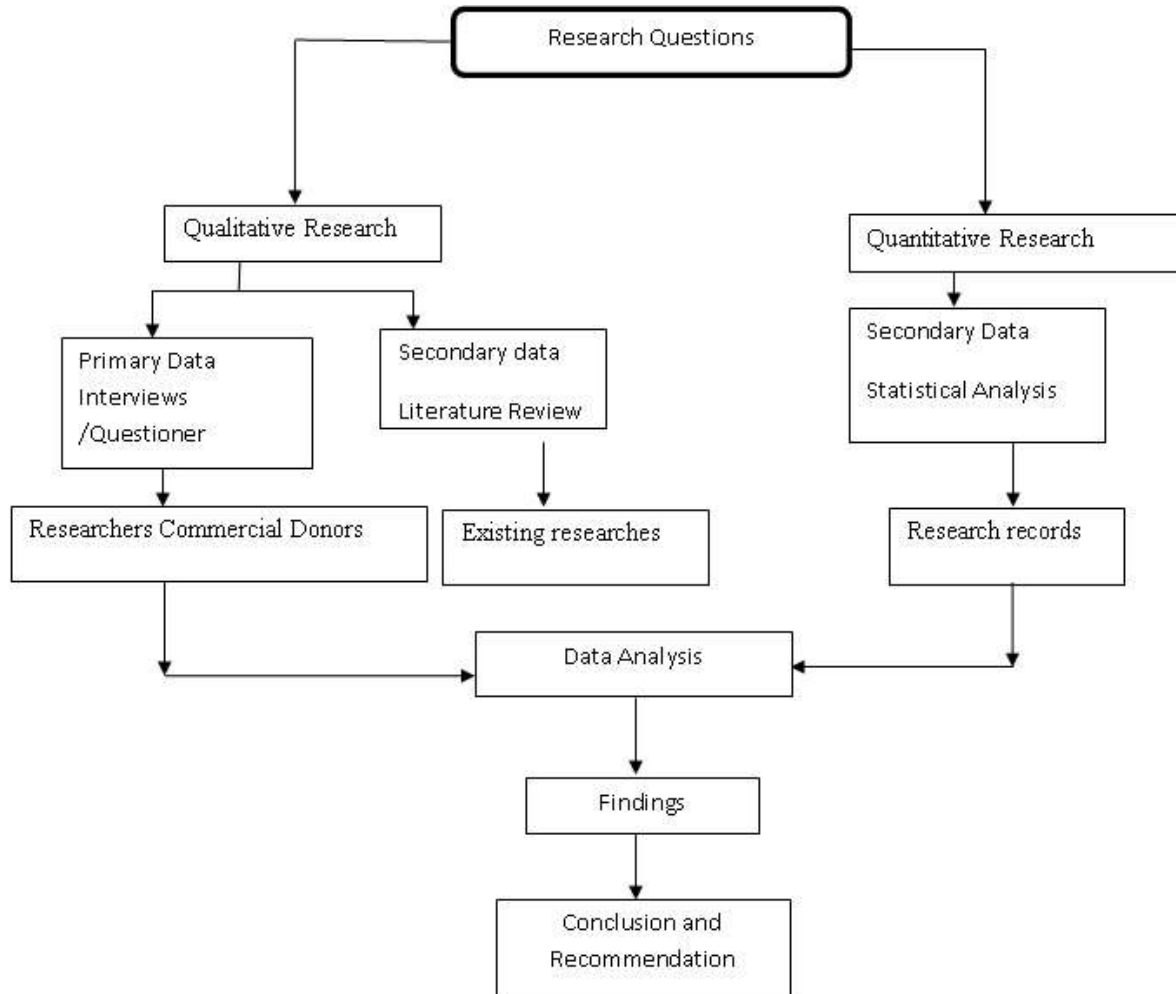


Figure 4.1 Flow Chart for Methodology

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. The data were tabulated, which led to a set of findings that were analyzed, resulting in the creation of a set of recommendations using Factor analysis. Each step of the methodology is described in the following subsections:

4.1.1 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.

4.1.2 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

In the second step, the most relevant and updated sources were chosen for closer scrutiny and use in this research. By critically reviewing the available literature, an attempt was made to establish the following aspects of humanitarian logistics:

- Main characteristics and recent trends
- Important factors shaping the future of this sector
- Possible trends in the future

4.1.3 Key Performance Indicators (KPIs)

1. Strategic planning
2. Inventory Management
3. Transportation Planning
4. Capacity Planning
5. Information Management
6. Facility Location
7. Level of Technology
8. Co-ordination among various players
9. Government Policies
10. Communication
11. Training of rescue team
12. Performance Measurement System
13. Disaster Management Institutes
14. Nation's Relation with other countries
15. level of participation of citizens
16. Infrastructure- road connectivity

4.1.4 Data Analysis

The information collected from the literature review and the interviews was duly categorized and incorporated in tables. The key performance indicators as a result of primary and secondary research and response of respondent were tabulated and factor analysis was done on it. The following findings were obtained after analysis:

Total Variance Explained

Factor Loading

Communalities

| | Initial |
|----------|---------|
| VAR00001 | 1.000 |
| VAR00002 | 1.000 |
| VAR00003 | 1.000 |
| VAR00004 | 1.000 |
| VAR00005 | 1.000 |
| VAR00006 | 1.000 |
| VAR00007 | 1.000 |
| VAR00008 | 1.000 |
| VAR00009 | 1.000 |
| VAR00010 | 1.000 |
| VAR00011 | 1.000 |
| VAR00012 | 1.000 |
| VAR00013 | 1.000 |
| VAR00014 | 1.000 |
| VAR00015 | 1.000 |
| VAR00016 | 1.000 |

Extraction Method:
Principal Component
Analysis.

| Component | Initial Eigenvalues | | | Rotation Sums of Squared Loadings | | |
|-----------|---------------------|---------------|--------------|-----------------------------------|---------------|--------------|
| | Total | % of Variance | Cumulative % | Total | % of Variance | Cumulative % |
| 1 | 2.429 | 15.179 | 15.179 | 1.883 | 11.767 | 11.767 |
| 2 | 1.975 | 12.346 | 27.524 | 1.823 | 11.396 | 23.163 |
| 3 | 1.848 | 11.548 | 39.072 | 1.812 | 11.328 | 34.491 |
| 4 | 1.638 | 10.236 | 49.308 | 1.786 | 11.163 | 45.654 |
| 5 | 1.496 | 9.350 | 58.658 | 1.699 | 10.621 | 56.275 |
| 6 | 1.256 | 7.853 | 66.511 | 1.638 | 10.235 | 66.511 |
| 7 | .906 | 5.663 | 72.173 | | | |
| 8 | .828 | 5.177 | 77.350 | | | |
| 9 | .698 | 4.360 | 81.710 | | | |
| 10 | .653 | 4.080 | 85.789 | | | |
| 11 | .582 | 3.639 | 89.428 | | | |
| 12 | .485 | 3.030 | 92.458 | | | |
| 13 | .388 | 2.427 | 94.885 | | | |
| 14 | .349 | 2.181 | 97.067 | | | |
| 15 | .299 | 1.869 | 98.935 | | | |
| 16 | .170 | 1.065 | 100.000 | | | |

Table 4.1.1.1 Extraction Method: Principal Component Analysis.

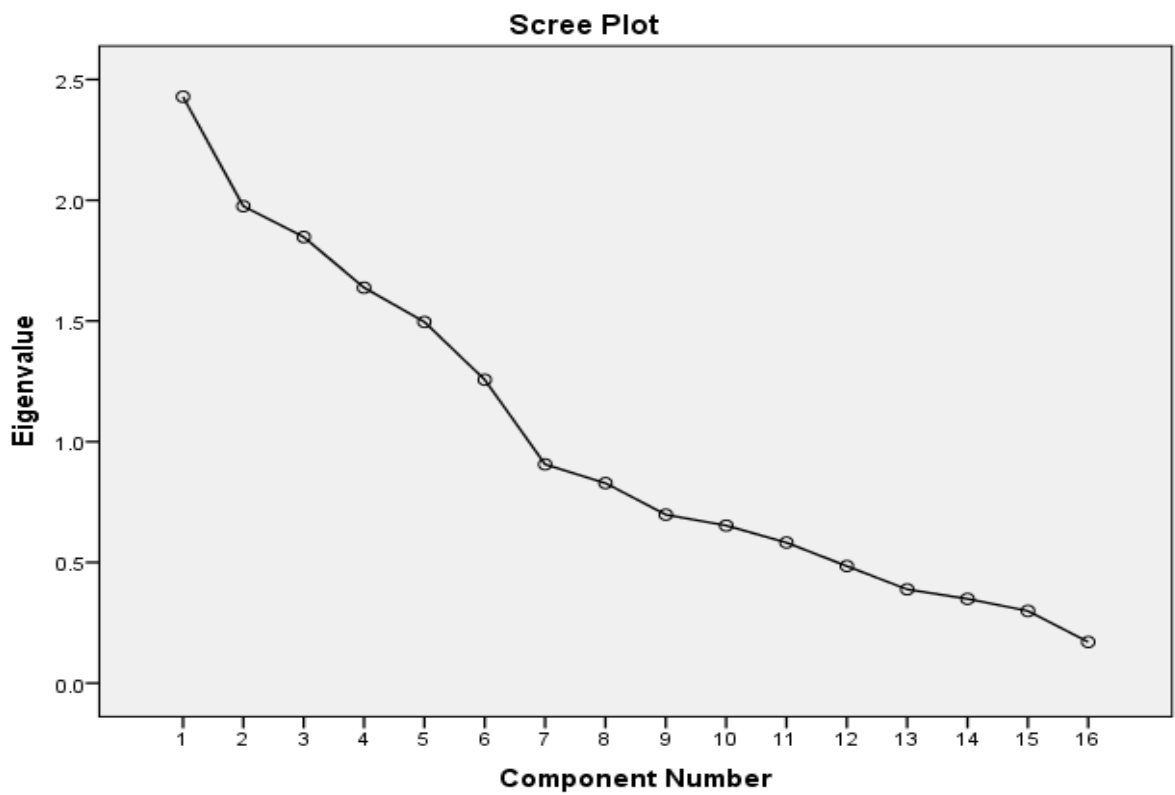


Figure 4.1.2 Scree plot graph

Table 4.1.1.2 Rotated Component Matrix

| | Component | | | | | |
|----------|-----------|-------|-------|-------|-------|-------|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| VAR00001 | -.549 | -.249 | .466 | -.324 | .325 | |
| VAR00002 | | | -.212 | -.576 | .190 | -.366 |
| VAR00003 | | .109 | -.113 | .760 | | |
| VAR00004 | .768 | | | -.172 | | |
| VAR00005 | | .842 | .137 | | | |
| VAR00006 | .208 | .205 | | | .119 | .772 |
| VAR00007 | .293 | .132 | .150 | .192 | .147 | -.660 |
| VAR00008 | .731 | -.201 | .360 | .108 | | .160 |
| VAR00009 | -.367 | .567 | .139 | -.160 | | .269 |
| VAR00010 | .107 | | -.636 | | .447 | .196 |
| VAR00011 | -.349 | -.351 | -.439 | .305 | -.243 | |
| VAR00012 | | .219 | .775 | .106 | -.121 | |
| VAR00013 | | | .100 | .205 | -.774 | |
| VAR00014 | -.194 | -.292 | .127 | .696 | | -.237 |
| VAR00015 | | | | .157 | .783 | |
| VAR00016 | | -.584 | .332 | | -.161 | .502 |

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 10 iterations.

Table 4.1.1.3 Component Transformation Matrix

| | 1 | 2 | 3 | 4 | 5 | 6 |
|---|-------|-------|-------|-------|-------|-------|
| 1 | .005 | -.496 | .353 | .497 | -.592 | .179 |
| 2 | .738 | .433 | .495 | -.074 | -.131 | -.018 |
| 3 | .578 | -.241 | -.551 | .444 | .166 | -.282 |
| 4 | -.245 | .026 | .366 | .198 | .098 | -.870 |
| 5 | -.247 | .673 | -.124 | .660 | -.030 | .185 |
| 6 | .025 | -.233 | .422 | .273 | .771 | .313 |

4.1.5 Findings

After doing factor analysis on 16 performance indicators of humanitarian supply chain we reduced it to 6 most important performance indicators which can help in developing a strategic plan to mitigate loss and avoid large economic losses bellow mentioned are key performance indicators.

- Infrastructure- road connectivity
- Strategic planning
- Inventory Management
- Transportation Planning
- Capacity Planning
- Information Management

4.1.6 Conclusion

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.

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8. Developing A Framework To Study The Various Issues of Humanitarian Supply Chains **Akhilesh Barve and Devendra K. Yadav**

ANNEXURE 1

Questioner

Rate the following key performance indicators on scale of 1 to 5, 1 being the least important and 5 being most important

| S.No | Key performance indicator | 1 | 2 | 3 | 4 | 5 |
|------|--|---|---|---|---|---|
| 1. | Strategic planning | | | | | |
| 2. | Inventory Management | | | | | |
| 3. | Transportation Planning | | | | | |
| 4. | Capacity Planning | | | | | |
| 5. | Information Management | | | | | |
| 6 | Facility Location | | | | | |
| 7. | Level of Technology | | | | | |
| 8. | Co-ordination among various players | | | | | |
| 9. | Government Policies | | | | | |
| 10 | Communication | | | | | |
| 11. | Training of rescue team | | | | | |
| 12 | Performance Measurement System | | | | | |
| 13. | Disaster Management Institutes | | | | | |
| 14. | Nation's Relation with other countries | | | | | |
| 15. | level of participation of citizens | | | | | |
| 16. | Infrastructure- road connectivity | | | | | |