

Major Project

On

“Identification and Analysis of Challenges and Innovations in Humanitarian Supply Chain”

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January – May, 2016

DECLARATION

I, Ragesh Ramachandran student of EMBA 2014-2016 batch of Delhi School of Management, Delhi Technological University, Bawana road, Delhi-42 declare that term project on “**Identification and Analysis of Challenges and Innovations in Humanitarian Supply Chain**” submitted in partial fulfilment of Executive MBA programme is the original work conducted by me.

The information and data given in the report is authentic to the best of my knowledge.

This Report is not being submitted to any other University for award of any other Degree, Award and Fellowship.

Ragesh Ramachandran

Sign

Place: New Delhi

Date: 28 May 2016.

CERTIFICATE

This is to certify that Minor Project Report titled “**Identification and Analysis of Challenges and Innovations in Humanitarian Supply Chain**” is a bonafide work carried out by Ragesh Ramachandran of our Delhi School of Management, Delhi Technological University, Delhi for fulfilment of Executive – Master of Business Administration (E–MBA) degree.

He has worked under my guidance and supervision.

Dr. Mohit Tyagi

Assistant Professor – DTU

ACKNOWLEDGEMENT

Due to the fact that all the knowledge required was not in the literature, it was imperative that the people who guide be very resourceful and knowledgeable. A deep sense of gratitude for the above reason is thus owed to Dr. Mohit Tyagi for his continuous guidance and motivation and for helping in whatever capacity he could at various stages in the project. I would like to thank for his support in all matters, whenever required. I really appreciate his involvement in the project and his regular advices that helped me to refine the project as I went along and also to include all the points that helped significantly with the growth in my learning.

I would also like to thank our Head of Department Prof. P.K. Suri for his constant motivation and sensitization. His thoughts have been very helpful.

I am also thankful for all the faculty members of Delhi School of Management, Delhi Technological University, Delhi for their support and encouragement throughout my work.

Ragesh Ramachandran

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Introduction:

The motive of the humanitarian supply chain is to provide relief and assistance to the people who are affected by natural and man-made disasters. The objective is to reduce the pain and sufferings of the human beings affected and displaced during these natural disasters and calamities.

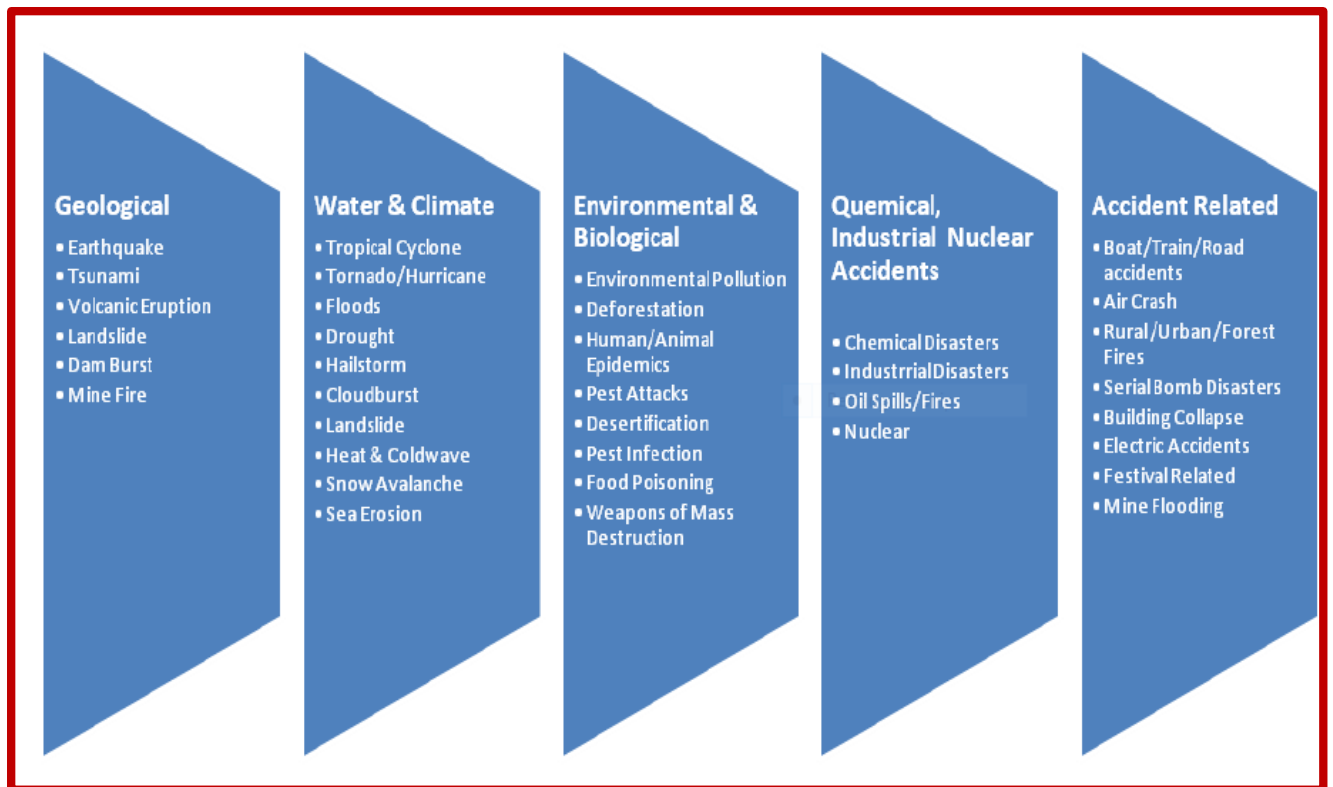
In today's world, Humanitarian Supply Chain should be rapid and agile through which the humanitarian assistance can be extended to the people in need in the shortest possible time.

Supply chain management is key to a successful disaster relief operations because effectiveness, efficiency and speed in supplying beneficiaries with health, food, shelter, water, medicines and sanitation are essential in case of a disaster (**Thomas and Kopczak, 2005**).

Tomasini and Van Wassenhove (2009) stated that around “**80 per cent of the costs for relief operations consist of logistics costs in the form of procurement and transportation**”. It reaffirms the fact that Humanitarian Logistics is the most challenging area of entire humanitarian supply chain.

The increasing number of natural disasters and the resulting humanitarian emergencies puts pressure on international and national humanitarian organizations to deliver humanitarian assistance in most suitable and cost-effective way (**Thomas and Kopczak, 2005; Van Wassenhove, 2006; Oloruntoba and Gray, 2006; Kovács and Spens, 2007**).

Presently disaster relief operations field is increasing and unfortunately will continue to be a growth sector. Natural and man-made disasters are expected to increase by another five-fold over the next fifty years due to global environmental exploitation, changing patterns in urbanization, climate change impact and other various health epidemics like EBOLA outbreak in West Africa, ZIKA Virus threat and increasing number of cases of HIV/AIDS in the developing world. The man-made disasters continue to create havoc in countries like Syria, Yemen, Iraq, South Sudan and Somalia.



Figures 1.1.: Types of Hazards as cited in Kahn et al (2008)

Natural disasters in India, many of them related to the climate of India, cause massive losses of Indian life and property. The main causes of natural catastrophe in India are:

- ✓ Droughts;
- ✓ Earthquakes;
- ✓ Flash Floods;
- ✓ Cyclones;
- ✓ Landslide occur due to torrential rains;
- ✓ Avalanches;
- ✓ Other dangers include frequent summer dust storms
- ✓ Floods are the most common natural disaster in India.

Objective of Study

The main objectives of the study are:

- ✓ To build a safe and **disaster resilient place** by developing a holistic, proactive, multi-disaster oriented and technology driven strategy through a culture of prevention, mitigation, preparedness and response.
- ✓ To reach out to **maximum people with relief items in the shortest possible** time during any unforeseen emergency / natural **catastrophe by making humanitarian supply chain smooth and agile by unplugging bottlenecks** which were learnt from past experiences during humanitarian relief works.
- ✓ To deliver humanitarian aid not only on time, but also ensuring it is done in the most **cost-effective way by continuously applying innovative ideas to optimize the benefits to the larger masses.**

Literature Review:

A lot of literature has affirmed the importance of supply chain in humanitarian relief works. This review has mainly focused in identifying the present challenges and innovations in the field of Humanitarian Supply Chain. The following journals, research papers, bulletins, books, news items on various websites have been extensively reviewed for collection of secondary data:

| S.no. | Author | Work Done |
|--------------|--|--|
| 1. | Henrietta Buddas , (2014) | 2014),"A bottleneck analysis in the IFRC supply chain", Journal of Humanitarian Logistics and Supply Chain Management, Vol. 4 Iss 2 pp. 222 – 244 |
| 2. | Gyöngyi Kovács Karen M. Spens, (2011), | "The Journal of Humanitarian Logistics and Supply Chain Management: first reflections", Journal of Humanitarian Logistics and Supply Chain Management, Vol. 1 Iss 2 pp. 108 - 113 |
| 3. | Maria Besiou Orla Stapleton Luk N. Van Wassenhove, (2011) | 2011),"System dynamics for humanitarian operations", Journal of Humanitarian Logistics and Supply Chain Management, Vol. 1 Iss 1 pp. 78 – 103 |
| 4. | Gyöngyi Kovács, and Karen Spens, (2009), | 2009),"Identifying challenges in humanitarian logistics", International Journal of Physical Distribution & Logistics Management, Vol. 39 Iss 6 pp. 506 - 528 |
| 5. | David B Kaatrud, Ramina Samii and Luk N Van Wassenhove | UN Joint Logistics Centre: a coordinated response to common humanitarian logistics concerns |
| 6. | Gyöngyi Kovács Karen M. Spens, (2007), | 'Humanitarian logistics in disaster relief operations", International Journal of Physical Distribution & Logistics Management, Vol. 37 Iss 2 pp. 99 - 114 |
| 7. | Mark Vonderembse Michael Tracey Chong Leng Tan Edward J. Bardi, (1995) | "Current purchasing practices and JIT: some of the effects on inbound logistics", International Journal of Physical Distribution & Logistics Management, Vol. 25 Iss 3 pp. 33 - 48 |

| | | |
|-----|--|---|
| 8. | Professor Anna Nagurney, Spring 2012 | SCH-MGMT 597LG Humanitarian Logistics and Healthcare |
| 9. | International Federation of Red Cross and Red Crescent Societies, 2013 | World Disaster Report, Focus on technology and the future of humanitarian action |
| 10. | Development Initiatives | Global Humanitarian Assistance Report, 2015 |
| 11. | Acaps, September 2015 | Lessons Learned Social Media Monitoring during humanitarian crises |
| 12. | Deloitte, March 2015 | Promoting Humanitarian Innovation Exchanges Developing Models for Humanitarian Innovation Knowledge Bases |
| 13. | National Disaster Management Institute | Website of National Disaster Management Institute, India, http://www.ndmindia.nic.in/ |
| 14. | Overseas Development Institute, London | Humanitarian Coordination: Lessons from Recent Field Experience, June 2001, |
| 15. | Dublin Institute of Technology, 2010 | (Le)agility in Humanitarian Aid Supply Chains, School of Management |
| 16. | National Disaster Management Division | Disaster Management Report in India, A status report August 2004, National Disaster Management Division, Ministry of Home Affairs, Govt. of India |

Table: 1.1. Literature Review

Research Methodology:

The case study was carried out by desk review of secondary data available on various sources such as books, journals, bulletins, news items on various websites, research papers, case studies etc., available on Humanitarian Supply Chain.

This case study is also reflection of my experience with humanitarian supply chain operations. A brief snapshot of these emergencies are outlined below:

- KOSI Floods in Bihar in 2008
- Philippines Typhoon Yolanda in 2013
- Earthquake in 2015 in Nepal.

Flow chart of Research Methodology

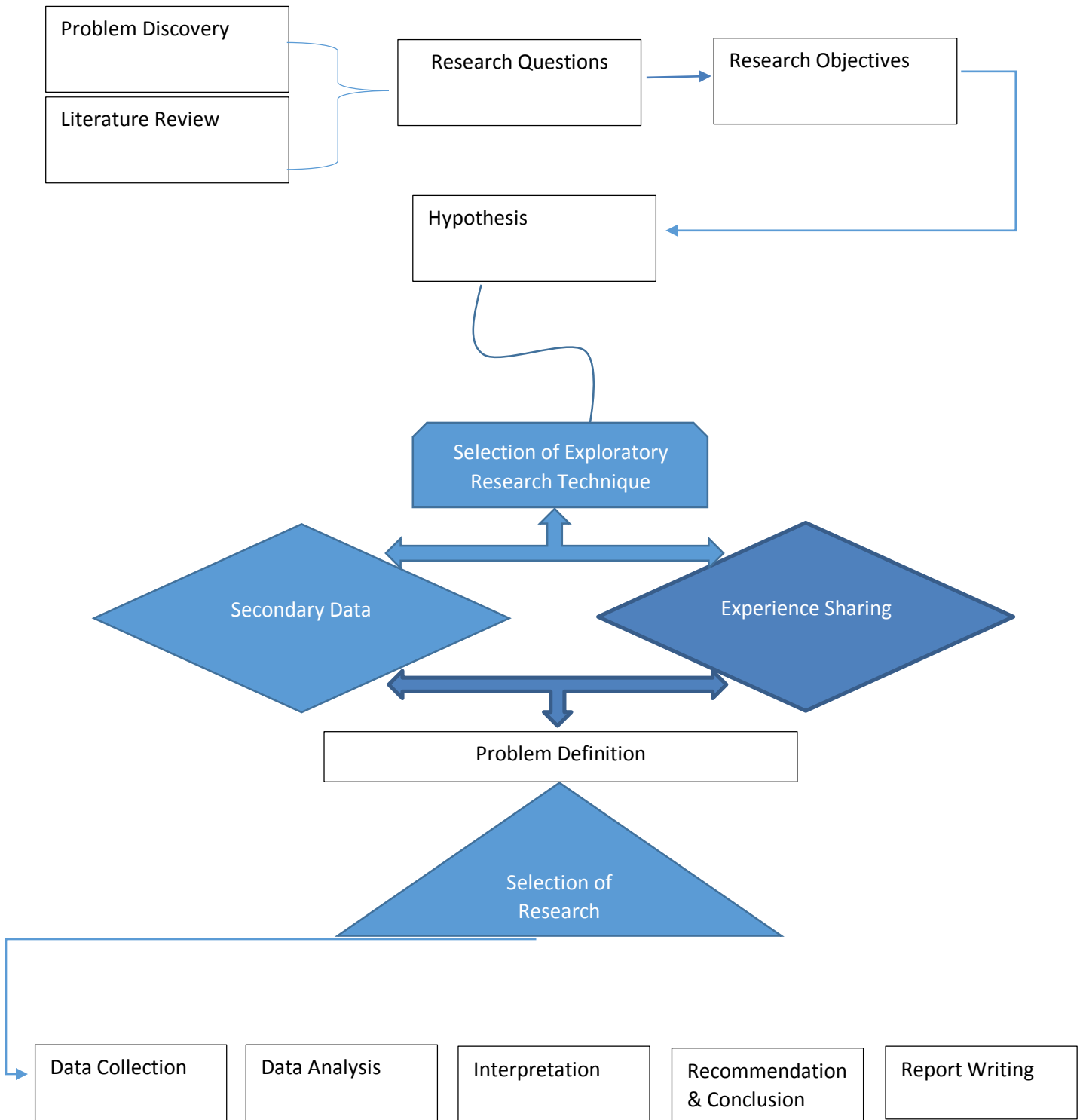


Figure: 2.1. Flow Chart of Research Methodology

My experience in Disaster Management and Humanitarian Supply chains:

Bihar Kosi Floods, 2008:

During Kosi Floods 33,45,545 people were affected who were living in 993 villages of 412 panchayats in 35 blocks of 5 districts were affected. A total of 3,40,742 houses were damaged and 7, 12,140 animals were affected. About 239 human and 1232 animal lives were lost (Department of Planning and Development, Government of Bihar).

In Madhepura district of Bihar, government's mechanisms of managing logistics while responding to Kosi floods 2008, one of the main weakness observed during emergency relief operations was distribution network design which was used for relief management with reference to strategic locations of relief camps, during the first month after Kosi Floods.

I was part of UNICEF, Bihar Emergency Team which responded to this disaster management. My specific role was to conduct procurement planning of more than USD 10 million of various relief items of Water and Sanitation, Health, Nutrition and other relief material like Tarpaulins, Tents, etc.

Philippines Typhoon Yolanda – 2013

Typhoon Haiyan, Philippines, 8th Nov 2013

‘Super typhoon’ Haiyan – locally known as Yolanda – was one of the most powerful and destructive typhoons ever, hit central Philippines claiming more than 6000 lives.

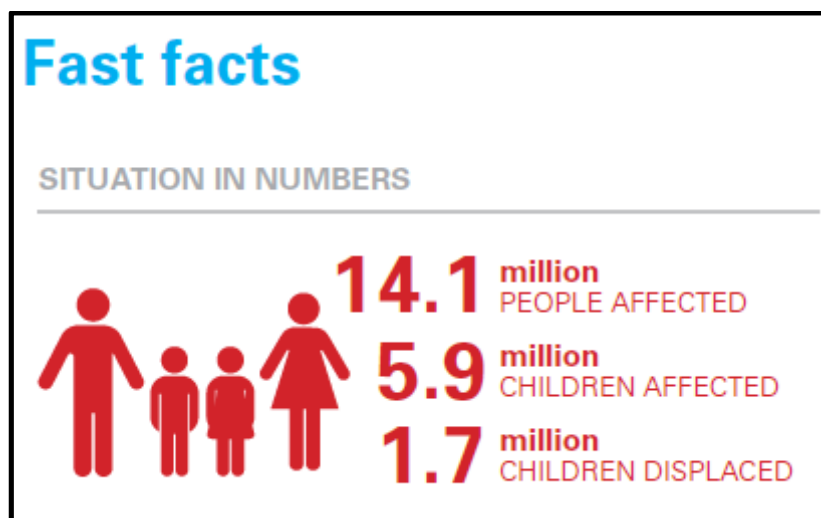


Figure: 2.2. Fast Facts of Philippines Typhoon Yolanda - 2013

Supplies and Logistics (as of 1st week of February 2014)

UNICEF has approximately procured over US\$ 27 million in emergency relief supplies to respond to this emergency Typhoon Yolanda.

- ✓ UNICEF immediately drew on its remaining prepositioned emergency supplies for the first response from warehouses in Manila and Cotabato (Philippines).
- ✓ Critical supplies for life-saving have been mobilized globally, mainly from UNICEF Supply Division in Copenhagen and regional supply hubs in China and Indonesia.
- ✓ Supplies were immediately rushed into the Philippines, but delivery remained a challenge, with roads, airports and other key infrastructure critically damaged.
- ✓ UNICEF worked to identify all available means to deliver priority life-saving supplies – and also deployed staff – by working closely with the Government and other partners
- ✓ Local military planes were used in line with international guidelines on the use of military assets in disaster response – and international commercial airlines were mobilized, alongside a fleet of trucks and ships.

- ✓ UNICEF has procured supplies worth US\$27 million in total, of which local procurement accounts for US\$15.7 million.
- ✓ The estimated total amount of supplies ordered is projected to be around US\$41.1 million by the end of 2014.

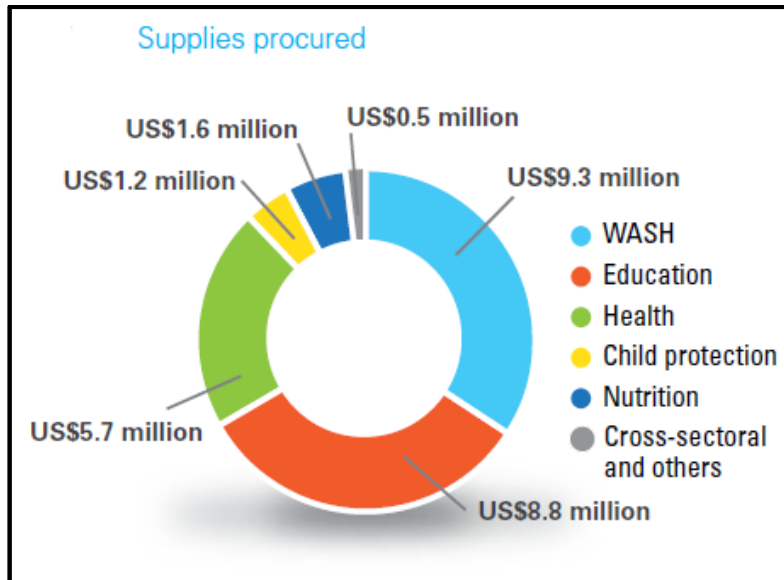


Figure: 2.3.: Quantum of Supplies Procured.

My Role:

- ✓ Support Supply and Procurement Section, Philippines Country office and Immediate Response Team in undertaking local procurement.
- ✓ 250 + procurement cases for over USD 9 million
- ✓ Emergency supplies procurement mainly covered WASH, Health, Education, Child Protection, Nutrition and Cross-sectoral supplies.
- ✓ Complex service contracts issued for transportation, warehousing, communications and operations.
- ✓ Imparted training on procurement and logistics staff on SCM ERP systems

NEPAL EMERGENCY - 2015

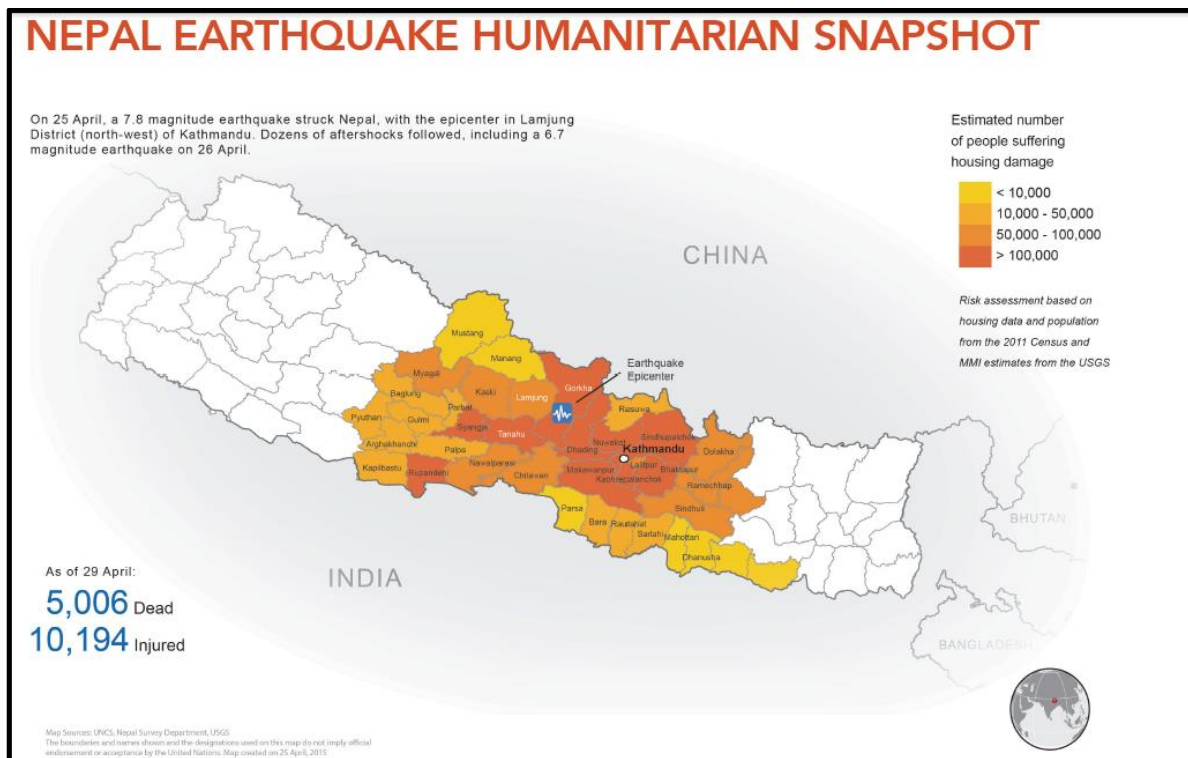


Figure: 2.4. Nepal Earthquake Humanitarian Snapshot, 2015

Target Population – data as of 29 April 2015.



Figure: 2.5. People Targeted

I have got the exposure to understand the benefits of agile supply chain, constraints, long term impacts during these emergency operations. Based on these learnings new success can be built on these foundations.

Analysis of Humanitarian Supply Chain

An analysis of humanitarian supply chain has been done below:

- ❖ Overview of Humanitarian Supply Chain
- ❖ Key Humanitarian Principles
- ❖ Stakeholders in Humanitarian Supply Chain
- ❖ Brief snapshot of Humanitarian Organizations
- ❖ Brief on Humanitarian Disasters in 2004
- ❖ Funding in Humanitarian Organizations
- ❖ Recipients of Humanitarian Funds
- ❖ Comparison of Commercial and Humanitarian Supply Chain
- ❖ Brief of Disaster Management Cycle Phases

Overview of Humanitarian Supply Chain Relief



Figure 3.1: Overview of Humanitarian Supply Chain

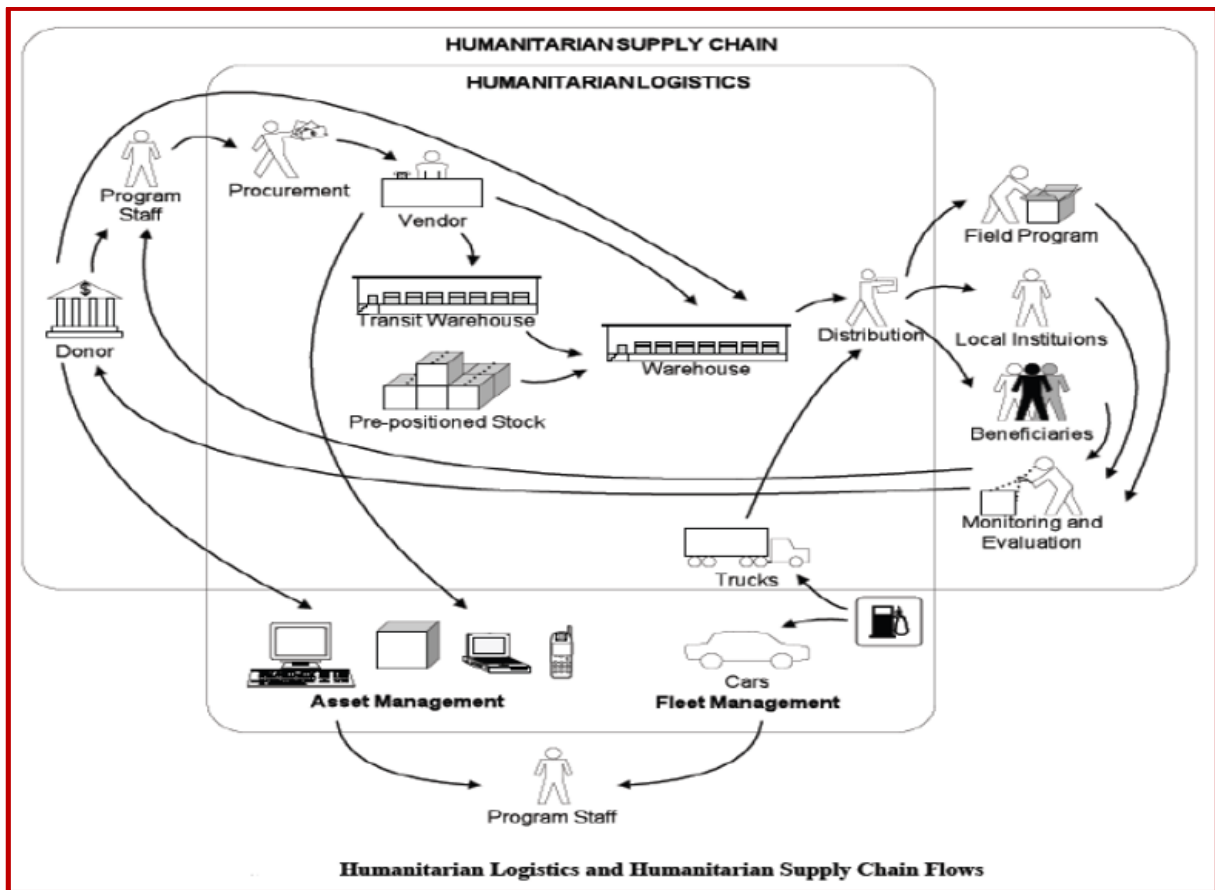


Figure: 3.2.: Humanitarian Supply Chain: Logistics View

Key Humanitarian Principles: Humanitarian principles provides the foundation for humanitarian action.

United Nations “Humanitarian assistance must be provided in accordance with the Humanitarian Principles namely:

- Humanity: Human suffering must be addressed wherever it is found, with particular attention to the most vulnerable in the population, such as children, women and the elderly. The dignity and rights of all victims must be respected and protected.
- Neutrality: Humanitarian assistance must be provided without engaging in hostilities or taking sides in controversies of a political, religious or ideological nature.
- Impartiality: Humanitarian assistance must be provided without discriminating as to ethnic origin, gender, nationality, political opinions, race or religion. Relief of the suffering must be guided solely by needs and priority must be given to the most urgent cases of distress. Adherence to these principles reflects a measure of accountability of the humanitarian community.”

UN General Assembly resolution 46/182, 1991. Since 1991, various legislative decisions have been made in order to recognize a changed humanitarian environment – internal displacement, access, protection, safety and security of humanitarian personnel, humanitarian-military relations, and the frequency and magnitude of natural disasters.

Stakeholders in humanitarian supply chain:

In Humanitarian Supply Chain (HSC) only limited number of studies have been carried out using stakeholders theory. The prominent one focused on stakeholders view of performance (Beamon and Balcik 2008, de Leeuw 2010, Schulz and Heigh 2009). The stake holders who are involved in making the HSC relevant to the beneficiary in natural catastrophe are identified as below:



Figures: 3.3. Stakeholders in Humanitarian Supply Chain

Brief snapshot of Humanitarian Organizations

In Humanitarian Supply Chain, there are various organizations which are working at the international and national level to reduce the sufferings of the human beings who gets affected due to the natural and man-made disasters. Brief introduction of the organizations are outlined below:

Action Against Hunger (AAH)

Develops and runs emergency programs in nutrition, health, water and food security for countries in need. It also provides disaster preparedness programs with the goal of anticipating and preventing humanitarian crises.

CARE

CARE is one of the world's largest private international humanitarian organizations, committed to helping families in poor communities improve their lives and achieve lasting victories over poverty. Founded in 1945 to provide relief to survivors of World War II, CARE quickly became a trusted vehicle for the compassion and generosity of millions.

Caritas Internationalis

Caritas Internationalis is a confederation of 162 Catholic relief, development and social service organisations working to build a better world, especially for the poor and oppressed, in over 200 countries and territories.

Catholic Relief Services (CRS - USCC)

Catholic Relief Services was founded in 1943 by the Catholic Bishops of the United States to assist the poor and disadvantaged outside the country.

Doctors Without Borders

Doctors Without Borders delivers medical help to populations endangered by war, civil strife, epidemics or natural disasters.

Emergency Nutrition Network (ENN)

Independently funded organization based in Dublin, Ireland UK. Works to improve the effectiveness of emergency food and nutrition interventions by providing a means of information exchange between field staff, humanitarian institutions, academics and researchers.

Food For The Hungry International (FHI)

Food For The Hungry is an international relief and development organization of Christian motivation, committed to working with poor people to overcome hunger and poverty through integrated self-development and relief programs.

Hunger Plus, Inc.

Not-for-profit relief agency that provides food and related supplies for emergency use. Partners with individuals, NGOs, government agencies, church and civic groups.

Interaction

InterAction is a coalition of over 150 US-based non-profit organizations which are usually the first to respond to a crisis. InterAction coordinates and promotes relief aid programs. With more than 160 members operating in every developing country, they work to overcome poverty, exclusion and suffering by advancing social justice and basic dignity for all.

International Committee of the Red Cross (ICRC)

The ICRC, independent of all governments and international organizations, endeavors to promote international humanitarian law and the fundamental human values underlying that law. The ICRC was founded by Geneva citizens in 1863 and has its headquarters in Geneva.

International Federation of Red Cross and Red Crescent Societies (IFRC)

The IFRC is one part of the International Red Cross and Red Crescent Movement, which comprises National Red Cross or Red Crescent Societies, the International Federation of Red Cross and Red Crescent Societies (the Federation), and the ICRC. The IFRC is the permanent liaison body of the National Societies and acts as their representative internationally. It organizes and coordinates international disaster response in support of the actions of the affected National Societies, encourages the creation of new National Societies and assists them in developing their structures and programs.

International Organization for Migration (IOM)

The IOM is committed to the principle that humane and orderly migration benefits migrants and society. As an intergovernmental body, IOM acts with its partners in the international community to: Assist in meeting the operational challenges of migration; Advance understanding of migration issues; Encourage social and economic development through migration; Uphold the human dignity and well-being of migrants.

International Rescue Committee (IRC)

Founded in 1933, the International Rescue Committee is the voluntary organization involved in resettlement assistance, global emergency relief, rehabilitation, and advocacy for refugees. The IRC delivers lifesaving aid in emergencies, rebuilds shattered communities,

cares for war- traumatized children, rehabilitates health care, water and sanitation systems, reunites separated families, restores lost livelihoods, establishes schools, trains teachers, strengthens the capacity of local organizations and supports civil society and good-governance initiatives

Lutheran World Federation

Specializing in emergency relief linked to disaster preparedness (risk management) and sustainable development.

Mercy Corps (MC)

Nonprofit organization providing emergency relief and supporting development programs in agriculture, economic development, health, housing and infrastructure, and strengthening local organizations.

Oxfam

Oxfam is a development and relief agency working to end poverty. Oxfam International is a confederation of 12 organizations working together with over 3,000 partners in more than 100 countries to find lasting solutions to poverty, suffering and injustice.

Refugees International

Refugees International generates lifesaving humanitarian assistance and protection for displaced people around the world and works to end the conditions that create displacement. Refugees International advocates for refugees through diplomacy and the press.

Relief International

Founded in 1990, Relief International provides emergency, rehabilitation and development services that empower beneficiaries in the process.

Save the Children

Save the Children is the leading independent organization creating real and lasting change for children in need in the United States and around the world.

The Office of U.S. Foreign Disaster Assistance (OFDA)

OFDA is the office within USAID responsible for providing non-food humanitarian assistance in response to international crises and disasters. Responsible for facilitating and coordinating U.S. Government emergency assistance overseas and to provide humanitarian assistance to save lives, alleviate human suffering, and reduce the social and economic impact of natural and man-made disasters worldwide.

United Nations Children's Fund (UNICEF)

While working to ensure the survival, protection and development of children and advocating a high priority for them in the allocation of resources at all times, UNICEF continues to give relief and rehabilitation assistance in emergencies. The agency was awarded the Nobel Peace Prize in 1965.

United Nations High Commissioner for Refugees (UNHCR)

The UNHCR provides protection and assistance to the world's refugees. Today, the UNHCR is one of the world's principal humanitarian agencies, with headquarters in Geneva, and offices in some 115 countries. More than 80 percent of UNHCR's 5,000-member staff work in the field, often in isolated, dangerous and difficult conditions. The UNHCR has twice been awarded the Nobel Peace Prize for its work.

United Nations Office for the Coordination of Humanitarian Affairs (OCHA)

OCHA is mandated to mobilize and coordinate the collective efforts of the international community, in particular those of the UN system.

US Committee for Refugees (USCR)

Provides aid and resources for refugees worldwide.

World Vision International

World Vision is a Christian relief and development organization dedicated to helping children and their communities worldwide reach their full potential by tackling the causes of poverty.

OVERVIEW OF HUMANITARIAN DISASTER IN 2014:

Till 2014, there were millions of people who were affected by natural and man-made disasters in Iraq, South Sudan, Syria, Yemen, Central African Region and West Africa by Ebola Outbreak. These disasters and conflicts have displaced many people in this region.

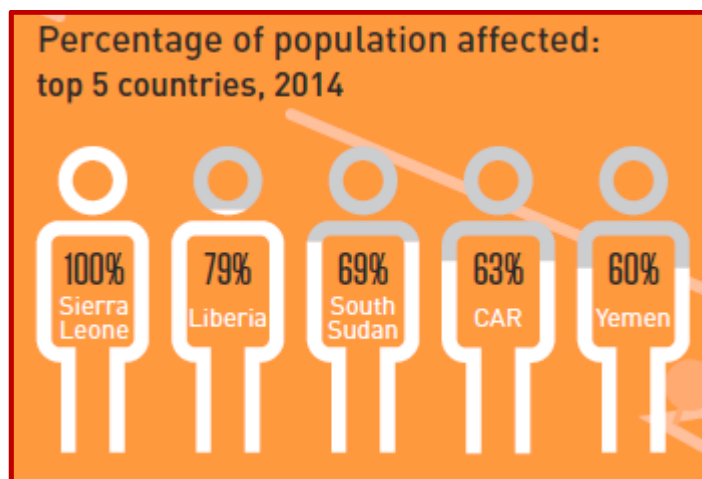


Figure 3.4.: Percentage of population affected in top five countries in 2014

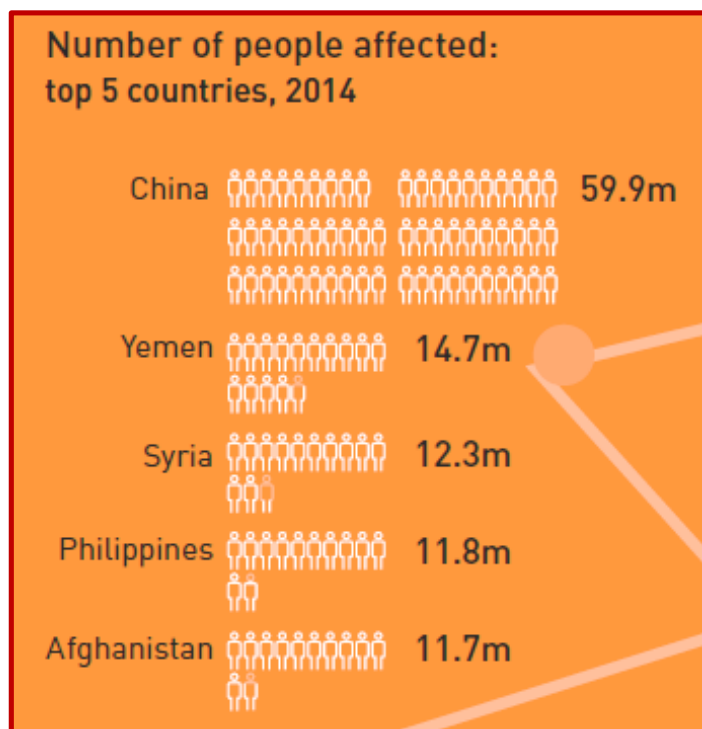


Figure 3.5.: Number of People affected in top 5 countries, 2014

Humanitarian Assistance Funding:

In 2014, due to large number of multi-scale emergencies, the fund raising in humanitarian funding has reached a new high. The approximate amount raised through fund raising an UN – Coordinated appeals in 2014 was \$ 24 billion which saw a 19% increase as compared to fund raised in 2013 which was \$ 20.5 billion. The major donor countries were United States, United Kingdom, Germany, Sweden, Japan, Turkey and European Union Institutions.

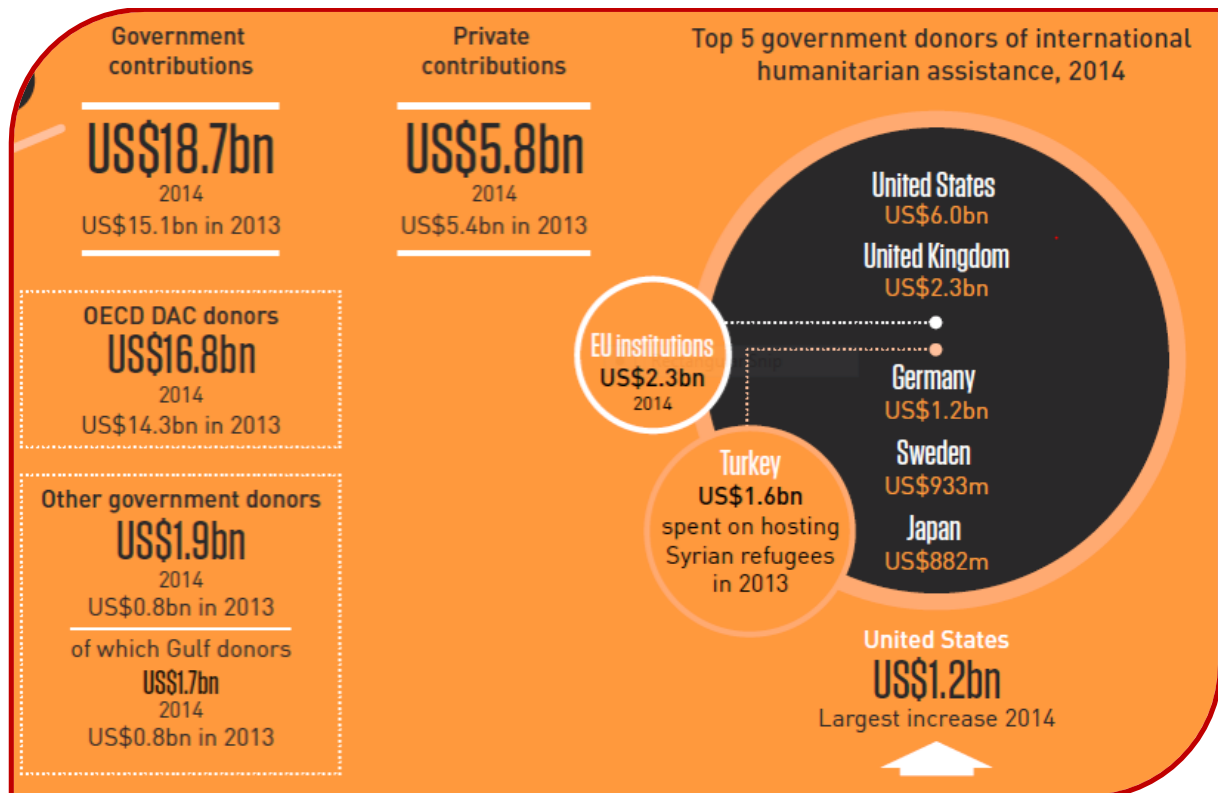


Figure 3.6.: Top 5 government donors of international humanitarian assistance, 2014

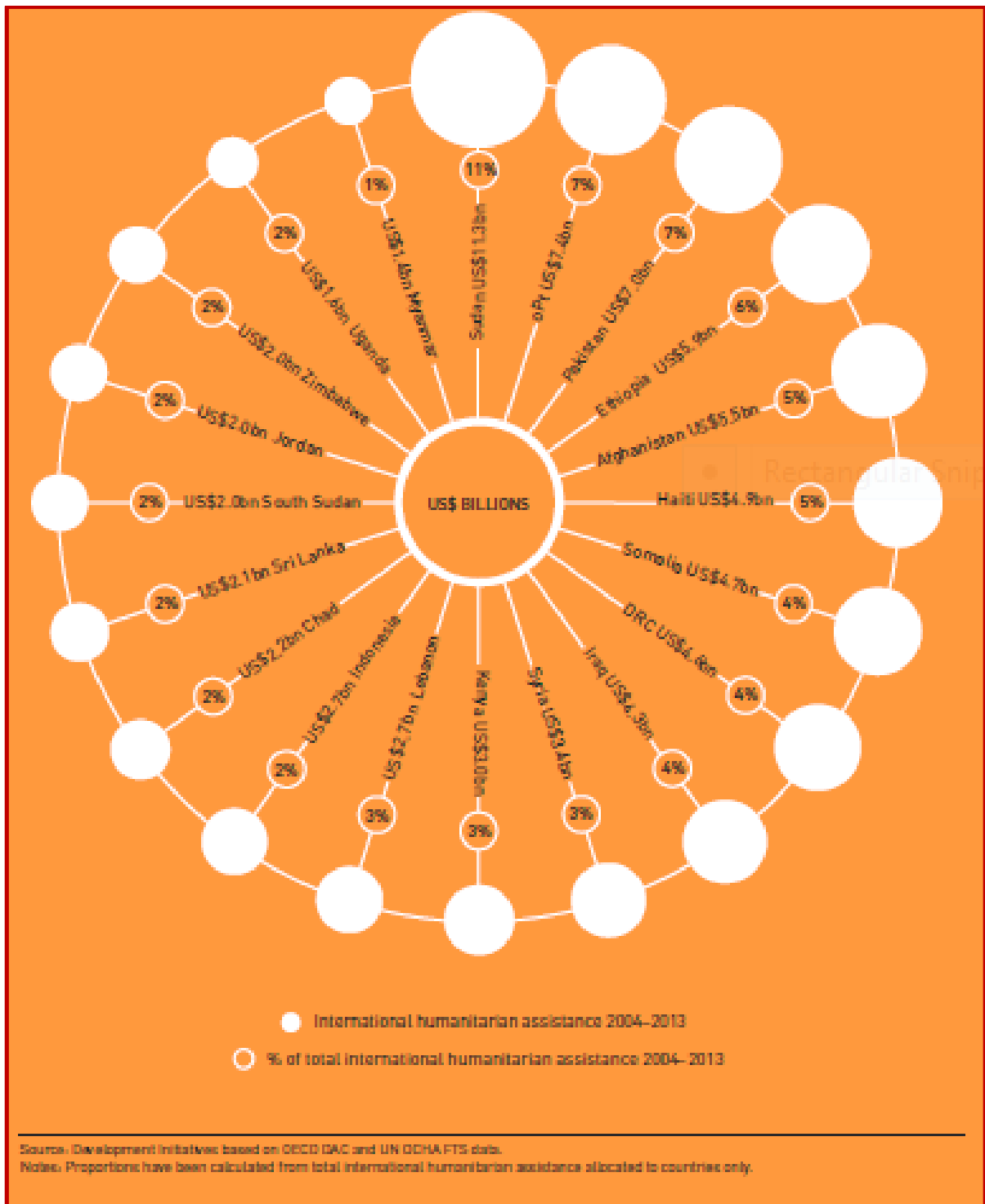


Figure 3.7.: Twenty largest recipients of international humanitarian assistance, 2004-2013

Highlighting the key differences between Humanitarian and Commercial supply chain:

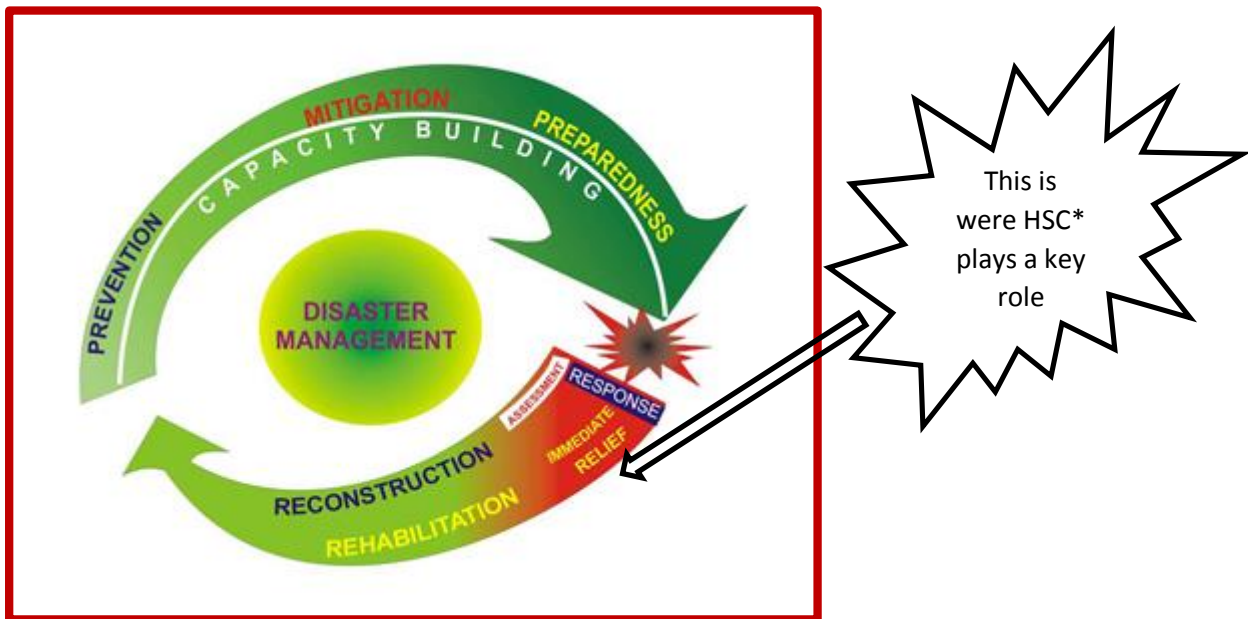
| Common Areas of Supply Chain | Commercial Supply Chain | Humanitarian Supply Chain |
|------------------------------|---|--|
| What is “Demand?” | Products | Supplies and People |
| Demand Pattern | Relatively stable, predictable. Demands occur at fixed locations in set quantities. | Demand is generated from random events that are unpredictable in terms of timing, type, and size. Demands are estimated after they are needed, based on an assessment of disaster characteristics. |
| Inventory Control | Uses well-defined methods for determining inventory levels based on lead time, demand and target customer service levels. | Inventory control is challenging due to high variations in lead times, demands, and demand locations. |
| Lead Time | Lead time determined by the Supplier-Manufacturer-DC-Retailer-chain. | Zero time between the occurrence of the Supplier-Manufacturer-DC-Retailer-chain. demand and the need for it, but the actual lead time is determined by the chain of material flow. |
| Network Configuration | There exist methods for supply chain network design. | Challenging due to the nature of unknowns (locations, type and size of events, politics, culture) and “last mile” considerations. |

| | | |
|--------------------------------|---|---|
| Information Systems | Typically, well-defined, making use of advanced technology | Information is often unreliable, incomplete, or non-existent. |
| Performance Measurement System | Historically, focused on resource performance measures, such as maximizing profit or minimizing costs. | Primary focus on output performance measures, such as the time required to respond to a disaster or ability to meet the needs of the disaster victims |
| Strategic Goals | Usually, to produce high quality products at low cost in order to maximize profitability and achieve customer satisfaction. | Minimize the loss of life and alleviate suffering. |

Source: B. M. Beamon, 2004. Humanitarian relief chains, issues and challenges, Proceedings of the 34th International Conference on Computers & Industrial Engineering, pp. 77-82.

Table: 2.1. Difference between Humanitarian and Commercial Supply chain

Disaster Management Cycle Phases



* Humanitarian Supply Chain

Figure 3.8.: Disaster Management Cycle

A holistic and integrated approach will be evolved towards disaster management with emphasis on building strategic partnerships at various levels. Disaster Management can be categorized in the following phases:

- ❖ Prevention, Mitigation and Preparedness
- ❖ Response
- ❖ Recovery or Rehabilitation phase

Challenges in Humanitarian Supply chain

"Professional logistics assistance that is available on short notice is crucial to the success of rescue and relief operations and can save lives ... In major disasters, too often commodities are sent in from all over the world without consultation or coordination with rescue and relief teams on the ground."

-- *Adrian van der Knapp, Head,
United Nations Joint Logistics Centre (Airport emergency team, 2004)*

In humanitarian supply chain operations, profit motive is replaced by the objective of timely and appropriate provision of aid to beneficiaries. In other words, the right goods, at the right place, at the right time (before it is too late) for those who need it most. The main challenges in humanitarian chain is to provide the timely assistance to the vulnerable people affected in natural disasters. Some of the main challenges which has come out after the literature review and outcome of my experience in the humanitarian supply chain are listed below:

- The natural disasters are unpredictable, hence the planning for humanitarian supply chain is challenging.
- Lack of proper initial assessments of the disasters and unreliable information also contributes to wrong planning.
- Limited Collaboration: The willingness of the stakeholders to come together and share ideas and improve practice.
- Poor infrastructure: Often natural disasters destroys the infrastructure of the country due to natural catastrophe, which makes it very complex and challenging to manage the logistics.
- Minimizing the cost is difficult (due to problem size, non-convexity; integrality; constraints, execution, etc).
- Lack of use of ICT
- Security Situations
- Long supply lead time
- Lack of trained logisticians
- Lack of training programmes and certifications for logisticians
- Lack of proper warehousing facility
- Lack of use of social media during natural disasters
- Oversupply of no needed items into the scene
- Host country entrance clearance

- Inventory Control
- Challenges in Procurement
- Transportation and distribution systems within the affected country
- Lack of vehicles and proper fleet management
- Lack of Transport Management:
- Challenges in using multi-modal transport system
- Vast distance and difficult terrain
- Lack of data analytics
- Climate change
- Haphazard urbanization
- Threat of epidemic due to carcass

These are some of the challenges which are encountered in the Humanitarian Logistics during relief operations.

Humanitarian action is developing continuously in response to new application of technologies. We see innovations almost in every aspect of humanitarian action, from robots being deployed for search and rescue or demining, to remote surgeries or improvement in vaccine transportation and conservation, water purification or sanitation.

Current State Analysis through the innovation funnel: To understand the current state, the innovation process can be expressed as a funnel and used to identify critical pain points and challenges in taking ideas from problem identification through to scaling and diffusion.

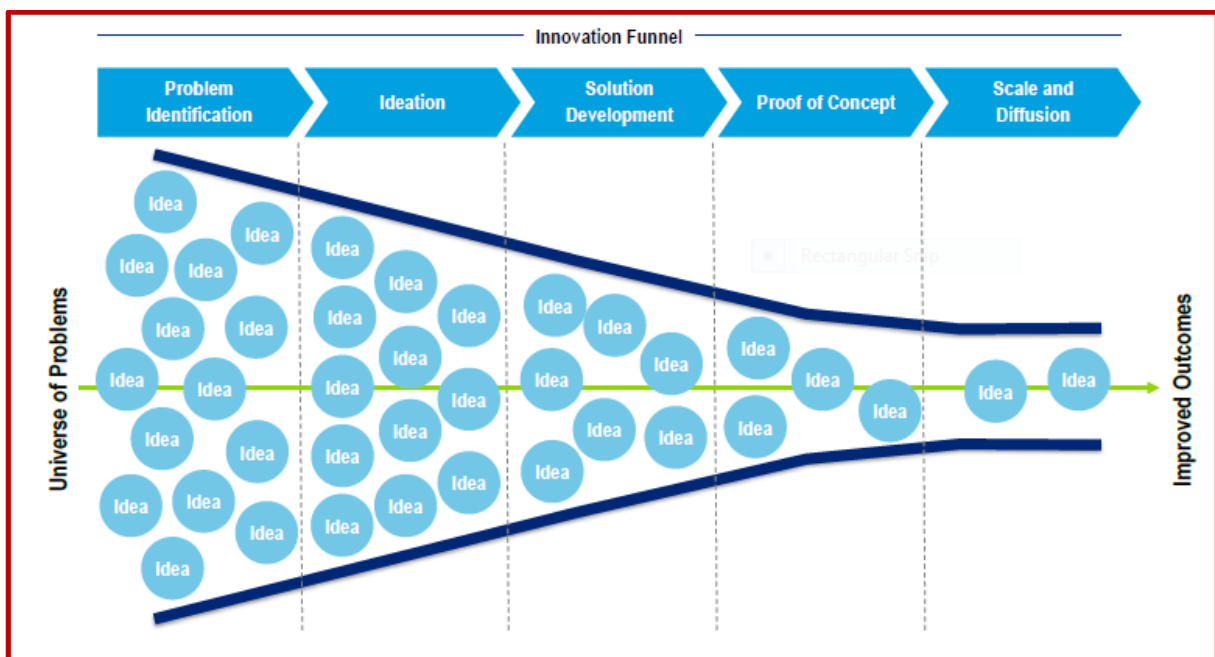


Figure: 3.9. Innovation Funnel.

In 2015, United Nations Children’s Fund (UNICEF) have launched Global Innovation Centre and Innovation Fund to bring to scale creative and cost-effective solutions to save the lives of the poorest children. Similarly, UN Refugee Agency (UNHCR) have also set up innovation labs to develop innovations applicable specifically to refugees/children.

Some of the innovations used in the recent past in humanitarian sectors are:

- The Government of Malawi and UNICEF have started testing the use of Unmanned Aerial Vehicles (UAVs or drones) to explore cost effective ways of reducing waiting times for HIV testing of infants. The test, which is using simulated samples, will cut waiting times dramatically.

- In Syria, for example, digital data collection tools were adapted and are now used to serve as a commodity tracking system, monitoring the distribution of supplies as they are transported and delivered by local partner organizations in areas that remain inaccessible to international humanitarian agencies. The system improves efficiency and accountability and helps deliver life-saving supplies.
- Use of Social Media like Twitter and Facebook in issuing early warning system and mapping of people affected and stuck during natural catastrophe.

Findings of the Study:

The major finds of the study with respect to Humanitarian Relief works are outlined below which will be helpful to understand the areas which needs to be strengthened:

The greatest challenges for humanitarian aid and development assistance are efficiency, effectiveness, and the extremely complex political, economic, and social side effects associated with them. It has become increasingly clear that aid is not a panacea. Although externally driven, humanitarian aid and development assistance programs inevitably take on roles within the conflict and in the societies in which they operate.

Forecasting and Early Warning Systems: It is most essential to establish, upgrade and modernise the forecasting and early-warning systems for all types of disasters. The nodal agencies responsible for monitoring and carrying out surveillance, for specific natural disasters, will identify technological gaps and formulate projects for their upgradation, in a time bound manner.

Communications and Information Technology (IT) Support: For dissemination of advance warning and information through broadcasting mediums such as television and radio shall be used significantly as it has higher geographical reach. For coastal and hilly regions, network of meteorological department may be used. Communication and sharing of upto-date information using state-of the art IT infrastructure remain at the heart of effective implementation of the disaster management strategy.

Strengthening of the Emergency Operations Centres: The establishment of Emergency Operations Centres at the national, state, metros and district level and equipping them with the contemporary technologies and communication facilities and their periodic upgradation, is a priority.

Medical Preparedness and Mass Casualty Management: Medical preparedness is a crucial component for any Disaster Management Plan. The NDMA, in close coordination with the Ministry of Health and Family Welfare, states and premier medical research institutes will formulate policy guidelines to enhance our capacity in emergency medical response and mass casualty management.

Training, Simulation and Mock Drills: Efficacy of plans and Standard Operating Procedures (SOPs) is tested and refined through training, seminars and mock drills.

Partnerships for Mitigation and Preparedness:

- Community Based Disaster Preparedness
- Stakeholders' Participation
- Corporate Social Responsibility (CSR) and Public Private Partnership (PPP)
- Media Partnership

Management of Humanitarian Supply Chain – Relief Supplies:

Ensuring minimum standards of relief and speedy management of supplies are important features of relief operations. Standard Operating Procedures should be put in place for ensuring the procurement, packaging, transportation, storage and distribution of relief items, which need to be carried out in an organised manner. The affected community and local authorities need to work in tandem in managing the relief camps.

Prepositioning of essential supplies:

Experience in major disasters in the last decade has clearly established the need for prepositioning of some essential reserves at crucial locations, including some for the high altitude areas. These reserves are intended to augment the resources at the State level during a disaster or disaster like situation.

In any natural disaster, logistics especially transportation network by road, sea and air is always a bottleneck. Fragile infrastructure of Primary and Secondary roads emerged as the major Roadblock during the landslide in Uttanchal Floods in 2013. Airstrips of country where emergency strikes, becomes fully congested and any unloading of cargo planes with humanitarian relief items becomes difficult and impossible to handle during the humanitarian relief work.

Key Recommendation:

- ✓ Adoption of Information Technology closely in order to improve planning and forecasting. This would mean optimize the use of IT in Humanitarian Supply Chain.
- ✓ Real time stock tracking and which would help in procurement of required relief items during emergency rather than flooding of all relief items.

- ✓ A consortium of public and private logistics players should be established to optimise and complement the logistics capabilities of cooperating agencies within a well-defined crisis area for the benefit of the future humanitarian operations.
- ✓ Develop a pool of expert logisticians from private corporate house or individual consultants who could provide assistance during any unforeseen emergency in India on pro-bono basis as part of corporate social responsibility.
- ✓ Establish a consortium for transportation companies and learn their agile supply techniques which could be implemented in humanitarian supply chain.
- ✓ Establishment of Regional Hubs and Warehousing Facilities at Strategic locations based on the Vulnerability mapping.
- ✓ Use of social media like Twitter, Facebook for fund raising and communicating the location of the people who are affected in natural disasters.

Conclusion:

Humanitarian logistics has the opportunity to increase its contribution to disaster relief and to be recognized for that contribution by implementing initiatives in the areas of knowledge management, technology, measurement, community, and positioning. Ensuring movement of relief items to disaster prone areas will continue to be an important role for logistics, the strategic focus must be on providing timely information, analyzing that information to garner insight as to how to improve operations, and learning internally and with others.

International humanitarian supply chains are unpredictable and turbulent, which require flexibility and agility to deal with humanitarian supply chains. This will ensure supply chain will become more relevant, efficient and effective in managing supply chain in any emergency.

Limitations of Study:

The study has following limitations:

- The study has primary been done based on the desk review of various Research Papers Journals, various books on humanitarian supply chain, website articles and based on my experience in dealing with humanitarian supply chains.
- I believe that further investigations through quantitative study will help in developing the current findings and correlate the linkages and ways to handle the challenges through continuous innovations in Humanitarian Supply Chain.

Future Scope of the Study:

Humanitarian logistics is a field which has grown very rapidly for Logisticians. This field is also a growing area of concern due the Climate Change and increasing urbanization, which has led to many natural disasters in the recent past. The humanitarian supply chains also provides very inquisitive experience being the most unpredictable, agile and flexible supply chains.

The purpose of this research is to identify and analyse the challenges and innovations in the field of humanitarian supply chain which could demonstrate effectiveness in providing agile and swift response to impending natural catastrophe. The use of technological innovations in humanitarian supply chain will further reduce the suffering and pains of the vulnerable and downtrodden of the human beings and strengthen the capacity of logistician in dealing with unpredictability in more planned manners.

However, the HSC still requires the conceptual and empirical studies to improve the entire humanitarian logistics providing the last mile delivery to the beneficiary who are in need of crisis.

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