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EMERGENCY RESPONSE LOGISTICS IN ACTION

Case: Finnish Red Cross ERU mission in Pakistan 2010

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ABSTRACT

The aim of this study is to reflect on the area of supply chain management from the humanitarian logistics perspective. Focus is on the work of the Finnish Red Cross logistics emergency response unit (ERU). The outcome of the study is to analyze the logistics ERU mission in Pakistan 2010 and provide suggestions to the Finnish Red Cross on how to improve the work procedures and the aid efficiency.

The study is a qualitative case analysis and it is divided into theoretical and empirical parts. The theoretical framework of the thesis is based on scientific literature. It contains areas of supply chain management in general and from the humanitarian perspective. Some of the key concepts, such as generic types of supply chains, supply chain flows and disaster management are introduced. Further the study makes a comparison between humanitarian and business supply chains. The aspects of physical distribution and information management in humanitarian logistics are covered. The empirical part explains the details for the Finnish Red Cross ERU mission in Pakistan 2010 and provides background information for the International Federation of Red Cross and Red Crescent Societies and its approach to logistics functions. Information for the case study was gathered through interviews with two Finnish delegates, field observations and secondary data collection.

As the main result, the study revealed that the professionality of the Finnish Red Cross ERU logistics delegates is very high and the team worked successfully in Pakistan. The areas of improvement are found in the information management. There is need for a standard supply chain planning tool and logistics performance measurement system. Further research topics are suggested for development work for the new information management tools, deeper research for cooperation between humanitarian agencies and logistical a development project launched in Pakistan in co-operation with the Finnish Red Cross.

Keywords: Humanitarian logistics, Supply Chain, Disaster Management, Emergency Response Unit (ERU), Finnish Red Cross, Pakistan

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TIIVISTELMÄ

Tämän opinnäytetyön päämäärä on tarkastella toimitusketjun hallintaa humanitaarisen logistiikan näkökulmasta. Painopiste on Suomen Punaisen Ristin nopean avustustoiminnan logistiikkayksikön eli emergency response unitin (ERU) työssä. Tutkimuksen tavoitteena on analysoida logistiikan ERU-ryhmän operaatiota Pakistanissa 2010 ja esittää Suomen Punaiselle Ristille ehdotuksia keinoista miten parantaa toimintatapoja ja avun tehokkuutta.

Tutkimus on laadullinen tapaustutkimus ja se jakaantuu teoreettiseen ja empiiriseen osaan. Teoriassa käsitellään toimitusketjun hallintaan liittyvät yleiset käsitteet, toimiketjun virtaukset, humanitaarinen logistiikka ja katastrofien hallinnan periaatteet. Lisäksi tutkimuksessa esitetään vertailu humanitaarisen ja kaupallisten toimitusketjujen eroista, esitellään materiaalien jakeluketjua sekä tiedonhallintaa humanitaarisen logistiikan näkökulmasta. Teoreettinen viitekehys pohjautuu humanitaarisen logistiikan ja toimitusketjun hallinnan tieteelliseen kirjallisuuteen.

Empiirisessä osassa selitetään Suomen Punaisen Ristin ERU-operaatiota Pakistanissa 2010 sekä kerrotaan taustatietoja Kansainvälisen Punaisen Ristin ja Punaisen Puolikuun yhdistysten logistisesta toiminnasta. Tietoa empiiriseen tutkimuksen kerättiin haastattelemalla kahta suomalaista delegaattia, havainnoimalla sekä hakemalla tietoa Internetistä.

Tutkimuksen tuloksista voidaan päätellä, että Suomen Punaisen Ristin ERU-logistiikkojen ammattitaito on erittäin korkeatasoista ja tiimi työskenteli menestyksekkäästi Pakistanissa. Kehitettävää löytyy lähinnä tietojen hallinnan alueelta. Punaisen Ristin tulisi kehittää standardisoitu työkalu toimitusketjun suunnitteluun sekä logististentoimintojen suoritustason mittausjärjestelmä.

Jatkotutkimusaiheiksi ehdotetaan projektia, jossa kehitetään yllämainitut puuttuvat työkalut sekä syvempää tutkimusta humanitaaristen toimijoiden yhteistyöstä. Pakistanissa on käynnistetty logistiikan kehitysprojekti yhteistyössä Suomen Punaisen Ristin kanssa, joka myös tarjoaa mielenkiintoisia tutkimuskohteita.

Avainsanat: humanitaarinen logistiikka, toimitusketju, Suomen Punainen Risti,

Emergency Response Unit (ERU), Pakistan

CONTENTS

1 INTRODUCTION 1

1.1 Objectives and research questions 3

1.2 Scope and limitations 4

1.3 Research method and data collection techniques 5

1.4 Thesis structure 7

2 LOGISTICS OF HUMANITARIAN AID 9

2.1 Supply chain management 9

2.1.1 Four types of generic supply chains 10

2.1.2 Supply chains in humanitarian context 12

2.1.3 Supply chain flows 14

2.2 Phases of humanitarian action 17

2.3 Humanitarian logistics versus business logistics 21

3 HUMANITARIAN SUPPLY CHAIN; MATERIAL AND INFORMATION FLOWS 24

3.1 Physical distribution of materials 25

3.1.1 Supply acquisition and procurement 26

3.1.2 Pre-positioning and warehousing 27

3.1.3 Transportation 28

3.2 Information Management 28

3.2.1 Information technology in humanitarial logistics 32

3.2.2 Coordination of information between humanitarian actors 32

4 CASE: FINNISH RED CROSS LOGISTICS ERU MISSION IN PAKISTAN IN 2010 37

4.1 International Federaton of Red Cross and Red Crescent Societies (IFRC) 37

4.1.1 Disaster Management in IFRC 39

4.1.2 Humanitarian Logistics in IFRC 40

4.1.3 Emergency Responce Units (ERU) 41

4.1.4 Information Management in IFRC 43

4.2 Research design 43

4.3 Pakistan floods in 2010 44

4.4 Logistics ERU in Action 46

4.4.1 Physical distribution in Pakistan 46

4.4.2 Information management in Pakistan 49

4.4.3 Coordination of information in Pakistan 52
4.4.4 Operation in general and long-term logistics project 52
5 CONCLUSIONS AND FURTHER RESEARCH AREAS 54
6 SUMMARY 58
REFERENCES 60

ABBREVIATIONS

AWB	Air Way Bill
B/L	Bill of Lading
ETA	Estimated time of arrival
CAP	Consolidated Appeals Process
CERF	Central Emergency Fund
CSCMP	Council of Supply Chain Management Professionals
CTN	Commodity Tracking Number
CTS	Commodity Tracking System
DMIS	Disaster Management Information System
ERU	Emergency Responce Unit
ETA	Estimated time of arrival
FACT	Fied Assessment Coordination Team
HLS	Humanitarian Logistics System
HUMLOG	Humanitarian Logistics and Supply Chain Research Institute
ICRC	International Committee of Red Cross
IFRC	International Federation of Red Cross and Red Crescent Societies
IT	Information Technology
LSS	Logistics Support Systerm
NGO	Non-Govenmental Organization
NS	National Society (in Red Cross and Red Crescent Society)
OCHA	Office of the Coordinator for Humanitarian Affairs
RC/RC	Red Cross/Red Crescent
RLU	Regional Logistics Units
SCM	Supply Chain Management
SUMA	Supply Chain Management System
TL	Team Leader
UNJLC	United Nations Joint Logistics Centre
UNICEF	United Nations Children's Fund
WFP	World Food Program
WVI	World Vision International

1 INTRODUCTION

Humanitarian logistics is a rather new scientific research area with growing attraction to its topics. For example, in Finland Humanitarian Logistics and Supply Chain Research Institute (HUMLOG Institute) was established in 2008 by Hanken School of Economics and National Defence University due to the economic importance of the aid industry, as well as to fulfil the corporate responsibility for society. The goal of the Institute is to share and disseminate knowledge in issues related to humanitarian logistics (Humlog 2011.) Humanitarian logistics should gain focus as a research area because the logistical costs form up to 80% of the disaster relief operation, logistics has an impact on the aid effectiveness and since there are public-private as well as civil-military partnerships in supply chain (Humlog 2011). Furthermore, it is estimated that the number of both natural and man-made disasters will increase five-fold over the next 50 years. Therefore, humanitarian logistics is, indeed, one of the most important aspects of the disaster management systems (Nikbakhsh & Farahani 2011, 291.)

Some of the recent studies have covered areas such as "A qualitative study exploring the challenges of humanitarian organisations" (Sandwell 2011) and "A two-stage procurement model for humanitarian relief supply chains (Falasca & Zobel, 2011). Sandwell focuses on identifying the underlying issues of humanitarian disaster relief logistics in order to provide an understanding of the challenges facing humanitarian organisations in a wider context. The results of the study suggest that operational issues encountered in humanitarian logistics are symptomatic of wider issues affecting humanitarian organisations. By understanding the issues and identifying the challenges, organizations could make for more effective relief missions by overcoming the "roadblocks". (Sandwell 2011.) The purpose of the study made by Falasca and Zobel was to discuss and to help address the need for quantitative models to support and improve procurement in the context of humanitarian relief efforts.

Their results show the ability of the new model to capture and model both the procurement process, and the uncertainty inherent in a disaster relief situation. This model can be used support the more efficient and effective procurement plans. (Falasca & Zobel 2011.)

The purpose of this study is to examine some of the key elements of supply chain management from the perspective of humanitarian logistics. As the number of disasters, and therefore the amount of operations around the world are increasing, the humanitarian sector has to find ways to become more efficient in order to respond to the growing number of people in need. Secondly, donors are becoming increasingly demanding with respect to performance and impact. (Thomas & Kopczak 2005, 4.) Thus, the goal of the thesis is to find proposals to gain efficiency in emergency logistics. The special interest is on the work of Finnish logistics emergency response unit (ERU), which operates under the International Federation of Red Cross and Red Crescent Societies.

The Finnish Red Cross is part of the International Red Cross and Red Crescent Movement, which is the world's largest humanitarian network. The Movement is made up of the International Federation of Red Cross and Red Crescent Societies (IFRC), together with National Societies and the International Committee of Red Cross (ICRC). The Movement is neutral and impartial, and it provides protection and assistance to people affected by disasters and conflicts. The Movement has nearly 100 million members, volunteers and supporters in 187 National Societies, a secretariat in Geneva and more than 60 delegations strategically located to support activities around the world. (IFRC who we are 2011). The scale of this international Movement enables that the International Federation of Red Cross and Red Crescent Societies is one the key organizations in the humanitarian logistics sector.

The role of the International Federation of Red Cross and Red Crescent Societies' (IFRC) Global Logistics Service is to ensure that the IFRC has a robust, competent and efficient logistics capacity to effectively carry out its

humanitarian assistance activities and achieve its goals. Its mission is to create a world-class service to support the core work of the Red Cross and Red Crescent network and to share resources with other humanitarian organizations. (IFRC humanitarian logistics, 2011)

The Finnish Red Cross has been training logistics delegates for Emergency Response Unit (ERU) since the year 2008 and at the end of 2011 its roster consists of 70 logistics professionals. In 2010, a large scale flooding disaster occurred in Pakistan and according to Pakistani government data the floods affected directly about 20 million people (Wikipedia 2011). The mission in Pakistan was the first mission managed and staffed by the Finnish Red Cross and due to its unique nature it was chosen as the case study.

1.1 Objectives and research questions

The objective of this study is to reflect the area of supply chain management from the humanitarian logistics perspective. Furthermore, the interest is to examine how the Finnish Red Cross logistics emergency response unit (ERU) work. Based on the literature analysis compared to the information received from the case, the author of this thesis aims to find whether there are any fall backs in the current ERU logistics procedures and to provide suggestions how to improve its work in order to gain efficiency in aid logistics. Questions to be answered are:

- How are humanitarian supply chains structured?
- What are the differences between business and humanitarian supply chains?
- How did Finnish Red Cross Logistics ERU work during the Pakistan mission on year 2010?
- What can be improved in Finnish Red Cross ERU logistics? How can this be done?

1.2 Scope and limitations

This study concentrates on analyzing and finding aspects for response in emergency logistics. Worldwide there are a large number of organizations working on the sector of humanitarian logistics; United Nations Children's Fund (UNICEF), World Food Program (WPF) and World Vision International (WVI) to mention just a few of them. The International Federation of the Red Cross and Red Crescent Societies (IFRC) and more specifically Finnish Red Cross was selected as a study case because the Federation is the world's largest humanitarian organization and is therefore interesting subject for a study. Finnish Red Cross Emergency Response Units are a part of IFRC's disaster response system and their professionals are often working in multinational teams. Among National Societies there are several different types of ERUs, including health care, water & sanitation, IT & telecommunication, relief and logistics all working closely with the Field Assessment Coordination Team (FACT). However, this study focuses on analyzing the ERU logistics in the context of the Finnish Red Cross only.

Disaster management contains several pre- and post-disaster phases, which are explained in detail later in the study. In the scope of this study is only the emergency logistics which is immediate response for the effects of disasters. Pre-disaster actions along with long-term development projects are out the scope. As mentioned before, the Pakistan floods operation in 2010 has been till this date the first and only large scale mission by the Finnish Red Cross logistics emergency response unit, which is the reason to limit the study to this one case only.

Disasters are classified into three types: natural, man-made and hybrid disasters. Natural disasters result from natural forces. Man-made disasters are those disasters which are caused by human decisions. Hybrid disasters are those disasters that result from both natural and man-made causes. (Shaluf 2007, 687). This study, based on the case, concentrates only on the natural disasters.

As discussed later in more detail, humanitarian supply chain contains several different flows which are material, information, financial, people and knowledge and skills (Tomasini & Van Wassenhove 2009, 5). Flow of materials can be further divided into coordination of the inbound, outbound and reverse logistics. Inbound system of logistics which is referred as materials management, comprise activities such as procurement, production planning, receiving and inventory management. Outbound system of logistics, which is usually called physical distribution, indicates to the movement and storage of finished goods. Reverse logistics refers to moving goods back from their final destination for example due to need of repair or refurbishing. (Langley, Coyle, Gibson, Novack & Bardi 2008.) In this study the scope of flows is limited to physical distribution of materials and information. The material management and reverse logistics has been excluded from the study as they are not the key elements of emergency response logistics.

1.3 Research method and data collection techniques

In order to execute successful study both research method and data collection techniques must be selected carefully, considering the object and scope of the research in hand. The main difference between quantitive and qualitative research is the emphasis on these two methods. The quantitive research emphasizes on testing and verification of the data and the focus is on facts and/or reasons. It is logical, critical and result oriented method. For data collection controlled measurements are used. Respectively the qualitative research emphasizes on understanding and the focus is on understanding the respondent's/informant's point of view. It is interpretative and rational approach and process oriented. For data collection, observations and measurements in natural settings are used. (Ghauri & Gronhaug 2010, 104-105.) Qualitative research is designed to tell the researcher how and why things happen as they do (Cooper & Schindler 2008, 162). As the objective of this study is, indeed, to answer those questions, qualitative approach was selected to examine the subject.

As indicated in the topic, this thesis contains a single case. Ranjit Kumar (2005, 113) defines the case study method as an approach of studying a social phenomenon through a thorough analysis of an individual case. All data relevant to the case are gathered and organised in the terms of the case. Maylor and Blackmon (2005) explains that the case study is not a "pure" research method, because normally data is collected from multiple sources and using several techniques such as surveying, interviewing, participant observation and archival research. Further case study design does not dictate the use of any particular technique for collecting or analysing data. The case study as design, integrates aspects of both a quantitive and qualitative design. Whether the case study takes more of quantitive or qualitive perspective depends on how the study is conducted. (Maylor & Blackmon 2005, 250). For the purpose of this study, the multi-method design with emphasis on qualitative method is the most useful for collecting and analysing received data. For data collection a combination of techniques was selected. Those are secondary data collection, observation and interviews. Figure 1 summarises both research method and data collection techniques used in this thesis.

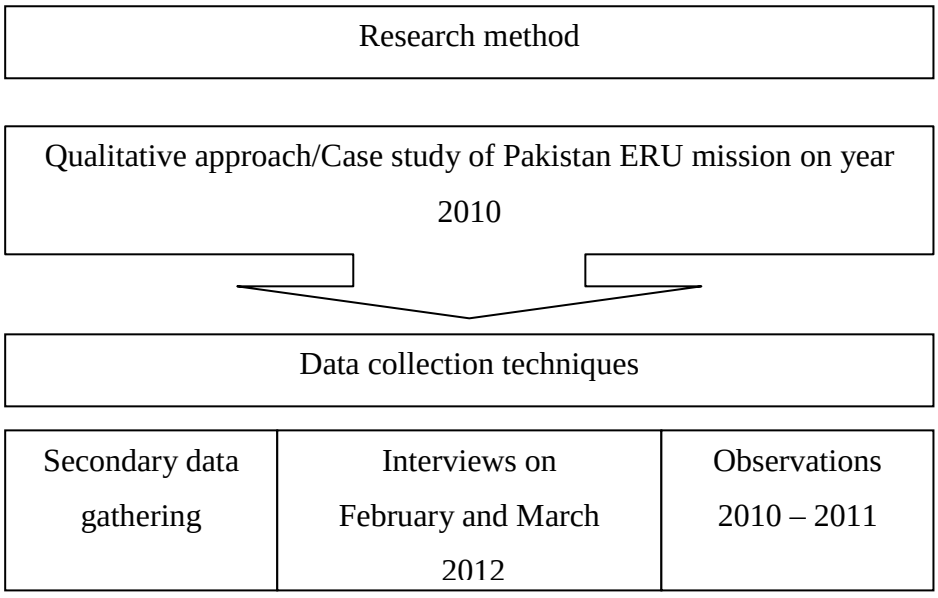

FIGURE 1. Summary of research methods and data collection techiniques

The theory part of the study has been gathered by analyzing the scientific literature available for humanitarian and emergency logistics. This part of the thesis is solely based on secondary data by using number of books and scientific publications. For the empirical part, the most valuable data was collected through interviews from two persons who worked in Pakistan during the mission. The questions were sent by email to Kirsi Pohjola, a Finnish Cross delegate (Appendix 2) and Ari Mäntyvaara, a Finnish Red Cross logistics coordinator (Appendix 1). Kirsi Pohjola responded by email on 24 February 2012 and Ari Mäntyvaara was interviewed through Skype without video connection on 6 March 2012.

Primary data is the core of the empirical study but also the secondary data was used to supplement the study. This information was mainly collected from the Internet and other non-scientific publications. As the author of the thesis is a delegate in Finnish Red Cross reserve and member of the ERU logistics rooster since year 2010, one method used for the information gathering was field observation. Field observation means that observer is a natural part of the situation or event. The researcher is part of the organization and decides to study it in one way or other. (Ghauri & Gronhaug 2005,121) These observations have been gathered during training sessions organized by Finnish Red Cross, in which the author has attended in 2010 and 2011.

1.4 Thesis structure

This thesis is structured to contain two main parts: the theoretical framework including chapters two and three and the empirical part with chapter four. Chapter two gives a general overview on supply chain management and humanitarian logistics. The chapter three focuses on the material and information flows from the humanitarian logistics aspect. The empirical part on chapter four starts with introducing the International Federation of the Red Cross and Red Crescent Societies, its approach to disaster management, humanitarian logistics and information management. Chapter four provides also backround information for the Pakistan Floods

occurred in 2010. The core of the chapter is on how the logistics ERU team worked in the Pakistan field in order to provide the full picture of the mission**.** The objective of the chapter five is to tie the theoretical framework and the case together. In this chapter the author will conclude the findings of the study and provide possible suggestions to the Finnish Red Cross in order to improve the efficiency of aid work in logistics Emergency Response Unit. Finally the last chapter number six summarizes the thesis. The overall structure of the thesis is illustrated in Figure 2.

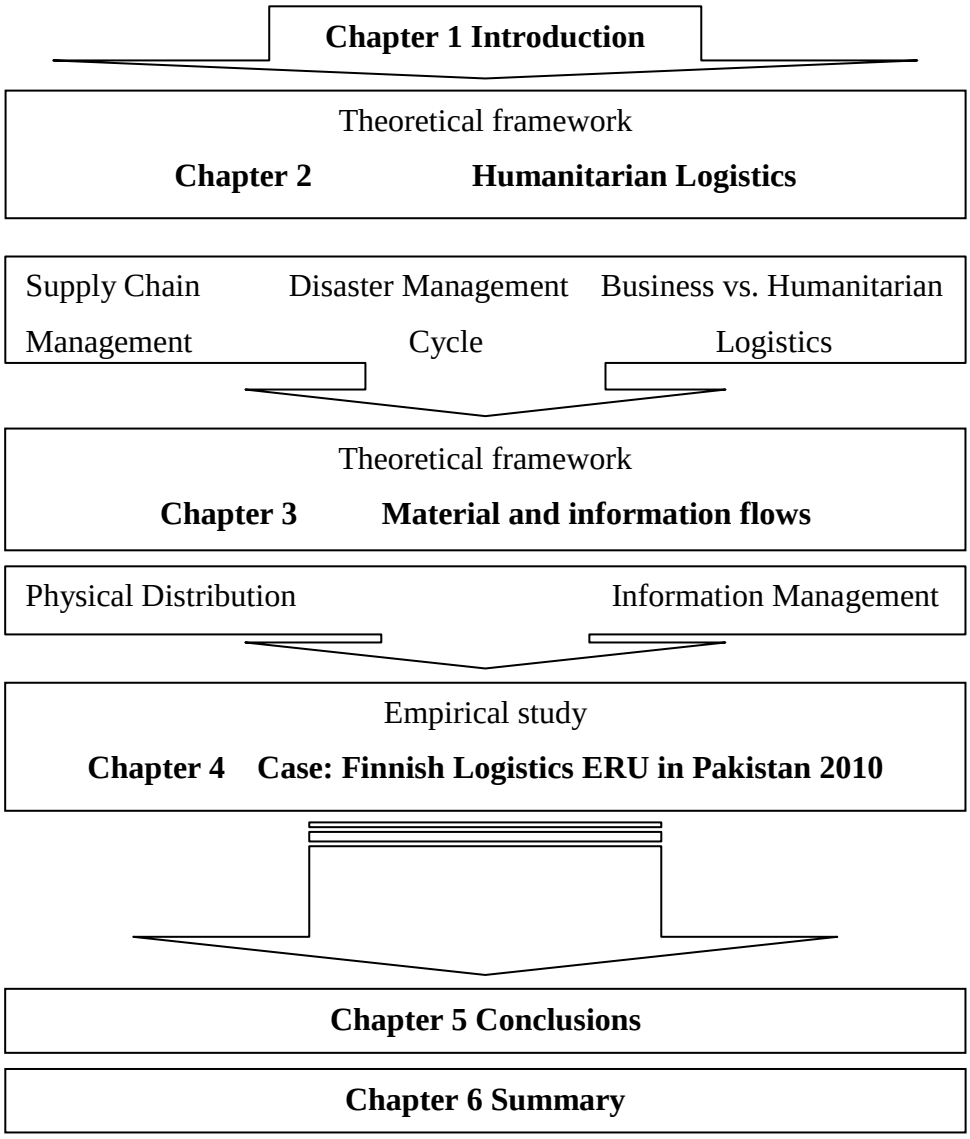

FIGURE 2. Structure of the thesis.

2 LOGISTICS OF HUMANITARIAN AID

Humanitarian logistics (and its synonyms, e.g. emergency response logistics, relief logistics, disaster relief logistics) is understood as a process of planning, implementing and controlling an efficient, cost-effective flow and storage of goods and materials, as well as related information, from point of origin to point of consumption for the purpose of meeting the end beneficiary's requirement (Thomas & Mizuhima 2005, 60). It is a branch of logistics dealing with logistical aspects of a disaster management system (Nikbakhsh & Farahani 2011, 291).

Like the private sector, the humanitarian organizations have realized that getting different parties to work together, to deliver food, shelters, hygiene kits or water cans to those in need, requires supply chain management approach to effectively perform, eliminate redundancies and maximize efficiencies. This chapter provides a brief introduction to supply chain management and covers the key elements of humanitarian logistics by defining the key terms, demonstrating the supply chain flows, presenting the generic supply chain types by John Gattorna (2009) and explaining the disaster management cycle as a tool for preventing and/or mitigating the disaster effects. In addition, a comparison between the humanitarian supply chains to business supply chains is provided.

2.1 Supply chain management

The term supply chain management (SCM) was originally introduced by consultants in the 1980's and it has received considerable attention. The term supply chain is a much wider, intercompany, boundary-spanning concept than logistics (Mangan, Lalwani & Butcher 2008, 10). There is no commonly agreed definition of supply chain, hence, there is a general agreement about the basic principle of a supply chain as the series of processes and organizations, in which materials – both tangible and intangible – move through their journeys from initial suppliers to final

customers (Waters, 2009). The following commonly used definition of supply chain management is provided by the Council of Supply Chain Management Professionals (CSCMP):

> *"Supply Chain Management encompasses the planning and management of all activities involved in sourcing and procurement, conversion, and all Logistics Management activities. Importantly it also includes coordination and collaboration with channel partners, which can be suppliers, intermediaries, third-party service provides, and customers. In essence, Supply Chain Management integrates supply and demand management within and across companies."* (Kovács & Spens 2012, xii).

In the evolution from logistics to supply chain management, a series of material movement activities have become a complex managerial function for planning and controlling the movement and storage of materials and in many cases within multiple organizations.

Using the supply chain management provides the opportunity to optimize logistical performance at the inter-organizational level. It also forces organizations to choose what capabilities along the value chain to invest in develop internally, and which activities to outsource for development by suppliers. (Tomassini & Van Wassenhove 2009, 2.) The use of supply chain management has become more popular also in the humanitarian area, with increasing use of inter-organizational clusters in logistics operations and stronger interest of donors and media of how and for what the donated money has been spent.

2.1.1 Four types of generic supply chains

Gattorna (2009) presents four generic types of supply chain of which there usually exist variations and different mixes, depending on the product, service and country. These four types are continuous replenish lean, agile and fully flexible supply chain. The general characteristics are summarized in Table 1.

Continuous replenish supply chains focus on the relationship with customers (or suppliers) and they share information freely with the partners. Strategic partnerships, long-term stability and mutual trust are all key components. This type of supply chain indicates to strong collaboration, which is restricted to those parties who have common values and are committed to helping each other for mutual benefit. Application on this type of supply chain should be the kind which is aimed at retaining loyal customers and suppliers. The leadership style must focus on consensus and concern for other team members. (Gattorna 2009.)

Lean supply chains focus on efficiency and lowest cost-to-serve. To achieve this outcome, high-volume, low-variety business is optimal, and products are made and distributed according to forecast. This type of strategy can be used for supply chains operating in predictable environment with mature products and services. Lean supply chain concentrates on reducing cost of core processes and aims for delivery-in-full-on-time-error free and routines should not be disturbed under any circumstances. The leadership style emphasizes stability and cost control. (Gattorna 2009.)

Agile supply chains concentrate on delivering a quick response to demanding customers, mostly by making the order using postponed techniques due to unpredictable operating environment. The organization is composed of clusters of multidisciplinary personnel who have a common goal of speed as they focus on specific customer segments. The leadership style obsessively searches for solutions to meet the tough objectives, often in high-growth markets. (Gattorna 2009.)

Fully flexible supply chains are designed to meet unplanned and unplannable demand. It offers innovative solutions, which are delivered extra fast. This type is very entrepreneurial with low system requirements without standard processes and involves a small group of similarly minded individuals quickly seeking creative solutions. The leadership style is informal, led by inspiration and valuing the innovation. (Gattorna 2009.)

TABLE 1. Four generic types of supply chains (modified from Gattorna 2009, 48-51).

Type of Supply Chain	General Characteristics
Continuous replenishment	* Focus on the relationship development. * Key components: Information sharing, Long-term stability and mutual trust. * Consensus and concern for others in leadership.
Lean	* Focus on high volume, low variety and low costs. * Key components: operates in predictable environment, concentrates on reducing cost. * Leadership style emphasizes on stability and cost control.
Agile	* Focus on quick response. * Key components: Fast decision-making, rapid response in unpredictable conditions. * Leadership style searches for solutions.
Fully flexible	* Focus on meeting unplanned and unplannable demand. * Key components: entrepreneurial, low system requirements, no standard processes. * Informal leadership style, led by inspiration and valuing innovation.

2.1.2 Supply chains in humanitarian context

Humanitarian supply chains are possibly the most complex type of supply chains. They are formed in response to unforeseeable and unplanned events that range from small localized hazards all the way to catastrophic events affecting large regions and populations. (Hughes 2009, 85.) Disasters can be natural or man-made, as well as complex combination of both types. Characteristically disaster (the term catastrophe is used in the same context) is a serious disruption of the functioning of a community or society involving widespread human, material, economic or environmental losses and impacts, which exceed the ability of the affected community or society to cope using its own resources. (Kovács & Spens 2012, xxi). Humanitarian organizations adhere to the three widely accepted principles of neutrality, impartiality and humanity in their operations (Tomasini & Van Wassenhove 2009, 20-21; Heaslip 2012, 163). Neutrality as principle means that the

organization does not take sides in hostilities, nor it does it engage in political, racial, religious or ideological controversies. Principal of impartiality means that individuals are not discriminated based on gender, nationality, race, religious beliefs, class, political views or any other feature. Prevention and alleviation of human suffering wherever it may be found defines the principle of humanity. (Larson 2012, 11.) These principles should be observed by humanitarians in their decision-making and they form part of the today's policy that sets the parameters in action and defines the roles of agencies (Tomasini & Van Wassenhove 2009, 21).

One way to facilitate the effectiveness of humanitarian supply chain is to identify the phases within the life of this supply chain in order to model the stages and eventually the process of providing aid. One limitation of the models is that they will only approximate reality and there will always be exceptions and complications. However, better understanding of the various activities and processes in humanitarian supply chains will help the organizations in their decisions making in order to provide maximum benefit to the aid recipients. The ultimate aim for each humanitarian relief response is to dismantle over time as business and community activities are re-established. (Hughes 2009, 86.) These phases can be distinguished for the time before disaster strikes (the preparation phase), instantly after disaster strikes (the immediate response phase), rebuilding and restoration (the reconstruction phase) and finally capacity building (the preparation phase (Hughes 2009, 87 – 88; Larson 2012, 13). The contents of the phases as well as their relation to generic supply types will be discussed more detail in chapter 2.2.

2.1.3 Supply chain flows

In the business sector, flows in the supply chains can be referred to as the Three B´s: Boxes, Bytes and Bucks. In the humanitarian supply chain, fourth and fifth B for Bodies and Brains, representing people with their knowledge and skills is added. The types of flows in supply chain are listed following. (Tomasini &Van Wassenhove 2009, 4.)

Boxes, as material, represent the physical product flow from suppliers to customers. Bytes, which stand for information, represent the order transmission and order tracking which coordinates the physical flows. Bucks, which mean the financial flow of credit terms used, payment schedules and consignment arrangements. Bodies stand for people. In other words, meaning the manpower deployed at each mission to implement the supply chain. Brains, which stands for knowledge and skills, is particularly acute in humanitarian sector since each time a supply chain is deployed in response to a disaster the required skills need to be quickly evaluated and each supply chain is different. (Tomasini &Van Wassenhove 2009, 4-6.)

None of the flows can be neglected, as failure in one of them is likely to have impact on the others. For example, shortage of professional staff in customs clearance can stop the relief items entering the country or lack of proper assessment can cause a wave of non-required donations. The key is to combine all flows into flawless execution plan to produce an adequate response (Tomasini &Van Wassenhove 2009, 4-6.)

Figure 3 below demonstrates the five types of flows in relation to the network of processes and organizations in which the materials move through their journeys from initial suppliers to final customers, as discussed earlier.

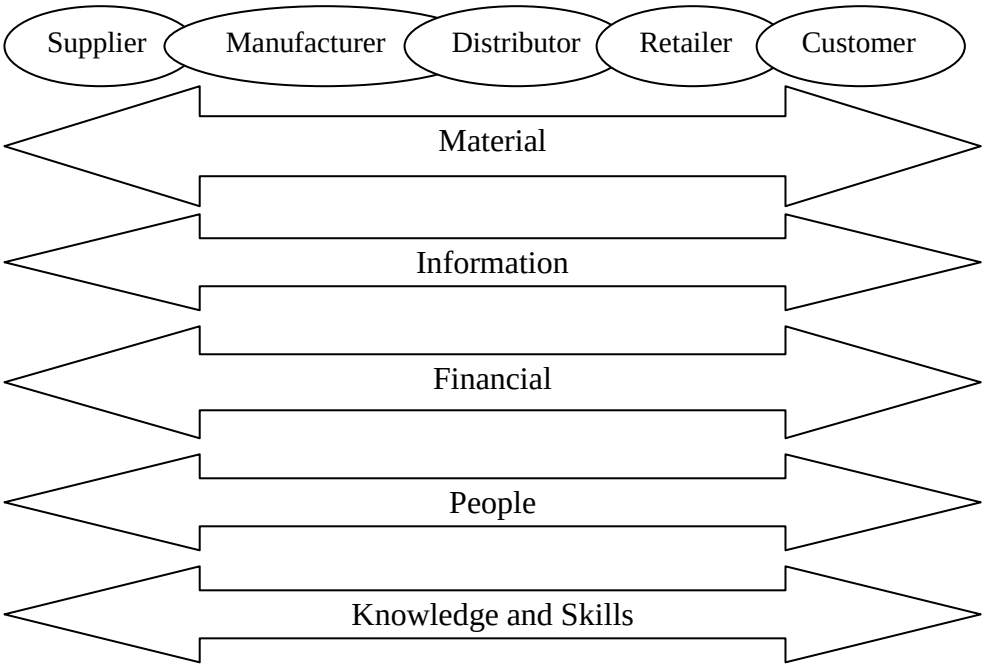

FIGURE 3. The Supply Chain Flows (Tomasini & Van Wassenhove 2009, 5).

When responding to need for humanitarian aid, the target is to deliver the right goods, at the right time, to the right place and distribute the materials to the right people. In the early stages of a respond, goods may be flown from abroad as quickly as possible but later on, the response becomes a mixture of being effective at reasonable cost. Not every type of goods is required in every disaster and a lot of unsolicited donations may become a burden to the system. Therefore, it is important that cost, speed and quality of the units is monitored and communicated to improve the efficiency. (Tomasini & Van Wassenhove 2009, 48.)

Information is critical in designing a supply chain that addresses the needs of beneficiaries, such as water, food, medicines, shelter and defining the means to meet those needs. The factors to be considered are sufficient warehousing capacity, airport or corridor access, transport capabilities and telecommunications. Further, smooth coordination and avoidance of dublicated efforts relies on information sharing and knowing who will be

involved in disaster response and what are capacities of acting particies. (Tomasini & Van Wassenhove 2009, 49.)

The compelling images revealed in media from disaster areas are critical to humanitarian organizations in order to raise funds and allocate them to emergencies. More important is, in terms of disaster management, liquidity of the funds raised. The funds will take days, weeks or months to reach the organizations. The challenge is that meanwhile relief organizations need to meet the financial obligations to their supply chain partners. (Tomasini & Van Wassenhove 2009, 50.) The characterics of material and information flows are further discussed in third chapter.

Getting the right skill set to a disaster area may be difficult, as there must be people who are available for deployment. Often in disasters, many locally trained staff cannot assist as they are victims themselves. Foreign teams need to be deployed to assess and assist in the operation. They will train the local and foreign staff as well as volunteer for the longer-term tasks. (Tomasini & Van Wassenhove 2009, 51.)

Specialized knowledge is required to make quick decisions under high uncertainty when designing a response. This is knowledge that could be already present in the area from the local emergency response teams or it is imported. The type of knowledge needed changes at different phases of the disaster, demanding a variery of expertizes to be available. (Tomasini & Van Wassenhove 2009, 51-52.)

The key characteristics of each flow are summarized in Table 2 on the following page.

TABLE 2. Characteristics of humanitarian supply chain flows (Tomassini & van Wassenhove 2009, 49-51)

Flow	Characteristics
Material (Boxes)	Cost, speed, quality
Information (Bytes)	Tool for designing supply chain and coordination
Funds (Bucks)	Liquidity
People (Bodies)	Getting staff to the field
Knowledge (Brains)	Making skills available to create solutions

2.2 Phases of humanitarian action

Disaster management is a set of processes designed to be implemented before, during and after disasters to prevent or mitigate their effects. The scope involves preparing for disasters, responding to them and finally supporting and rebuilding the society after the actual disaster relief operation has ended. As disasters pose a permanent threat, disaster management systems and practices should be a part of the preparedness and should be continually monitored and improved in order to adapt to possible disaster in the future. Any disaster management system consists of four main phases: mitigation, preparedness, response and recovery. (Tomasini & van Wassenhove 2009, 44-47; Nikbakhsh & Farahani 2011, 296-299.) In disaster management literature, these phases are in various diagrams illustrated as cycle which eventually leads to greater preparedness, reduced vulnerability and stronger society. This cycle is referred as the disaster management cycle.

Mitigation addresses the long-term, proactive social component of emergencies. This includes structural (such as strengthening buildings and transport networks) and nonstructural measures (such as laws and land-use planning) that reduce the vulnerability of the population and increases their capacity to survive from future disasters. Due to preventing nature of the mitigation phase, it is the most effective and important against disaster

effects. Preparedness means implementing response mechanisms in case a disaster occurs. For example a community establishes a set of plans and solutions from preplanning the logistics of relief operations to defining the responsibilities for personnel and training personnel for emergency services. Response phase requires the immediate deployment of the necessary personnel (e.g. medical units, search and rescue units and firefighters) and equipment to the disaster area. From the logistical point of view response during disaster is very complex. Accurate data for demand (number of beneficiary's and type of items required) and supply (donations) can be scarce during the relief operation. The recovery phase follows the response by restoring the areas affected by disasters to their previous level. This phase is mainly concerned with secondary needs of people such as rebuilding houses. One of the main goals of this phase should be to improve the infrastructures and conditions of the affected area by using mitigations techniques. (Tomassini &Van Wassenhove 2009, 44-47; Nikbakhsh & Farahani 2011, 296-299)

Hughes (2009, 88-90) has examined these phases in relation with the four generic supply chain types introduced by John Gattorna. In this article the mitigation and preparedness phases are referred to as prequel to demonstrate the situation prior to catastrophic events. This phase is used for long-term capacity building and stockpiling as well as training and certifying aid worker for potential aid situations. In fact there is an increasing recognition of skilled logisticians and supply chain expects for implementation of successful response efforts. There activities involve lean and collaborative supply chain activities. They are the basic ingredients (goods and services) required for the agile supply chains which will facilitate and improve the response time.

Phase one, which corresponds to disaster management cycle phase response, is called emergency response. This is triggered by the disaster. The immediate response to an emergency is to provide trained personnel, medical teams, search and rescue teams and professionals from larger non-governmental organizations (NGOs) to assess the damage and level of aid

required. This rapid mobilization of groups is an agile supply chain response. The goods and services provided at this stage are often minimal requirements for survival – including medicines, clean water or simple water purification systems and shelter (Hughes 2009, 89-91.)

In phase two, which is described as survival, the emergency phase of humanitarian supply chains rapidly makes a transition from agile supply into seeking creative solutions in situations where the systems and activities within the original community is often completely destroyed and the humanitarian supply chain has be developed "from almost nothing", relying heavily on resources supplied outside the affected area. This is the realm of the fully flexible supply chain in which the distribution of goods and services is not straight forward and ongoing rapid decisions are required to sustain the flow of aid (Hughes 2009, 89 - 93). In disaster management cycle, the fully flexible supply chains take place in response phase.

When moving to phase three, known as rebuilding and restoring by Hughes (2009, 93-94) and named as recovery in the demand management cycle, the activities and processes within the humanitarian response will become more stable as the communities affected by the events stabilize and re-establish. The requirement for urgent and creative solutions reduces in this phase as the fully flexible supply chain is replaced by an array of supply chain types that evolve out of the more routine and standardized activities developed within aid situation. The re-establishment of community's common activities shifts from chaotic reactionary phase of survival to into the rebuilding and restoration phase. This phase of humanitarian supply chain is more stable and often less complex than in the previous stage. It is characterized by a declining need for fully flexible solutions and the emergence of more typical collaborative, lean and agile supply chains all re-forming in the economy of the area.

Figure 4 summarizes the disaster management cycle phases discussed above and the relation of general models of supply chains in reflection to the cycle.

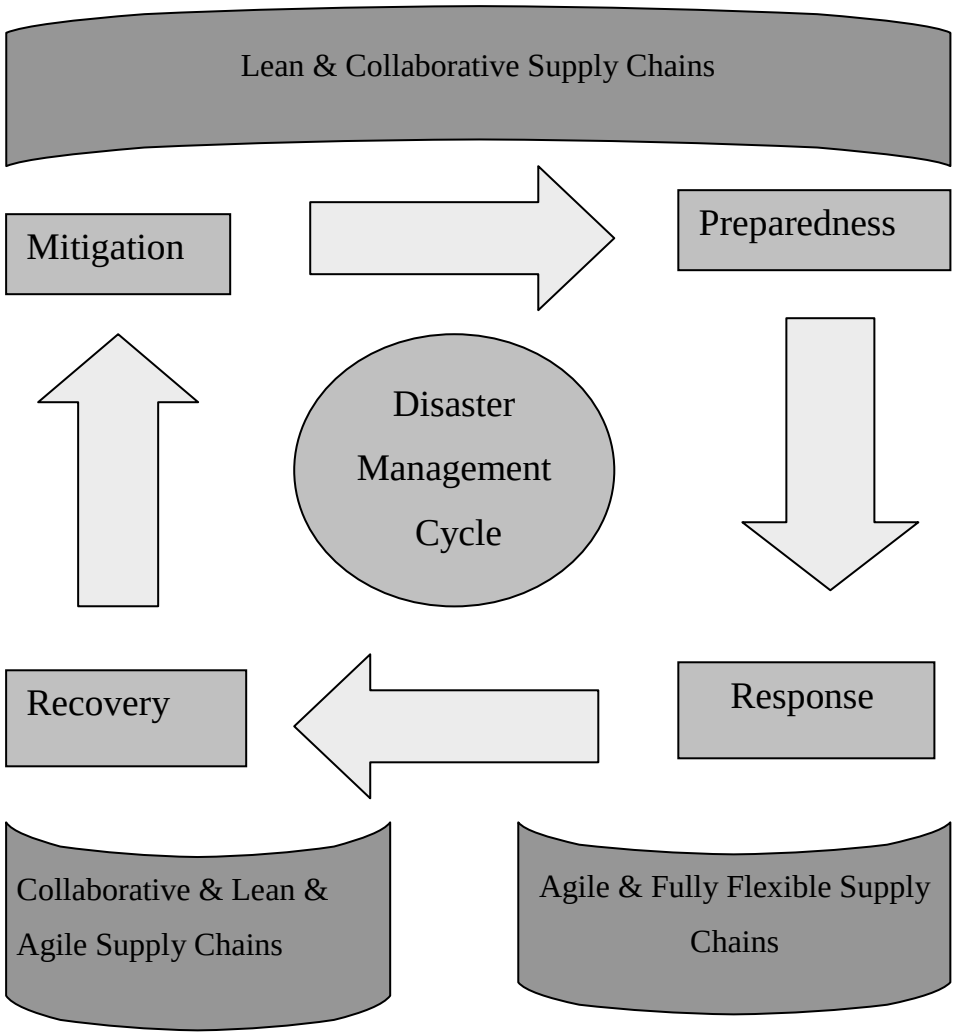

FIGURE 4. Disaster management cycle combined with general models of supply chains (Modified from Hudges 2009, 89; Tomasini & Van Wassenhove 2009, 45).

Understanding the phases in humanitarian supply chain has important implications for aid providers. The dynamic alignment of the different stages and activities with the requirement of the beneficiaries provides the potential for the aid effort to be most effective. The more distinctive features of each phase can the catered for by selecting activities that will most help the beneficiaries and improve the agency's accountability to their donors. Humanitarian supply chain actually consists of a series of supply chains all with the same goal – to rescue and prevent loss of life, then sustain life, and finally to rebuild communities (Hughes 2009, 94.)

2.3 Humanitarian logistics versus business logistics

The humanitarian sector focuses on developing capabilities to respond to high-impact events with unpredictable resources. Humanitarian organizations such as the International Federation of Red Cross Red Crescent Societies (IFRC) and World Food Program (WFP) have specific mandate to raise funds, recruit and train staff, set up agreements with business and government, and develop relationships with communities to respond to natural and political disasters affecting communities. This mandate is an exceptional license to focus on saving lives by mitigating the impact of disasters and helping communities to rebuild the infrastructure. As discussed in the previous chapter, their core of action is to develop a supply chain, which is agile enough to adjust to changes in types of goods and quantities required, and adaptable to react to changing conditions, for example security, and new actors in the field e.g. different Non-governmental organizations (NGO's) and military. (Tomasini & Van Wassenhove 2010, 368.) Whereas, business logistics actors are motived by economical profit (Larson 2012, 2-3).

Business logistics generally work in a stable environment in terms of political and economic conditions. The infrastructure in the operational area is in place as well as all the critical factors; customers, suppliers, service providers and employees. The unstable environment, in which the humanitarian organizations operate during the response phase, is characterized by a lack of stability, greater complexity and special challenges in matching multiple sources of supply within shifting recipient demand. (Larson 2012, 3.) Further, in commercial supply chains, the demand for the product is usually either estimated using proper forecasting techniques or initiated by the customer. Therefore, commercial supply chain managers try their best to eliminate elements of uncertainty as much as possible. On the contrary, the nature of demand in humanitarian logistics is very uncertain because disaster time, location and intensity - and hence the knowledge of relief items required – are not known until after a disaster occurs. (Nijbakhsh & Farahani 2011, 300.)

While it is said that "time is money" to a business logistician, time is life for the humanitarian. More effective supply chain management can make the difference between life and death; greater efficiency means serving more people in need. One of the most pressing humanitarian supply chain challenges is to balance the conflicting objectives of flexibility and efficiency. (Larson 2012, 3.)

Nonprofit organizations face stiff competition for donor support, rather than competition of paying customers or buying end-customers, as donors provide funding, material and/or service support. However, donors are also considered as customers, since their wishes and mission statements can mean restrictions on the use of money ("earmarking") or loss of funds. Thus, the not-for-profit sector serves multiple stakeholders, including two fundamentally different types of customers; beneficiaries, which are also end-users of the relief materials, and donors. (Charles, Lauras, Van Wassenhove 2010, 729; Larson 2012, 3.) In humanitarian supply chain, also two kind of suppliers exists; those who give products or money (donors) and those who are paid by the organization for the supply of the necessary items. Given these elements, it is said, that the concept of supply chain varies slightly from one sector to another. (Charles, Lauras, Van Wassenhove 2010, 729.) In the business sector, the flow from supplier to end-customer is straightforward.

Another major difference is in the lifecycle of each supply chain. Humanitarian chains are project oriented. They have a short lifecycle and are set up in specific conditions. Stable business environment in commercial supply chains enables longer lifecycle and not all business require such agile capabilities as humanitarian ones. (Charles, Lauras & Van Wassenhove 2010, 729.)

One differentiating factor between the humanitarian and business sector is the nature and size of flows. As to information flows, the role played by the media is incredibly high in humanitarian supply chains, it directly impacts

the size and the complexity of the relief operations. With no media coverage, the number and commitment of donors, and therefore the number of items flowing in the supply chain, tends to diminish. On the contrary, over exposition leads to over reaction of donors and this creates some imbalance between the amount of items received and the amount of resources available to manage them. (Charles, Lauras & Van Wassenhove 2010, 729.)

TABLE 3. Main differences between humanitarian and commercial supply chain (modified from Charles, Lauras & Van Wassenhove 2010, 729-732; Larson 2012, 2-6)

Aspect	Logistics Context	
	Humanitarian	**Business**
Purpose	Social Impact	Gain of economical profit
Demand environment	Uncertainties. Highly volatile and unstable	Usually forecasted/known
Perspective on time	Time is life (of death)	"Time is money"
Source of funds	Donors	Paying customers
Supply chain range	From donors and suppliers to beneficiaries	From suppliers' supplier to customers' customer
Customer definition	End user (beneficiary) ≠ Buyer (donor)	End user = Buyer
Supply chain lifecycle	Project oriented	Continuous nature
Information flow	Means of communication often reduced (no internet access on the field etc)	Well structured
Human flows	People flows + knowledge transfer	
Financial flows	Unilateral (from donor to beneficiary) and uncertain	
Actors	Multiplicity in nature, but scarcity in number + misaligned incentives	Known, with aligned incentives

3 HUMANITARIAN SUPPLY CHAIN; MATERIAL AND INFORMATION FLOWS

Multiple models of supply chains are used within different phases of managing disasters and humanitarian logisticians have developed tools and methods to respond quickly to short-term changes, thereby improving the agility of their supply chain (Charles, Lauras & Van Wassenhove 2010, 723). Further, as international humanitarian supply chains are acknowled for their ability to respond and they are clearly unpredictable, turbulent and requiring flexibility (Oloruntoba & Gray 2006, 117), they have potential to fill the requirements for agile supply chain.

As discussed in Chapter 2, humanitarian supply chain consists of flows of material, information, finances, people and knowledge and skills. Material flow can be divided further into materials management and physical distribution, depending on the direction of flow of materials. Materials management described as planning and control of the flow of inbound logistics including activities such as procurement, production planning, receiving, quality control and inventory management. Physical distribution is outbound logistics indicating to the movement and storage of finished goods. (Langley, Coyle, Gibson, Novack & Bardi 2008, 509.) Logistics chains are network of intermediaries involved in transfer, storage, handling, communication and other functions that affect to the efficient flow of goods. The chain can be simple or complex depending on the structure of organization. (Langley, Coyle, Gibson, Novack & Bardi 2008, 65-66.)

Information is critical in supply chain management and it must flow effectively between organizations and key participants. Without accurate, timely information it is difficult to make decisions and take action (Langley, Coyle, Gibson, Novack & Bardi 2008, 190.)

This chapter focuses on the physical distribution sector of material flow as well as the information management in the humanitarian supply chain. Topics covered are the characteristics of humanitarian logistics chain structure, the role of information, information technology within supply chain and coordination of information between humanitarian organizations.

3.1 Physical distribution of materials

The operational characteristics of humanitarian logistics chains differ, depending on the type of disaster and the types of relief organizations involved. However, there is a typical flow of supplies in their logistics. (Balcik, Beamon, Krejci, Muramatsu & Ramirez 2010, 24.) The typical logistics chain for materials is illustrated in Figure 5 and its structure is discussed in more detail in following sub-chapters. The pre-disaster relief chain includes procurement and stock pre-positioning, while post-disaster operations focus primarily on procurement and transportation (Balcik, Beamon, Krejci, Muramatsu & Ramirez 2010, 24).

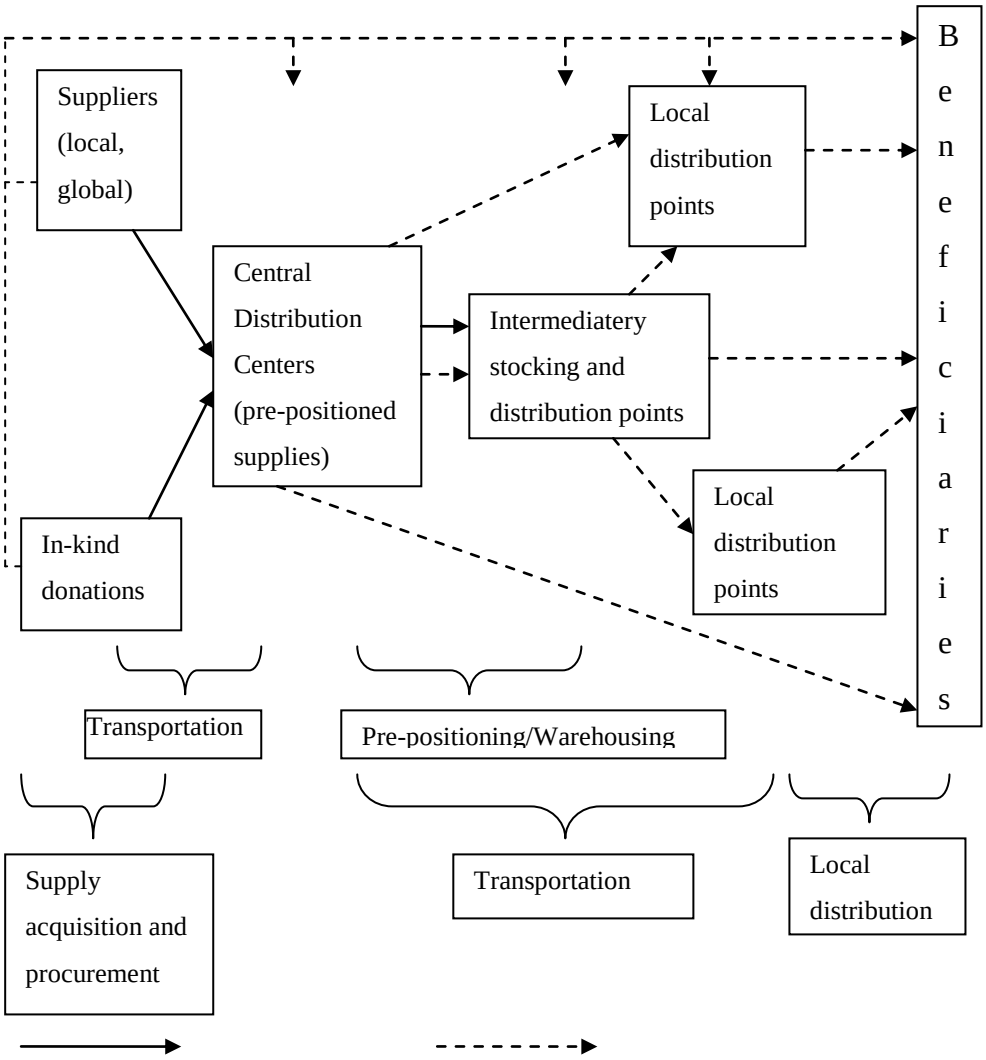

FIGURE 5. Humanitarian logistics chain structure (Balcik, Beamon, Krejci, Muramatsu & Ramirez 2010, 25).

3.1.1 Supply acquisition and procurement

The first stage of any humanitarian logistics chain is to purchase and procure the necessary items and equipment for relief purposes either locally or globally (Nikbakhsh & Farahani 2011, 301). Both options have their advantages and disadvantages. Balcik and Beamon (2008) provide the following example. Although local supplies may not be available in the quantity and quality needed, local procurement requires shorter lead times and has lower logistics costs. However, strong post-disaster demand and

local competition for supplies may inflate local market prices, thereby increasing the unit cost of local supplies. The challenges of global procurement in the post-disaster environment rise primarily from the time-consuming processes involved, for example, competitive bidding and customs clearance and transportation capacity requirements for shipping large quantities of bulk supplies. Relief supplies may also be acquired through in-kind (non-financial) donations, which usually become available after a disaster occurs. (Balcik, Beamon, Krejci, Muramatsu & Ramirez 2010, 24.)

3.1.2 Pre-positioning and warehousing

After purchasing the required items and equipment during the pre-disaster periods, relief organizations are obliged to pre-position and store their items and equipment in suitable locations considering the location of disaster prone areas (Nikbakhsh & Farahani 2011, 301-302.) As shown in Figure 5, humanitarian organizations may hold pre-positioned stock at multiple intermediary levels, which are global, regional and in-country. Such intermediary distribution centers can also be established temporarily and used only to support post-disaster relief logistics. Storage facilities at airports and seaports are commonly used for this purpose. (Balcik, Beamon, Krejci, Muramatsu & Ramirez 2010, 24.) Challenges of this stage include high cost of opening and operating permanent warehouses, inventory holding costs and possible deterioration of items. There is also high risk that warehouses will be destroyed during disasters, so those used for humanitarian logistics should have higher resistance and need to be located wisely. (Nikbakhsh & Farahani 2011, 301-302.)

3.1.3 Transportation

Transportation is a major component of any humanitarian logistics chain in which human personnel, equipment and and relief items are sent to pre-defined central distribution centers, distribution intermediary points, local distribution centers and finally to regions affected by the disaster. (Balcik, Beamon, Krejci, Muramatsu & Ramirez 2010, 24-25; Nikbakhsh & Farahani 2011, 302.)

Transportation during the post-disaster period is the most difficult stage of humanitarian logistics even if preventive measures and plans have been taken into account. This is mainly because of limited transportation resources, or the infrastructure and equipment are damaged and in poor condition after disaster. Humanitarian organizations do not typically own and operate vehicle fleets in a disaster-affected region. As such, agencies typically rent local vehicles and drivers which results that high peak in vehicle demand may inflate the rental costs. The geographical and weather conditions as well as the security situation of the affected regions may restrict the types of transport vehicles used. For example, some remote areas may be reachable only with small trucks and helicopters or there is lack of basic tools, such as reliable local maps for general orientation or information regarding current road conditions after a disaster. For security reasons, vehicles may need to travel together, as a convoy. (Balcik, Beamon, Krejci, Muramatsu & Ramirez 2010, 24-25; Nikbakhsh & Farahani 2011, 302.)

3.2 Information Management

The commercial supply chain management literature points out, that information flow in a logistics system is as important as material flow, and information is considered as a key source in logistics system. As the complexity of logistics systems and channels increases and more members become involved, the role of information flow in logistics system becomes

more significant. (Shokoofeh 2011, 222.) Broadly, the coordination of information flow can be classified into two main classes, vertical and horizontal coordination. Vertical coordination refers to the coordination of an organization with it downstream and upstream supply chain participants, whereas horizontal coordination refers to the coordination between same-level supply chain participants. (Nikbakhsh & Farahani 2011, 315-316.)

On both vertical and horizontal streams, the quality of the information is critical for the knowledge flowing across the supply chain. To ensure that valuable, actionable knowledge flows across the supply chain and preferably between supply chains, information must be accessible, relevant, accurate, timely and transferable as visualized in figure 6. Information must be available to those who have legitimate need for it, regardless of their location. Obtaining needed information can be difficult because supply chain data often is dispersed among multiple locations and information systems. Technical issues must be addressed and trust built between the organizations sharing information. The information provided must be pertinent and it should be quick to access. The goal is to avoid being overwhelmed by extraneous data that is not useful. Further, the information must be correct, reflect the reality and be available in a reasonable timeframe. Finally, information must be provided in such way that it is transferable from one format to another to make it understandable and useful. (Langley, Coyle, Gibson, Novack & Bardi 2008, 190 -191.)

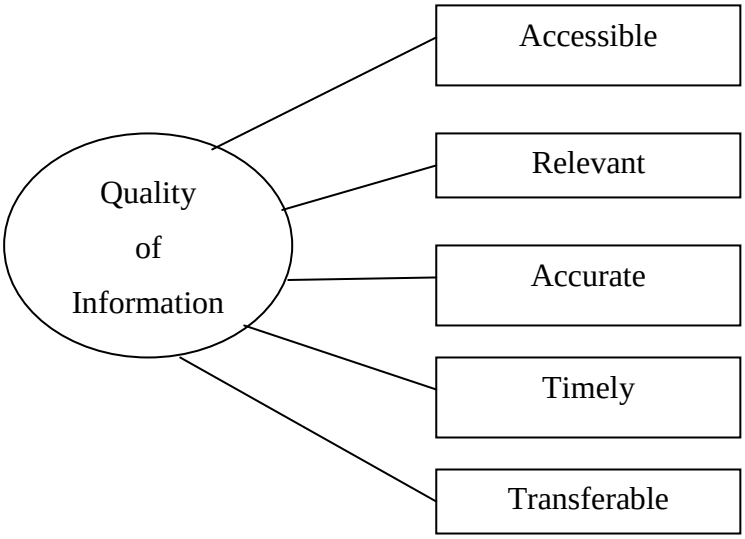

FIGURE 6. Characteritics for quality of information (Langley, Coyle, Gibson, Novack & Bardi 2008, 190 – 191)

Information is as important for humanitarian logistics as it is for business logistics. For organizations providing immediate response, one of the biggest challenges is to receive the information about the situation on the disaster area. Information is the foundation upon which the humanitarian supply chain is designed, formed and managed and information flow needs to be managed as a critical component of the supply chain. (Tomasini & van Wassenhove 2009, 89 - 90.)

Figure 7 shows the typical vertical information supply chain for humanitarian relief as indentified by the Red Cross. The information flows downstream and upstream into the affected areas. It coordinates the sourced donations from donors, purchases from vendors and inventories held in pre-positioned stocks and finally indicates replenishment needs and tracks distributions. (Barber 2012, 133-134.)

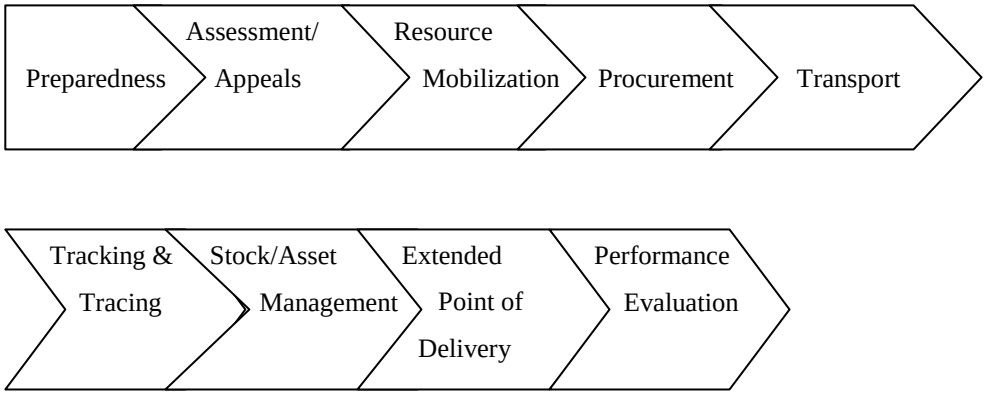

FIGURE 7. Information supply chain in humanitarian organization (Barber 2012, 134).

The humanitarian supply chain management system (SUMA) was developed and launched in the early 1990's. Its objectives were to increase the capacity of disaster operators to be able to manage the information supplies. This system attempted to make the information more transparent and accountable to the total system. Over the years, new systems such Logistics Support System (LLS) and Humanitarian Logistics Software (HLS) have been developed for assisting with mobilization, procurement, transport and tracking. (Barber 2012, 132-133.)

The information flows of the humanitarian supply chain serve as the information bridge between any preparedness and planning and response, between procurement and distribution and between the coordinating headquarters of the logistical flows and recipients. According to Howden (2009) humanitarian logistics information systems should integrate logistical units into the humanitarian supply chain. In other words, it should enhance logistical activities and provide continuous support and create new possibilities for collaboration between organizations. (Barber 2012, 134.)

3.2.1 Information technology in humanitarial logistics

Information technology (IT) has long been recognized as being important for the support of humanitarian relief efforts. According to Gunasekaran and Ngai (2003) information technology assists in integrating activity and providing information to allow the supply chain to operate more effectively. IT systems offer continuity of accurate information, performance measurement and control. They can assist in crisis, the disaster and emergency planning, response and management. (Pettit & Beresford 2009, 458.)

Yet, the inadequate use of technology is still among the main challenges in humanitarian organizations and one possible solution is the use of supply chain management software tools. However, the functional requirements for the software in humanitarian operations are complex. Solution is required for areas such as supply chain planning (for demand, supply and distribution), execution (including track & trace system for commodities and management of warehouse and transport), documentation and reporting. Number of software solutions, for example Humanitarian Logistics Software (HLS), Helios, LogistiX and Sahana, have been developed and are used by humanitarian organizations in order to manage the information flows. (Blecken, Hellingrath, Aufenanger & Ortgiese 2008, 106 -119; Pettit & Beresford 2009, 458 - 459.)

3.2.2 Coordination of information between humanitarian actors

After a disaster strikes in a region, different international organizations and non-governmental organizations (NGOs) along with responsible governmental organizations and military are involved in carrying out relief operations. Efficient and effective use of these groups, coming from different organizations structures and cultures, requires a close cooperation and coordination between them. However, the chaotic nature of post disaster

relief operations, lack of necessary resources and teamwork along with presence of different and numerous organizations have caused many relief operations to fail. Hence, coordination of humanitarian logistical organizations is one of the most important aspects of humanitarian logistics, especially during preparedness and response phases. (Nikbakhsh & Farahani 2011, 315-316.)

Kovács and Spens (2008) have indentified the various actors involved in the humanitarian aid supply network. These actors include aid agencies, NGO's, logistics service providers, military, governments, suppliers and donors and they are illustrated in figure 8.

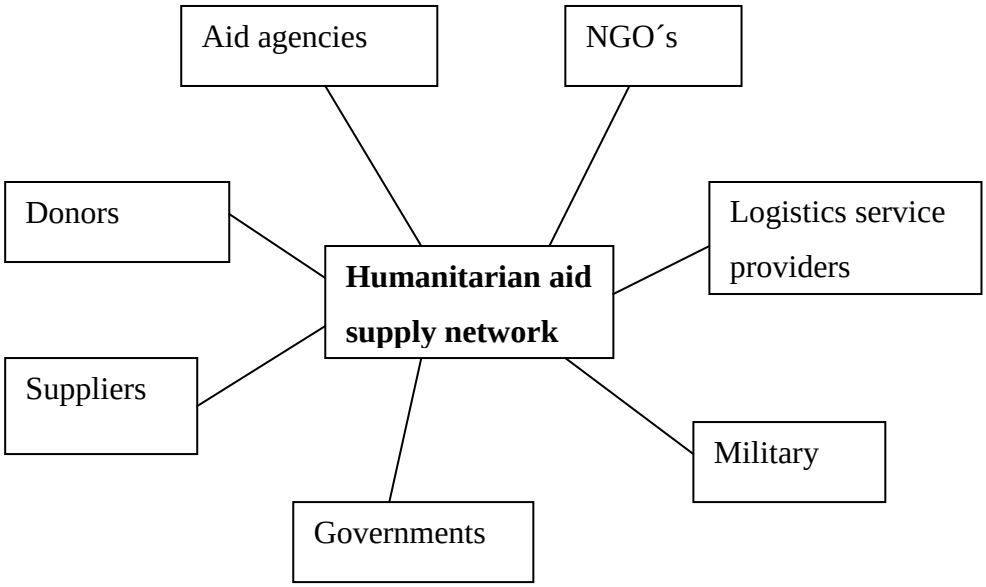

FIGURE 8. The humanitarian aid supply network (Kovács & Spens 2008, 223).

The actors in the humanitarian logistics community vary in their capabilities, size and attitudes with considerable implications for cooperation and for success of the overall relief effort (Heaslip 2012, 151). The UN and relief agencies have established various committees and offices (such as the Office of the Coordinator for Humanitarian Affairs (OCHA), United Nations Joint Logistics Centre (UNJLC)) and deployed various

programs (such as Central Emergency Fund (CERF) and Consolidated Appeals Process (CAP)) to improve coordination and information sharing within the relief organizations (Balcik, Beamon, Krejci, Muramatsu & Ramirez 2010, 23).

No individual or group has the authority to lead a relief operation. The relief actors operate in an environment which does not encourage for coordination due to strong competition of resources and media attention, high staff turnover and different organizational backgrounds. (Balcik, Beamon, Krejci, Muramatsu & Ramirez 2010, 23; Heaslip 2012, 151.) The characteristics of the relief environment that impact planning and coordination are number and diversity of organizations involved, donor expectations and funding structure, competition of funding and media attention, unpredictability, resource scarcity and oversupply and cost of coordination (Balcik, Beamon, Krejci, Muramatsu & Ramirez 2010, 23). These characteristics are visualized in Figure 9 and discussed in detail in following.

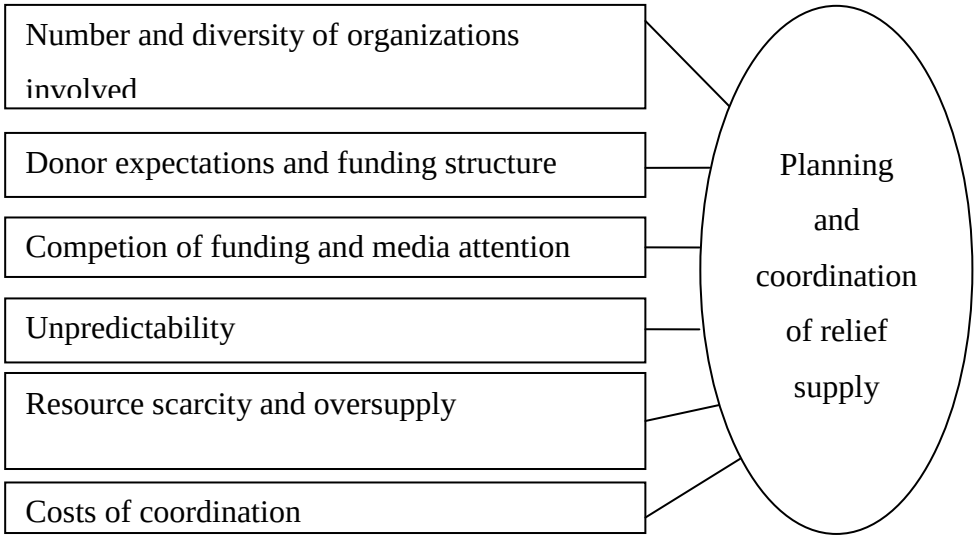

FIGURE 9. Characteristics impacting the planning and coordination of relief supply (Nikbakhsh & Farahani 2011, 318; Balcik, Beamon, Krejci, Muramatsu & Ramirez 2010, 23).

Due to a disaster's severe effects various organizations with different policies, training and operational procedures and methods are involved in the relief operation. Even though all organizations have common goal to alleviate suffering, the diversity of actors, challenges in communication due to different speaking languages and lack of coordination experience in affected countries may cause barriers in information flow. (Nikbakhsh & Farahani 2011, 318.)

Most relief organizations rely almost solely on donor funding. Therefore they cannot initiate a disaster response before funding becomes available. As such, many organizations arrive at a country to deliver aid only if and when donor funding becomes available. NGOs are also sometimes under pressure to spend the available money in a short period of time. Donors may even place restrictions on the types of relief activities which may executed. Such funding structure is not necessarily conductive for relief agencies. (Balcik, Beamon, Krejci, Muramatsu & Ramirez 2010, 23).

As the relief organizations compete for funding, it may also affect coordination. For instance, relief organizations may be reluctant to share information with other organizations if they believe this information gives them a competitive advantage in attracting media and donor attention. However, donors are demanding greater accountability, becoming less tolerant of inefficiencies in relief and therefore strongly encouraging relief organizations to collaborate. The media is often a critical factor affecting relief operations. Relief organizations seek visibility to potentially attract more resources from major donors and the public. (Balcik, Beamon, Krejci, Muramatsu & Ramirez 2010, 23.)

Disaster environments are very uncertain due to various factors, such as location, timing, population characteristics and pre-existing regional infrastructure as well the intensity of disasters. The extent of post-disaster infrastructure damage may not be predictable in advance. Finally, the political environment and post-disaster funding levels are unpredictable. Given these uncertainties, it may be challenging to establish coordination

mechanisms with the flexibility and efficiency to be effectively implemented in any given disaster situation. (Balcik, Beamon, Krejci, Muramatsu & Ramirez 2010, 23.)

Due to the uncertainties associated with the disasters (location, timing, intensity) along with lack of supporting financial, human, technological, informational resources may create coordination difficulties when attempting to match demand to supply. If there is lack of functioning coordination mechanisms, relief organizations may compete for the same scarce resources, which may cause harm for future coordination efforts. The relief chain may also be challenged by oversupply. The volume of relief supplies and information flowing into a region can be enormous – in quantities greater than required or sometimes inappropriate and unusable. (Balcik, Beamon, Krejci, Muramatsu & Ramirez 2010, 23.)

Strategic and tactical level coordination meetings on the future relief operations, which are held during the pre-disaster period, requires staff salaries and travel costs (Nikbakhsh & Farahani 2011, 318). At the operational level, resource capabilities of smaller relief organizations may not allocate personnel to attend coordination meetings while providing relief at the same time (Balcik, Beamon, Krejci, Muramatsu & Ramirez 2010, 23).

4 CASE: FINNISH RED CROSS LOGISTICS ERU MISSION IN PAKISTAN IN 2010

As mentioned in the first chapter the floods mission in Pakistan in 2010 was chosen as the case for this thesis as it is the first – and to this date the only larger scale deployment by the Finnish Red Cross ERU logistics team. At the beginning of the chapter the International Federation of Red Cross and Red Crescent Societies (IFRC), its approach to disaster management, humanitarian logistics, Emergency Response Units (ERU) and information management are briefly introduced. This is is followed by the recap of the research design and some facts of the Pakistan floods. Finally, the mission will be discussed from the physical distribution and information management perspective.

4.1 International Federaton of Red Cross and Red Crescent Societies (IFRC)

The International Federation of Red Cross Red Crescent Societies (IFRC), is as mentioned in the introduction, the world's largest humanitarian organization, providing assistance without discrimination as to nationality, race, religious beliefs, class or political opinions. The IFRC was founded in 1919 and the vision and mission of the organization is to inspire, encourage, facilitate and promote at all times all forms of humanitarian activities by National Societies, with a view of preventing and alleviating human suffering, and thereby contributing to the maintenance and promotion of human dignity and peace in the world (IFRC, who we are 2012).

The IFRC work is guided by the seven fundamental principles which are humanity, impartiality, neutrality, independence, voluntary service, unity, universality as shown on Table 4. (IFRC, seven fundamental principles, 2012).

TABLE 4. The seven fundamental principles of IFRC (modified from Larson 2012:11)

Principle	Brief Description
Humanity	Prevent and alleviate human suffering wherever it may be found.
Impartiality	Do not discriminate as to nationality, race, religious beliefs, class or political views.
Neutrality	Do not take sides in hostilities or engage political, racial, religious or ideologicial controversies.
Independence	Remain autonomous from governments.
Voluntary service	Service without desire for gain.
Unity	There is only one Red Cross/Red Crescent society per country.
Universality	It is world-wide movement.

The Finnish Red Cross is one the 187 national societies within IFRC and it is one of the largest civil organisations in Finland with approximately 95 000 members, tens of thousands of active volunteers and 70 000 regular contributors (Finnish Red Cross, home page 2012). The Finnish Red Cross has various activities both domestically and internationally. Some examples of the domestic activities include the blood transfusion services, youth activities and work among the elderly and immigrants. Internationally, the Finnish Red Cross works in the areas of disaster relief and development cooperation. (Finnish Red Cross, help and support 2012). Emergency Response Units (ERUs) are part of IFRC's global logistics network and are deployed to a disaster zone. These units support logistics operations in an emergency situation and can be deployed within hours of a disaster occurring (IFRC logistics global structure 2012).

4.1.1 Disaster Management in IFRC

IFRC defines the disaster management as the organization and management of resources and responsibilities for dealing with all humanitarian aspects of emergencies. This concerns in particular preparedness, response and recovery in order to mitigate the impact of disaster. (IFRC disaster management, 2012) The definition is illustrated in Figure 10 and it can found in larger scale from Appendix 3.

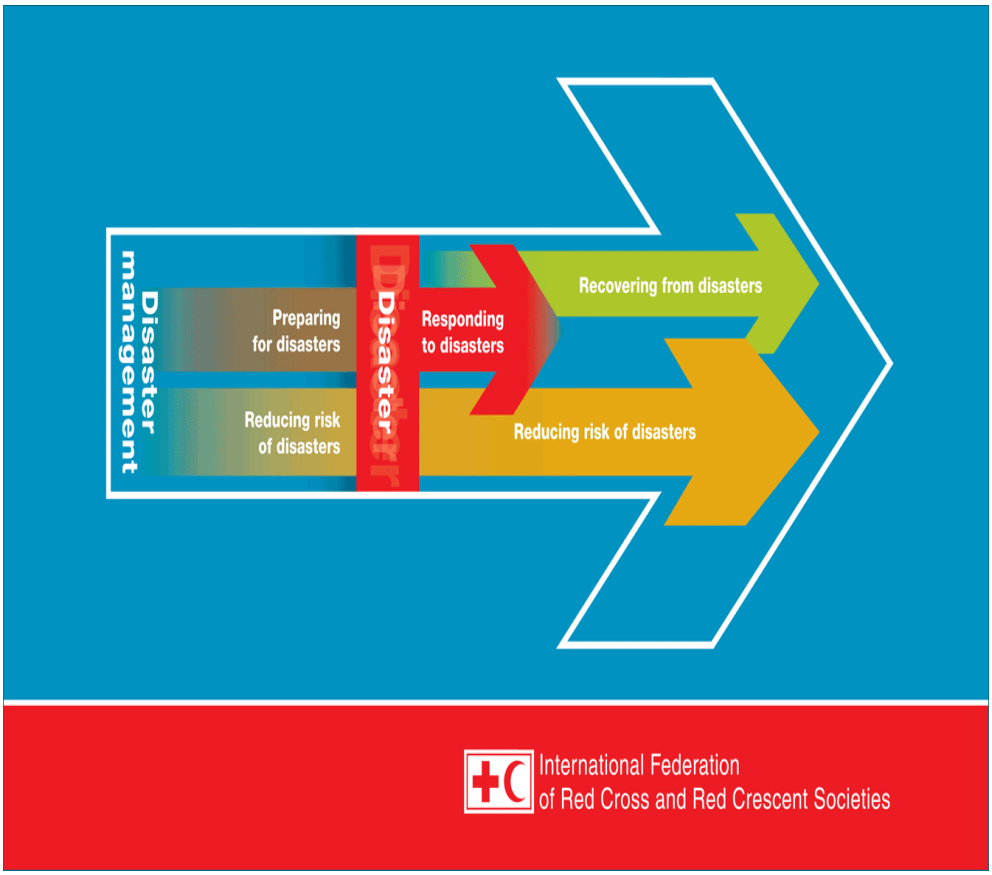

FIGURE 10. Disaster Management defines by IFRC (IFRC disaster management 2012).

To be effective in an increasingly complex environment, the International Federation has tailored its approach to disaster management. It seeks to support and build local, community and National Society capacities by strengthening household, community and national resilience and reducing

disaster risks, ensuring effective and efficient disaster preparedness and response and facilitating durable and sustainable recovery which goes hand in hand with development. IFRC's approach to disaster management not only involves meeting basic needs after a disaster. It is important to reduce vulnerability before of a disaster and in the event of disaster, to build on and develop the affected communities' capacities, skills and resources so that they are less vulnerable and stronger to meet future crises. This requires strengthening the capacities of the local Red Cross or Red Crescent (RC/RC) Society, as well as of individuals and the community. The International Federation's action can be therefore regarded as continuous cycle, with the strengthening of community capacity and disaster risk reduction at the centre. (IFRC approach to disaster management 2012)

The people affected by a disaster are the first to respond to it. They know what their needs are, have first-hand knowledge of the area and may have experienced similar events in the past. It therefore makes sense that they are consulted and involved in RC/RC relief operations. People should not be seen as passive, helpless recipients of assistance. They need to be included in the assessment, planning and implementation of relief operations. (IFRC approach to disaster management 2012)

4.1.2 Humanitarian Logistics in IFRC

The ultimate goal of logistics defined by IFRC is to provide the means to get goods, people and manufacturing capacity to the right place, at the right time, in the right quantity, at the right quality, at the right price. In the immediate aftermath of any disaster, supplies provided include items that are vital for survival, such as food, water, temporary shelter and medicine.

The role of the IFRC's Global Logistics Service is to ensure that the IFRC has a robust, competent and efficient logistics capacity to effectively carry out its humanitarian assistance activities and achieve its goals. The mission is to create a world-class service to support the core work of the Red Cross Red Crescent network and to share resources with other humanitarian organizations.

The IFRC's global logistics activities are built on 90 years' experience of delivering humanitarian logistics services. The activities of the IFRC's global logistics service focus on three strategic objectives are to support the enhancement of National Society logistics capacity, increase the IFRC's logistics capacity to deliver logistics services for preparedness and operational activities and finally to provide agreed logistics services to third parties in the humanitarian sector. (IFRC, logistics 2012).

The IFRC have a permanent network of logistics hubs – strategically located in Panama, Dubai, Kuala Lumpur, Amman, Nairobi and Las Palmas – that are staffed by logistics specialists and by consolidating orders and sourcing items strategically, the IFRC is able to use large purchase volumes to achieve the most competitive prices. Emergency items catalogue provides the exact specification of over 2,000 relief items, which guarantees quality and equity for people assisted. Framework agreements are used as an effective way of securing the required goods and services at a competitive price, whilst guaranteeing quality, quantity and delivery terms. Strong consideration is always given to the ethical and environmental impact of the work, and the same is expected from the people IFRC do business with. (IFRC logistics how we operate 2012.)

4.1.3 Emergency Responce Units (ERU)

An Emergency Response Unit (ERU) is a standardized package of highly qualified and trained personnel and equipment ready to be deployed in a disaster at short notice. Different types of ERU teams are deployed

depending on the function required at the disaster area. These include logistics, relief, water and sanitation, information technology, telecommunications and medical. ERUs provide specific support or a direct service when local facilities are either destroyed, overwhelmed by needs or do not exist. These units are fully self-sufficient for one month and can be deployed for up to four months. (IFRC, types of ERU 2012).

Every unit arriving to the disaster area has its own survival equipment, including food, beds, tents, electricity generators, mobile telephone and office equipment, which is stored in light, easy-to-carry containers. On arrival, local professionals, employed through national RC/RC offices, supplement the ERU's core technical staff. Each member has to operate in the agreed working language as well as adhere to Federation rules of conduct. The National Society sponsoring an ERU team covers salaries, benefits, insurance, and travel costs of personnel during training and operations. (IFRC, emergency response unit's personnel 2012)

ERU deployment depends largely on the magnitude and evolution of the disaster, needs of vulnerable people, capacity of the host National Society and other available relief capacities. Once the sponsoring National Society receives a deployment order, all material and equipment and personnel should be ready for dispatch within 48 hours. (IFRC, emergency response units deployment 2012).

A logistics ERU team coordinates and provides immediate support to the incoming relief supply line, including customs clearance, warehousing, transportation and support to other ERUs. It also tracks incoming relief goods that are on the Federation's "mobilization table". (IFRC, types of ERU 2012). The standard team consists of four persons, which can be modified depending on the mission. The team is staffed with a team leader, a systems delegate, who is responsible for the tracking of relief items, reporting and finances, a warehousing & transport delegate and a flight operations & logistics delegate. The key tasks and responsibilites of each team member in stardard logistics ERU setting are illustrated in Appendix 4.

In addition, a logistics unit hires local staff. The number of the local workers depends on circumstances and existing local on-site professional resources. (Emergency Response Unit (ERU)/ Logistics 2010.) Logistics ERUs are on standby in the United Kingdom, Finland, France, Denmark, Spain and Switzerland (IFRC, types of ERU 2012).

4.1.4 Information Management in IFRC

Effective information management for disasters is a vital component of international disaster response and relief. In IFRC it is based on the assumption that accurate and timely information is available before (early warning and monitoring), during and after disasters. Information management saves lives through early warning. Secondly it reduces suffering in the wake of disasters, by providing tracing services, concise information on assistance packages or clearly indicating where and when shelter will be provided. Thirdly it promotes better media coverage of the world's neglected disasters so that global assistance might be more equitably allocated. Disaster Management Information System (DMIS) is a vital component in the IFRC information management system. (IFRC, information management 2012)

4.2 Research design

The research was executed by interviewing two members of Finnish ERU personnel reserve who were deployed to Pakistan during the ERU mission in 2010. Interviews were executed by email and Skype connection. Questions were sent by email to Ari Mäntyvaara and Kirsi Pohjola in February and March 2012 (appendix 1and 2). Kirsi Pohjola responded on February 24th, 2012 by email and Ari Mäntyvaara was interviewed via Skype on March 6th, 2012. Questions were semi-structured which means that sample size, people to be interviewed and open-ended questions to be asked were determinated beforehand (Ghauri & Gronhaug 2005, 132). As the total number of Finnish Red Cross personnel working on this mission

was 13, two persons were considered as sufficient sample. Data was supplemented with information received by the author of the study during Red Cross ERU logistics trainings in November 2010 and September 2011.

The information on the Pakistan floods and International Federation of the Red Cross and Red Crescent Societies were collected from the Internet. Ari Mäntyvaara also shared some facts regarding the Pakistan floods.

4.3 Pakistan floods in 2010

The flooding began in July 2010, resulting from heavy monsoon rains in the Khyber Pakhtunkhwa, Sindh, Punjab and Balochistan regions of Pakistan and affected the Indus River basin. One-fifth of Pakistan's total land area was underwater, approximately 796,095 square kilometres (Wikipedia, 2012.) Figure 11 illustrates the affected areas as of August 12th 2010.

Figure 11. Map of affected area in Pakistan flooding as of August 12, 2010 (fonzibrain wordpress,2012).

The total number of deaths was close to 2000 and the floods directly affected about 20 million people, mostly by destruction of property, livelihood and infrastructure (Wikipedia, 2012). By mid-September 2010, according to the Singapore Red Cross close to 3000 people were injured, more than 1.3 million people had been rescued and more than 1.89 million homes have been damaged or destroyed in 82 districts (Reliefweb, 2012).

The monsoon rains continued in Northern provinces of Pakistan until early August destroying the living conditions in the areas which already had been affected by massive military operation againt the Taliban in 2009. In early August, the heaviest flooding moved southward along the Indus River toward western Punjab. By mid-September the floods generally had begun to recede, although in some areas, such as Sindh, new floods were reported causing that the majority of the displaced persons had not been able to return home. (Wikipedia, 2012).

A large number of national governments, non-governmental organizations (NGOs), Islamic militant organizations, individuals, corporations, the UN and other organizations responded to the relief appeals made by the UN. The floods started one the biggest emergency response and recontruction projects ever operated by IFRC (Punainen Risti, 2012) Despite the efforts and clusters, the relief operations faced many issues. Aid organisations and the government were criticised for being too slow to respond and the Pakistani government was blamed for sluggish and disorganised response. (Wikipedia, 2012.) Organizations struggled to help the survivors, many of whom lost everything and said they received no warnings that raging waters were heading their way. Many were forced to live in wretched conditions beside roads, sleeping in the open with little food or clean water. (Trust, Pakistan floods 2010.)

4.4 Logistics ERU in Action

Ari Mäntyvaara (2012) described the Pakistan 2010 floods as slowly developing catastrophy, which started from the north. Pakistan Red Crescent was alert to the situation. It had functions in the area early on and it made first requests to the IFRC. However, there was delay in starting the operation. In the past, situations have occured in Pakistan where it has been forecasted that severe flooding will occur. Then suddenly raining has stopped and no outside help has required. There was no immediate reaction to the floods on the international level but since the water levels kept rising, the Field Accesment Coordination Team (FACT) was called in to work for two weeks along with Pakistan Red Crescent in August 2010. Quickly after the FACT team started their work, first ERU teams were alerted (Ari Mäntyvaara 2012.)

At the end of the August 2010 Finnish-Danish group of ERU logisticians were deployed to Pakistan being first ERU on the site. The team consisted of six persons. Ari Mäntyvaara was the team leader. A Danish delegate had a role of deputy team leader with responsibily of import and export functions. At beginning of the operation this was key task. It was important to get customs procedures working quickly as a lot of relief items was soon arriving by air to Islamabab and by sea to Karachi and items needed to be transported further by trucks. This was because all the activities were in the north at that time of the mission.

4.4.1 Physical distribution in Pakistan

Once the team had arrived to the country, things moved fast. The team arrived on Thursday, on Friday it was briefed for the situation on site and it travelled to Mardan and the logistics base was set up. The information was that the first units would be arriving to Pakistan on Sunday. On Friday there was no storage space rented for the relief items, so the pressure to find the

warehouse was huge.The relief ERU constisting of French-Benelux delegates arrived to Mardan as well. This team was responsible for the distribution of the relief items with the Pakistan Red Crescent. (Ari Mäntyvaara 2012.)

The rest of the logistics ERU team members were two Danish delegates who were responsible for the warehousing and transportation of the units, a Finnish systems delegate keeping track of the bookings in the warehouse and a Finnish delegate, who was located in Islamabad taking care of the air operations. He was responsible for receiving the items arriving by air freight. The Finnish-Danish logistics ERU stayed as team of six members for the whole mission which included four rotations and lasted until December 2010. A second logistics ERU arrived to Pakistan, when the floods moved to southern parts of the country. However, the position of an air operations delegate in Islamabad stayded under the first team during the whole operation. (Ari Mäntyvaara 2012.) The IFRC teams responsible for assessment and logistics in Pakistan are illustrated in Figure 12.

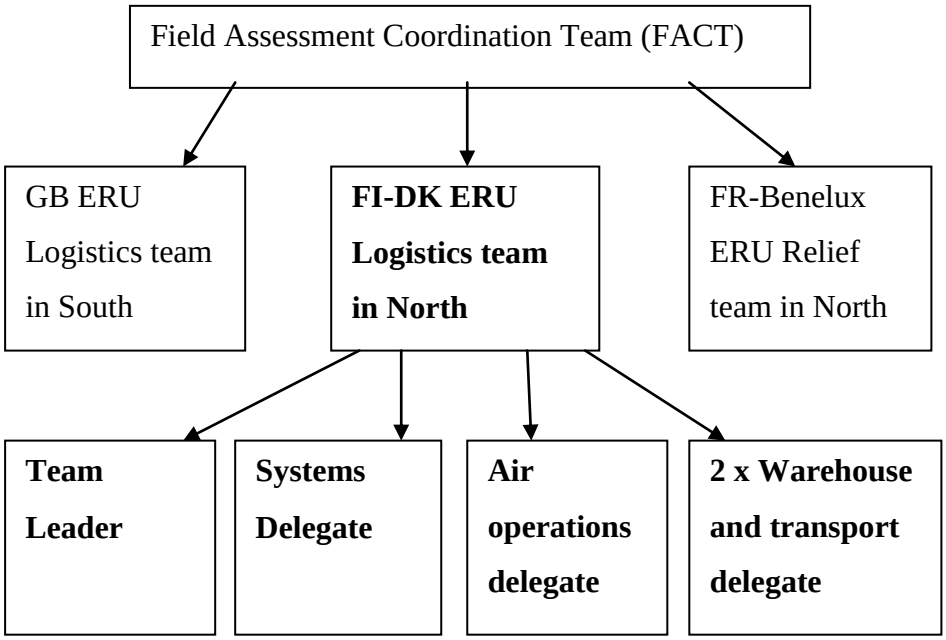

FIGURE 12. IFRC teams and ERU logistics team members in Pakistan 2010 (Ari Mäntyvaara 2012)

Logistics ERU was deployed to Pakistan to perform its basic functions. The team tasks included managing the receipt and customs clearance of the relief items as well as warehousing and transportation to the distribution sites. During the mission, a small amount of units arrived to Pakistan directly from the donors, for example Canadian Red Cross delivered relief items with a jumbo airplain. Finnish and Belgian Red Crosses used another method of relief item acquisition. They purchased units from Pakistanian suppliers. However, the problem of the direct purchasing was that in the beginning of the project the quality units was poor and a large number of units had to be returned back to the supplier. The most of the relief items arrived from the IFRC's regional logistics units (RLUs) from Kuala Lumpur, Malaysia and Dubai, United Arab Emirates by sea freigh to Karachi. At this point the floods had spread to the southern parts of the country and a second ERU logistics team, staffed by the British Red Cross, was deployed to the south of Pakistan. (Ari Mäntyvaara, 2012). The physical flow of materials arriving to Pakistan is illustrated in the Figure 13.

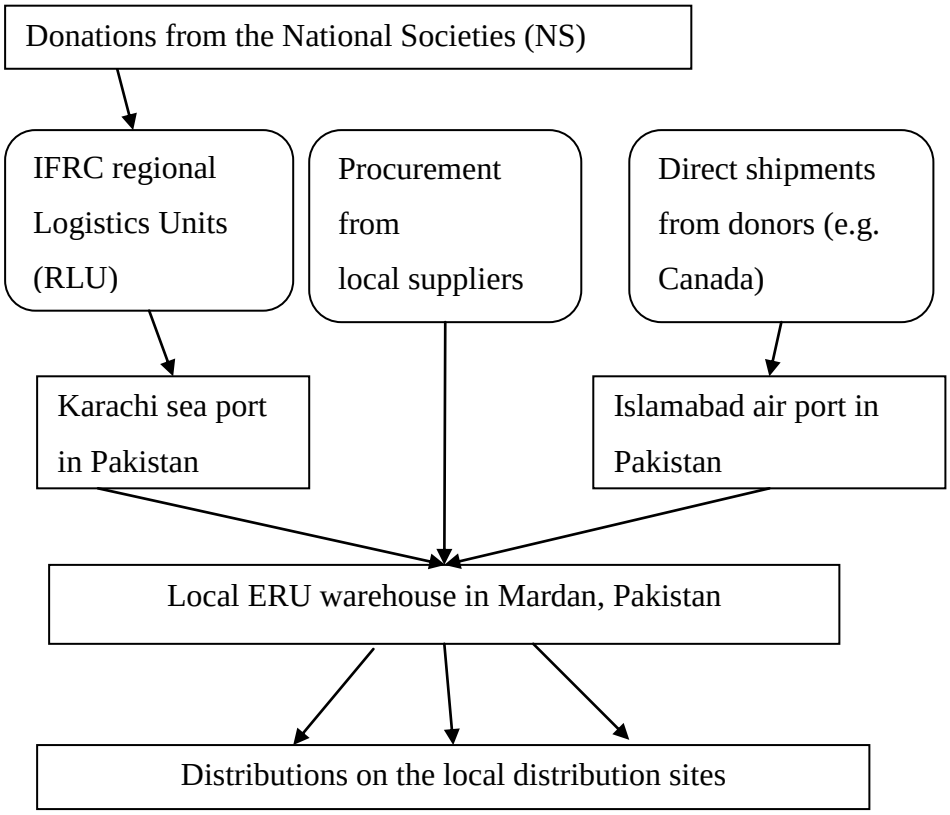

FIGURE 13. The physical flow of materials in Pakistan relief operation 2010 (Ari Mäntyvaara, 2012).

Warehousing and material handling was taken care by hand without forklifts or other tools, as that is the normal situation in Pakistan and it did not cause any problems. At the beginning, the trucks for inland transportation were rented ad hoc locally from the Mardan city and the price was reasonable. Once the transportation contracs was centralized to Islamabad, the prices increased and the service level went down. However, none of deliveries were endangered due to the problems. (Ari Mäntyvaara 2012.)

The biggest problems concerning the material flow during the Pakistan operation were related to the local transport. The transportation contact made in Islamabad was weak. The agreement was badly designed causing that the service was outsourced on too many levels. The IFRC contractor had subcontracts with the local trucking companies, which had contracts with individual drivers. This caused operational difficulties for the ERU team. (Ari Mäntyvaara 2012.)

4.4.2 Information management in Pakistan

Kirsi Pohjola (2012), who worked as a systems delegate in Pakistan, revealed that the ERU team has number of tools for the managing the information. Mobilisation table shows total needs of operation as well as in-kind donations pledges of all RCs (info includes; items, quantities, Commodity Tracking Number (CTN)) showing what to expect but without any schedule or final destination (for example in Pakistan there was 3 functioning warehouses by the end the mission). In other words, the mobilisation table shows the donations for the whole operation. (Kirsi Pohjola 2012.) Mobilisation table can be accessed in Disaster Management Information System (DMIS) site in Internet for which all ERU logistician has access to.

Inbound material flow (in Red Cross language “pipeline”) was received from the Regional Logistics Unit (RLU) in Kuala Lumpur which is in charge of Asia-Pasific region. Information on the document includes such as

items, quantity, CTN, transportation document number (for example AWB number, B/L number), ETA airport/seaport. The copies of shipping documents for importation procedures were received by the ERU systems delegate once RLU received them from the donor or transportation company. The issue was that the Pipeline report was received daily by email but shipping documents whenever. (Kirsi Pohjola 2012.)

For the receiving documentation was Goods Received Note used which fulfilled in the warehouse by a local warehouse manager. The information from this document was entered to the LogIC, which is the IT software used in the field by ERU, and this way the actual status of inventory was followed up. (Kirsi Pohjola 2012.)

For the outbound material flow, requisition was received from the Relief ERU team (Kirsi Pohjola 2012). This document contains information about units, quatities, dates and locations to which Relief team is planning to distribute items. According to requisitions logistics ERU warehouse and transportation delegate organizes the needed trucks and loading of the trucks.

For internal (only for North-Pakistan use) planning, Kirsi Pohjola kept the Excel sheet that indicated items plus quantities added to the ETA Mardan warehouse (vs. ETA airport/seaport plus customs clearance plus in country transportation) and she informed those dates for Relief team and Team Leader. That tool provided information with which the relief team was able to plan distributions in advance and Team Leader was able to try to stop the shipments in ports or direct them to other warehouses if it seemed that there is no space at Mardan warehouse. (Kirsi Pohjola 2012.) The illustration of the material flow and tools used for information management is found in the Figure 14.

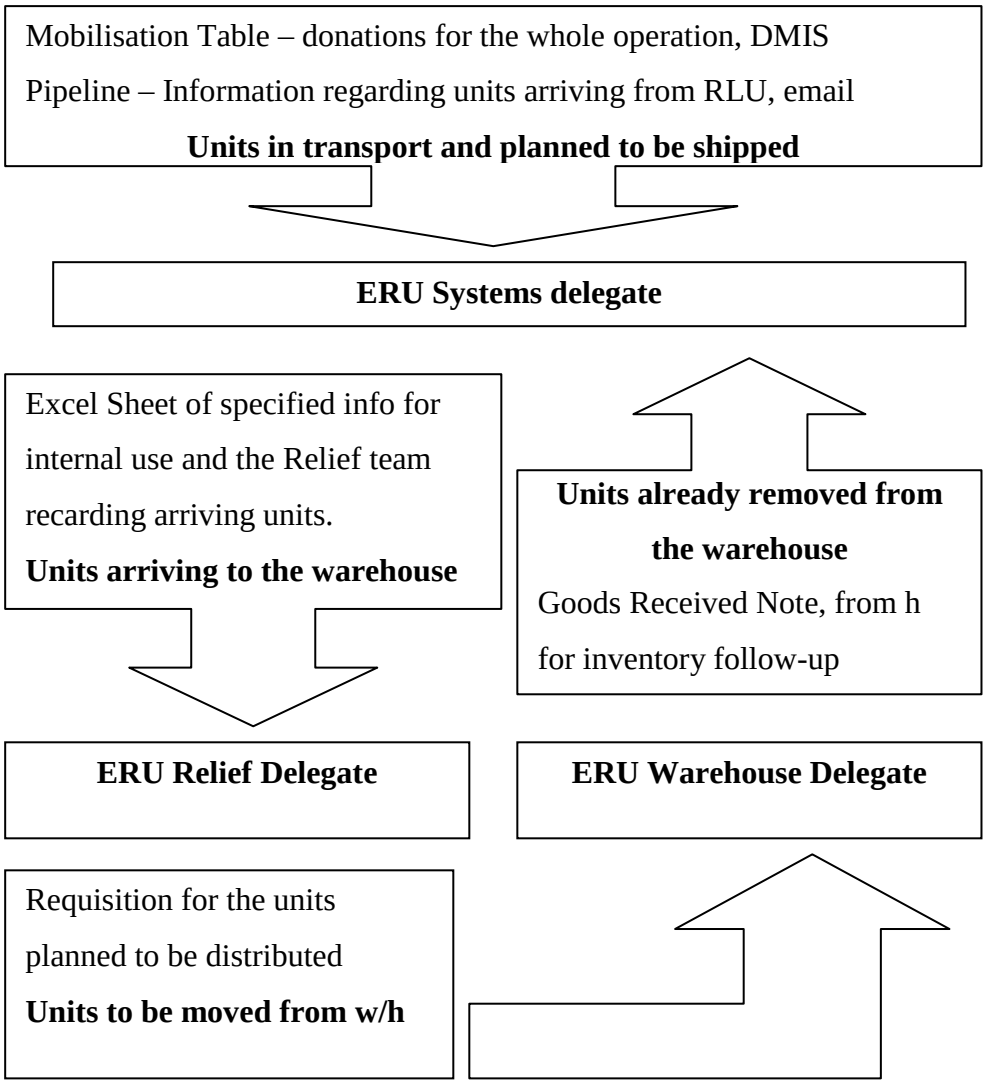

FIGURE 14. The flow of information and tools for managing it used in Pakistan 2010 (Kirsi Pohjola 2012).

The problem with information management in Pakistan mission was that the RLU was not updating the pipeline report in time and it created confusions (more in Kuala Lumpur than in the field as the ERU team knew what they had in the warehouse.) The initial assessment was misleading and the blankets were too big. The error was not corrected in the Mobilisation table which created a slight problem at the warehouse as rotation of blankets was not as high as for other items. A standard supply chain planning tool should be taken in use in IFRC so the RLU could already from the beginning of the operation to streamline inbound material flow. There is also a need

systematic analysis of logistics performance and a tool for managing this area is missing. According to Kirsi Pohjola tools for planning and analysis need to be improved. However, comparing with other operational areas e.g. relief, health, shelter, recovery, the logistics has the best systems in place. (Kirsi Pohjola 2012.)

4.4.3 Coordination of information in Pakistan

In the early stages of the operation there was no system for information sharing and cooperation. At the time Ari Mäntyvaara was deployed for the first ERU rotation, none of information sharing systems were in use. As for all the major relief operations, a logistics cluster lead by World Food Program was activated during Pakistan 2010 floods. The purpose of the cluster was to share information weekly basis on the higher level in Islamabad and some of larger organizations offered free of charge or on cost recovery basis transportation for the smaller relief providers. The IFRC role in the cluster was to share information as the Federation almost without exception organizes the transportation and warehousing by itself. This approach has two reasons. Firstly IFRC operations have large volumes and if the transportation services would be procured from UN, there would be no capacity left for smaller relief agencies. Secondly this way the fundamental principles of neutrality and independence are not compromized with too close relations with UN. They use armed forces to protect their convoys and that is not way the IFRC works. In a country like Pakistan, which has sensitive political atmosthere, this must be carefully considered. (Ari Mäntyvaara 2012).

4.4.4 Operation in general and long-term logistics project

If considered the mission as a whole, the operation in the north was working well. The ERU had good resources with strong team for the whole mission. All team positions were fulfilled for all four rotations. Never the whole ERU

logistics team was changed at one time and usually only one or two team members were exhanged at the time. Duty handovers were executed face to face and were successful even though often they were done in very short period of time. In the south, the British ERU team had problems to get staff and the operation in south expanded as the water from the northern parts starded to drain downwards. As the situation got worse in south and amount of relief items delivered increased, second logistics ERU team in that area would have been needed. At that point the operation was already so far that it was no longer possible to use ERU teams. The problem was solved by opening several positions for logistics delegates for the recovery phase. However, the slow visa handling and Pakistan bureaucracies caused that the south suffered from the lack of logistics delegates working in the area. (Ari Mäntyvaara 2012.)

Ari Mäntyvaraa (2012) says that in overall the operation worked very well, even though these types of missions always face some challenges. The IFRC funding was sufficient and National Society worked well. Pakistan Red Crescent is familiar with relief item distributions as the country is prone for disasters. The relief item deliveries were moved efficiently from Kuala Lumpur and Dubai even with large number of containers was shipped.

In December 2010 the ERU handed over the logistics centre to Pakistan Red Crescent Society for their use. The Finnish Red Cross continues to work in Pakistan through long-term development projects. In 2011 was lauched a project to develop country's logisticial preparedness and systems in order to improve Pakistan Red Crescent's resources to respond to the future disasters. The project is led by Finnish logistics expert. (Punainen Risti 2012)

5 CONCLUSIONS AND FURTHER RESEARCH AREAS

As discussed in the chapters two and three humanitarian supply chains are highly complex and they operate in unpredictable and unplanned contex. The operational environment ranges from small localized hazards all the way to catastrophic events affecting large large regions and populations. The key characterics include the same elements as business supply chains with different flows including material, information, finance with additional flows of people and knowledge. Disaster management is a set of processes designed to be implemented before, during and after disasters to prevent or mitigate their effects. This process is often illustrated as cycle including phases for mitigation, preparedness, response and recovery. All phases can be connected to the general supply chain types presented by John Gattorna, which are collaborative, lean, agile and fully flexible supply chains.

Humanitarian supply chains differ from their business counterparts by purpose, demand environment, customer definition, perspective on time and source of funds, just to mention few examples. Both supply chains types can and should learn from each other. Humanitarian supply chains could implement practices from business segment in order to improve the efficiency and cost effectivity. Business supply chains would benefit from agile and flexible nature of working used by humanitarian supply chains.

A total of 13 Finnish Red Cross logistics ERU delegates worked in Pakistan on year 2010 during the mission launched by the severe flooding. The mission objective was to make sure that relief items arriving by sea and air were received, cleared from customs, transported inland and storaged properly and in timerly manner. Tracking of incoming units and informing other teams of upcoming relief unit capacities were also taken care by the logistics ERU.

Even though overall, the Finnish-Danish ERU mission was successful, it also faced some challenges. The biggest road blocks were in centralized inland transporation and insuffiency of planning and analysis tools for

information management. When the agreement for the transport services was drafted the IFRC did not consider that services would be outsourced on multiple levels, which caused some operational difficulties for the ERU team. Another downside was that the price for transport increased and level of service decreased as the ERU team moved from the ad hoc contracts with local Mardan city drivers to a centralized contract managed fron Islamabad. The lesson to be learned is to carefully research the business environment within the ERU's operation before moving to centralized service contracts. With no doubt, the purpose of the contract was to look for cost savings and simplify the operational process. However, this was not achieved.

Kirsi Pohjola, whose role in Pakistan was a systems delegate, felt that more tools for planning and analysing is required in the field. The result of lacking pre-selected tools was that the systems delegate had to create suitable Excel tools on site. In general, the work efficiency suffers if the tools used must be created for again for each mission. The quality of the tools is also highly dependent on the professionality of the individual systems' delegates. Further problems reported in information management were that the delivery documents for incoming units are not mailed to the systems' delegate at the same time as the pipeline report. There was also delay in updating the pipeline report by RLU, which caused confusion. If the RLU and delegate in the field must continuously manually synchronize the data, it naturally causes inefficiency.

Comparing the theoretical framework to the information received from the interviewees, a conclusion can be made that IFRC delegates including the Finnish ERU team follows closely the practises introduced for humanitarian logistics. The physical distribution model used in Pakistan 2010 mission somewhat differs from the model discussed in chapter 3.1. The main differences between these models were that a portion of relief units were directly shipped from the donors to a Pakistani port and the direct procurement from the local suppliers was used as a mode of sourcing. However, there was no record that the model would have caused issues during the mission. As mentioned in the theory, humanitarian supply chains

are known for their agility and creative solutions and on this mission the controversal approach worked.

Ari Mäntyvaara was deployed to Pakistan at the early stage of emergency response and during the time he was deployed no coordination of information mechanisms between humanitarian actors were set up. Therefore no conclusion can be made from the area.

The professionality of the Finnish Red Cross ERU logistics delegates is very high. The way the Finnish team is working in the field has been developed under and in cooperation with IFRC, which has a lot of experience in emergency response logistics. Therefore the Finnish Red Cross is able to deploy high quality teams.

Based on the study, the information management has the most room for improvement. The recommendation to improve the Finnish Red Cross ERU logistics to even higher standards is to start development projects to create a standard supply chain planning tool and logistics performance measurement system. Both tools should be taken in use in IFRC. The benefit of the supply chain planning tool is that the RLU could, from the beginning of the operation, streamline inbound material flow. With real time pipeline data update, the issue caused by delays in data entry could also be solved. With a logistics performance measurement system, IFRC can collect systematic and long-term information on the ERU missions, their successes and areas for improvement. This information can be used for training, planning and strategy development. These tools should also be suitable for field work. The projects need to be executed in co-operation with the IFRC in order to gain real benefit. This should include the collection of the specific requirements, user needs and expectations as well as development of the actual tools or search for available software from business markets or other humanitarian organizations.

The coordination of information between different types of agents, the limitations of co-operation and possible financial or other advantages gained through joint operations should be further studied.

Another interesting area of further research opened up with the long-term logistics development project, which was launched in Pakistan in 2011 in co-operation with the Finnish Red Cross. The study would provide opportunity to further research the recovery phase of disaster management cycle as well as assess the success of the project.

6 SUMMARY

The objective of this study is to reflect on the area of supply chain management from the humanitarian logistics perspective. Furthermore, the interest is to examine how the Finnish Red Cross logistics emergency response unit (ERU) works. The author of this thesis aims to find whether there are any fall backs in the current ERU logistics procedures and to provide suggestions how to improve its work in order to gain efficiency in aid logistics.

The qualitative approach with multiple data collection methods wase chosen for the study in order to reveal the desired information. The information was gathered through secondary data gathering, interviews and field observations. A single case, flooding in Pakistan 2010, was used for the empirical study.

The thesis discusses supply chain management in general and from the humanitarian perspective. Some of the key concepts, such as generic types of supply chains, supply chain flows and disaster management are introduced. Further the study makes a comparison between humanitarian and business supply chains. The aspects of physical distribution and information management in humanitarian logistics are covered.

The study is followed by an introduction of International Federation of Red Cross and Red Crescent societies and its approach to the topics covered in theoretical framework. The case study concentrates on the Finnish Red Cross ERU mission in 2010. The focus is practical on the level of the material and information flows.

Finally, the author analyzes the findings of the study and provides a practical recommendation to Finnish Red Cross in order to improve the work of logistics ERU. By creating new tools for information management, IFRC and ERU teams could optimize their aid work. Needed tools are standard supply chain planning tool and a logistics performance

measurement system. IFRC should also pay attention to the timing of providing delivery documents to the ERU logistics team in the field. Development of these tools requires research within the International Federation of Red Cross and Red Crescent Societies logistics organization and national ERU logistics teams, in order to provide functional tools for complex humanitarian logistics environment. Another interesting future research area based on the thesis is the success of a long term logistics development project launched in Pakistan on 2011.

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Interviews

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APPENDICES

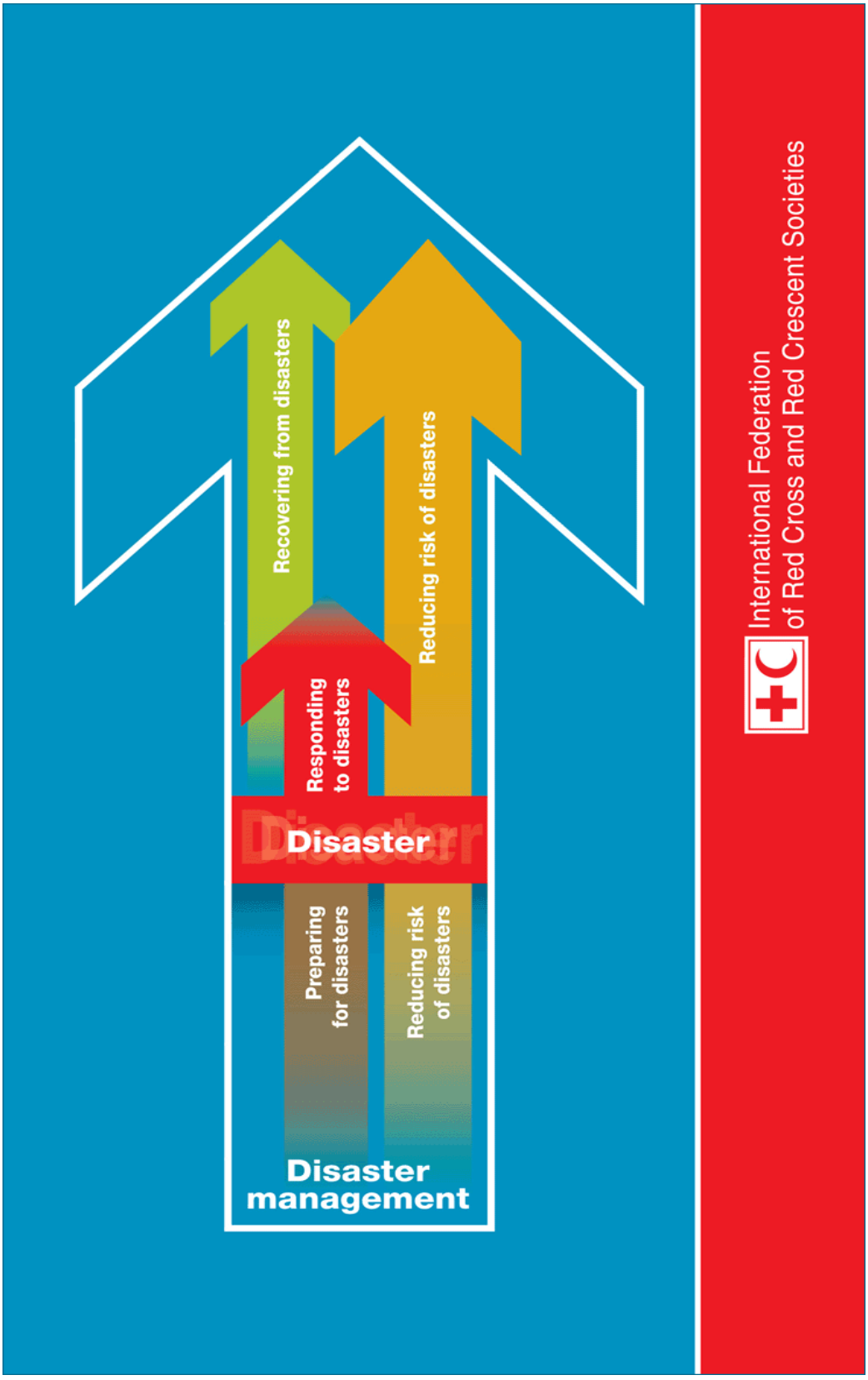
Appendix 1, interterview questions for Ari Mäntyvaara

1. Who are you and what is your position in Finnish Red Cross?
2. What are the roles and responsibilites of each team member in Logistic ERU?
3. On what year the first ERU logisticians trained for Finnish Red Cross and how many persons were in the reserve at the end of year 2011?
4. Could you please tell briefly about the facts for flooding disaster in Pakistan on summer 2010?
5. Could you please discripe the role of Finnish Cross ERU team in the IFRC Pakistan mission? How many logisticians were deployed in total from Finland?
6. What was your role on the ERU mission in Pakistan 2010?
7. How was the flow of materials handled in Pakistan ERU mission?
8. What were the tools (e.g. transportation and warehousing) used for handling materials during the mission? Were they sufficient?
9. Did you have any problems recarding the material flow during the mission? Which kind?
10. Was there any cooperation and information sharing between the IFRC logistics ERU team and other humanitarian actors in the field?
11. If the answer is yes, could you please explain, how it was organized?
12. In general, did you find any operational areas during mission that needs to be improved?

Appendix 2, interview questions for Kirsi Pohjola.

1. Who are you and what is your role in Finnish Red Cross ERU team?
2. What was your role on the ERU mission in Pakistan 2010?
3. How was the flow of information taken care within ERU team and IFRC during the Pakistan ERU mission? What were your tools (e.g. IT systems, documentation) for information management during mission? Were they sufficient?
4. Did you have any problems recarding the information flow during the mission? Which kind?
5. In general, did you find any operational areas during mission that needs to improved?

Appendix 3, International Federation of Red Cross and Red Crescent Societies, disaster management (IFRC, disaster management 2012)



Appendix 4, the key tasks and responsibities of Logistics ERU team member (DMIS for IFRC, 2012)

Title	**Short desciption of the tasks and responsibilitis**
Team Leader	Purpose: To provide effective leadership and management of ERU team members and coordination of the activities carried out by the Logistics ERU. Reports to FACT team leader or appointed IFRC delegate
	Key tasks and responsibilities: 1. Manage the safe reception, storage and distribution of relief consignments, recording movements and reporting on goods. 2. Provide appropriate supervision, guidance and support to the members of the ERU team. 3. Establish and maintain working relations with the Federation and NS staff to ensure the activities of the ERU are in keeping with the wider operational objectives. 4. Provide timely narrative, technical and financial reports to the FACT Team leader, Federation/Deploying NS and external donors. 5. Ensure security guidelines are implemented and enforced for ERU team members along with safe keeping of ERU assets and financial resources. 6. Ensure appropriate self-sufficiency for the ERU. 7. Liase with government officials and representatives from the UN and other NGOs as appropriate, including attendance at inter-agency meetings. 8. Uphold the fundamental principles of the International Red Cross and Red Crescent movement and work within equal opportunities policy

Team Member	Purpose: To provide logistics support to International Red Cross emergency operations through the Logistics ERU, ensuring the safe reception, storage, distribution and reporting of relief goods handled by the ERU team. Reports to ERU team leader
	Key tasks and responsibilities: 1. In conjunction with the ERU Team Leader, ensure the safe reception, storage and distribution of relief consignments, recording movements and reporting on goods. This may include: *Managing airport operations: receiving, un-loading, clearing and transporting relief goods. *Managing port operations: receiving, un-loading, clearing and transporting relief goods. *Managing warehouse operations, including sourcing and contracting existing warehouses, erection of temporary warehouses, implementation and maintenance of all warehouse systems including security and provision of stock level and stock movement data. *Provision and management of transport of relief materials as determined within the Relief Plan of Action. *Implementing fleet management for all vehicles within the relief operation. *Conduct procurement as required and as specified by the Logs ERU team leader and FACT. *Ensure appropriate document handling, stock management, performance figures and financial recording systems are established and maintained. *Train and develop the necessary skills for National Society counterparts and/or others to facilitate the handover of the Logs ERU tasks. 2. Contribute to narrative and financial reports for the FACT Team leader, Federation/Deploying NS and external donors. 3. Perform any other related duties or responsibilities that

	may be assigned by the overall manger of the Red Cross relief operation. 4. Uphold the fundamental principles of the International Red Cross and Red Crescent movement and work within equal opportunities policy.
Systems Member	Purpose: To participate in Logistics ERU operations, ensuring the full commodity tracking system, from acknowledgement of receipt through to consolidated stock issue reports. Reports to ERU team leader.
	Key tasks and responsibilities: Tracking: 1. Establish operating procedures to provide notification of incoming consignments to appropriate functions. 2. Establish operating procedures to receive confirmation of delivered consignments, to include the means to determine exact consignment contents in the absence of other documentation. 3. To establish, operate and maintain the Federation Commodity Tracking System (CTS). 4. To acknowledge receipt of consignments (including shortages, damage etc.) to appropriate functions, in-country, Geneva and NatSocs as appropriate. 5. In conjunction with the ERU Team Member, maintain up-to-date inventory reports for items held in the warehouse(s) or other locations, making such reports available to other functions as necessary. 6. In conjunction with the ERU Team Member and relief delegates, verify and input distribution data and provide consolidated distribution reports as required. 7. As appropriate, assist with the selection and recruitment of local staff; their training in the use of CTS and their supervision and management. 8. Oversee and ensure careful filing of all contracts signed by the Logistics ERU. Finance:

	9. Responsible for establishing and managing the cash book system. 10. Responsible for establishing and managing the petty cash and working advance systems. General: 11. Uphold the fundamental principles of the International Red Cross and Red Crescent Movement and work within equal opportunities policy.