Managing Chaos

Tool Development & Case Study to Improve International Incident Management Logistics

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Tool Development & Case Study to Improve International Incident Management Logistics

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Preface

Hereby I present my thesis, which is the final product of the Master program Transport, Infrastructures and Logistics (TIL) at the Delft University of Technology. In this thesis I studied the way logistic performance can be measured in incident management by constructing a balanced scorecard and by testing the usability of this scorecard in two major international incidents.

Since logistics have played a major role in almost my entire career it was logical for me to carry through this trend in my thesis. In this way I was able to use my experience and connections to continue where others had to stop. I enjoyed working with so many professionals, in education, management and in logistics.

This thesis could not have been possible without the help and support of many people.

In the first place I would like to thank my lovely wife Marloes, for her patience and support. The challenge we met last year would have been a showstopper for many, but through resolution and persistence we showed that anything is possible when you stick together.

Next I would like to thank my thesis committee: Bart Wiegmans and Ron van Duin, who acted as my daily supervisors. Seldom have I seen two teachers that matched so well, both highly professional, ambitious, but also with a great sense of humor. Lieutenant-Colonel Hans van de Ven, as my external mentor and colleague, thank you for sharing your vast experience, excellent network, and for helping me to find my way in the field of humanitarian logistics. Next I would like to thanks to Serge Hoogendoorn, for his wider perspective and pragmatic advice.

In addition I would like to thank all the people of the Royal Netherlands Armed Forces, United Nations (OCHA, UNDAC and WFP) and Oxfam Novib who shared insight in their organization and work experience. Also special thanks to Priscilla Hanselaar for her help in facilitating this thesis.

Last, but not least, I would like to thank my family and friends for their support and helping me to keep matters in perspective.

Rob Wessels
Delft, June 2016
Summary

The last decade can be characterized as unstable in terms of economic growth, international conflicts and environment. In this period several large, international incidents have occurred some of which are among the greatest disasters that ever happened, such as the tsunami in the Indian Ocean in 2004. These incidents cause multiple problems, not only in the direct vicinity of the crisis, but also in the surrounding countries and even in other parts of the world, like the current refugee problem caused by the conflict in Syria. Dealing with international incidents is especially challenging since these situations usually involve a great number of actors in extreme circumstances, which makes solving problems difficult. The recession of the last decade had an effect on the way organizations deal with incidents. Through cutbacks organizations cannot afford to spend too much on the management of crises, resulting in focus on effectiveness and efficiency. Also the performance of organizations is more in the public spotlight; mistakes in the execution of missions lead to critics on the performance of organizations. The goal of this research is to develop a tool for performance management in incident management logistics and to improve this performance. The main research question is:

*Which tool can be developed to measure the logistic performance of organizations in incident management and which concepts and measures can be found in order to improve the logistic processes of international incident management?*

The tool is developed in order to analyze and assess the performance of different prominent types of organizations in incident: the Royal Netherlands Armed Forces (RNLDAF), the United Nations Office for Coordination of Humanitarian Affairs (UNOCHA) and Oxfam Novib. In order to have the most benefit from the model for performance measurement, it needs to work for all three types of organizations. To determine which elements should be included in the tool, a literature study was performed that resulted in a description of incident management logistics. This shows that incidents are defined by different phases as described by the Federal Emergency Management Agency:

1. Mitigation: to prevent future emergencies or minimizing their effects. This includes all activities that prevent incidents, reduces the chance of incidents or reduces the amount of damage caused by incidents. These activities can take place before and/or after emergencies;
2. Preparedness: to prepare to handle an emergency, which includes all plans or preparations that are made to save lives and to help response or rescue operations. The preparation takes place before the occurrence of an incident;
3. Response: to respond safely to an emergency, which includes all actions to save lives and to prevent further damage to properties. The response takes place during the emergency. Activities in the supply chains commence after a decision is made on delivering aid to the incident;
4. Recovery: to recover from an emergency, meaning every action taken to return to a normal or safer situation after an emergency occurred.

Next the actors in incident management logistics and their roles and strategies are described. The most important types of organizations in incident management are governments, Governmental Organizations and Non-Governmental agencies. These organizations provide aid from different backgrounds. In case of an emergency the nation where the incident took place makes a request for emergency aid (usually together with or via the UN). After this request organizations determine what aid they can offer and communicate with each other in order to streamline the emergency aid. The organizational context in figure 1 shows that the organizations have different background,
structures and cultures. This makes combined incident management logistics difficult, which suggests that the relation between actors should be included in the performance measurement.

The strategies that can be used for incident management logistics describes ways to make the supply chain as effective and efficient as possible. This can be achieved by adjusting the supply chain management to the specific characteristics of the area of operation (AOO) of the incident. The use of logistic information systems makes it possible to adjust the supply chain to the most effective and efficient form.

Next theories on performance measurement are reviewed in order to select the best base for a tool that can measure logistic performance in incident management. This shows there are several methods that can be used for performance measurement: Cost Benefit Analysis (CBA), Multi Criteria Analysis, Supply Chain Operations Reference model (SCOR) and the balanced scorecard. This review includes Key Performance Indicators (KPIs), which are defined as measurable values that demonstrate how effectively a company is achieving key business objectives. The balanced scorecard from Kaplan is assessed as the best base for performance measurement in incident management logistics. From the KPI review several KPIs are selected for the balanced scorecard. The actors in the research were also involved in the development of the balanced scorecard in order to select the right KPIs.

The tool for performance measurement, as shown in figure 2, consists of a balanced scorecard based on incident management logistics theory combined with theory on performance measurement of Kaplan: for each organization Key Performance Indicators (KPIs) are set up for the perspectives aid output, organizational capacity, supply chain performance, financial efficiency and for the external process. These KPIs can be used by any organization in incident management logistics.
To indicate the level in which the KPIs should be used, the organizational levels have different colors: red for strategic level and blue for the tactical level. The balanced scorecard also shows which KPIs will be used by each organization.

Before the balanced scorecard is tested in a case study, two comparable incidents are selected from a list of the largest incidents of the last decade. The selection criteria concern the involvement of the three actors, both cases should have a large number of international actors victims, important because the impact of possible improvements will be greatest, the cases are not out-dated in relation with the usability of improvements for the organizations and related to the availability of data. The actors were also involved in the incident selection. Taken into account these elements, the cases selected for the case study are the earthquake in Haiti in 2010 and Nepal in 2015. Next the two cases are described, including the role of the three actors in the incidents and their contribution to the aid.

Next the balanced scorecard is tested in a case study using the two incidents as input. Assessment of the result of the case study shows that the balanced scorecard can be used to measure the performance of organizations in incident management logistics for the three actors. The best results are for the KPI ‘amount of help provided’ for the perspective of aid output, the ‘learning and growth’ KPI for organizational capacity, the external perspective and the KPI ‘responsiveness’ for the supply chain performance perspective.

In the conclusion of this research the assessment of incident management logistics show it is possible to improve the balanced scorecard by making more data available of the logistic processes, which should be made possible by the aid organizations. This can be achieved by incorporating logistic knowledge and experience in the top management of aid organizations, by increasing the cooperation among aid organizations and by implementing logistic information systems. Each aid organization should assign a logistic manager in the top management of their organization. The logistic management can lead the implementation of logistic information systems and the
improvement of the aid organizations. The initiator for increasing the cooperation should be the UN since its mandate and network are best suitable for improving the overall cooperation and aid process. Further possibilities for improvement lie in incorporating evaluation elements in the aid organizations, by improving the need assessment, increasing the use of money as an aid good, connecting financial information systems with logistic information systems and finally by using contingency planning in the preparedness phase of an incident. An important conclusion is that logistic information systems have a double benefit: information availability and supply chain effectively and efficiency.

![Figure 3: Improvements incident management per incident phase.](image)

In the final part of this research recommendations are stated on the usability of the balanced scorecard, how to improve incident management logistics and for further research, as visualized in figure 3. It is recommended the actors to implement the balanced scorecard. By keeping track on performance and by connecting performance with the goals, strategy and vision of the organization the aid output can be improved. In the use of the scorecard sufficient data quality and quantity should be established. Next all three organizations are recommended to increase the level of cooperation with other aid organizations and by implementing and connecting logistic information systems (supply chain integration). In this way more data will be generated on logistic performance, which shows what areas need to be improved. The increase in cooperation makes it possible to make the supply chain more effective and efficient because free capacity can be used more efficiently. This will also reduce the effect of influence of politics and media. Implementation should start within the top management of each organization by including logistic management in the management structure. It is recommended to intensify financing the need; by using money as an aid good, the aid process will be more effective and efficient. It is recommended that contingency planning should be improved in all three organizations. This will save time and benefits the speed of aid. It is further recommended to regularly adjust the need assessment and to introduce elements for evaluation within each organization.

Finally further research is recommended on the quality of need assessment, in-depth research for aid organizations in order to further improve incident management logistics and to conduct research on the usability of the balanced scorecard for long-term incidents.
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1. Introduction of incident management logistics and research set-up

This chapter introduces incident management logistics and the research set-up. The introduction of incident management logistics leads to the problem statement. Then the research goal, the scope constraints and limitations are stated. Next the research questions are explained after which the methodology explains the set-up of the research.

1.1. Introduction of incident management logistics

The last decade can be characterized as unstable in terms of economic growth, international conflicts and environment (institute for economics and peace, 2015). In this period several large, international incidents have occurred, some of which are among the greatest disasters that ever happened (list25, 2013). In order to understand the causes and consequences of these incidents it is important to know that these crises can be divided in two major types: 1. Man-made disasters and 2. Disasters of natural cause (School of hygiene and tropical medicine, 2009). Examples of natural disasters are tsunamis, earthquakes and floodings, for instance the earthquake that hit Haiti in 2010. Man-made disasters can be divided in two groups: 1. Accidents and 2. Disasters that are caused on purpose. Examples of man-made disasters are wars; inter- as well as intra-state, airplane crashes like the disaster of the MH-17 or the environmental disaster with the Exxon Valdez in 1989. Although the number of wars between states has decreased, the number of ethnic conflicts and revolutionary wars has increased (center for systemic peace, 2014).

International incidents usually occur without warning and have enormous consequences for society, the environment and the economy. Therefore this research will focus on international incidents, which can be defined as events that occur quickly and include any kind of threats to the country, its territory, citizens, armed forces, property or vital interests. This threat leads to the creation of conditions for some kind of international diplomatic, economic and political or security justifications (symorg 2012, 2012).

The incidents cause multiple problems in the direct vicinity of the crisis, but also in the surrounding countries and even in other parts of the world, such as the refugee problem in the Middle East (migration policy institute, 2015). These problems can encourage polarisation within the Netherlands society thus adding to the difficulty of solving problems (dutch news, 2015). Dealing with international incidents is especially challenging since these situations usually involve many actors in extreme circumstances, which makes solving problems difficult. Several organisations are involved in solving incidents: governments, Governmental Organisations (GO), Non-Governmental Organisations (NGO) and even profit organisations. They use incident-management, which can be defined as activities that organizations use to identify, classify, investigate and repair hazards, hazardous situations and crisis events. This also includes the restoration of the normal situation as soon as possible. Incident-management is a popular way to deal with incidents for it provides a structure how to prepare, handle and evaluate incidents. This research looks into the subject of incident management.

This research aims to set-up a tool to analyze the performance of different kinds of organizations in incidents so as to find ways to improve the logistics in incident management. Performance can be defined as the accomplishment of a given task measured against pre-set known standards of accuracy, completeness, cost and speed (business dictionary, 2016). For this reason prominent kinds of organizations are involved in this research, namely the Royal Netherlands Armed Forces (RNLDAF) as a representative of the Netherlands government, the United Nations Office for Coordination of Humanitarian Affairs (UNOCHA), which is a GO and Oxfam Novib, that is a NGO.
The recession of the last decade has also an effect on incident management; because of cutbacks in budgets organizations cannot afford to spend much on the management of incidents (defenceweb, 2011). This results in focus on effectiveness and efficiency. Another result, especially for governmental and non-governmental organizations, is that the performance of the organizations is more in the public spotlight. Mistakes or mismanagement in the execution of missions lead to criticism on the performance of organizations.

The problem can be stated as follows:

*Changes in the international situation concerning economics, politics and the environment make it difficult for organizations to manage logistics in international incidents and crises, and to perform effectively and efficiently.*

1.2. Research goals

The goal of this research is to gain insight into the logistics framework, set-up, core activities and evaluation of incident management from a multi-actor perspective, both qualitative as quantitative, and to develop an tool for performance measurement and provide measures for improving these processes for the actors included in this research. Next to this the research aims at obtaining a better scientific insight in incident management.

1.3. Research questions

A series of research questions is adopted to guide the research and to enable deeper understanding to the overarching research question. The main research question is described as follows:

*Which tool can be developed to measure the logistic performance of organizations in incident management and which concepts and measures can be found in order to improve the logistic processes of international incident management?*

In order to be able to answer the main research question several sub-questions are composed. These sub questions are:

1. *What are the current theories of logistic incident management?*
2. *What are the requirements for a logistic performance tool and the indicators in order to measure the logistic performance of actors in the selected incidents?*
3. *What are the characteristics of incidents of the last fifteen years and which two incidents can be selected as input for a case study?*
4. *State of the practise: How do the actors, RNLDAF, UNOCHA and Oxfam Novib manage logistics in incidents?*
5. *How did the actors, RNLDAF, UNOCHA and Oxfam Novib perform in the selected incidents: what went well and what were the problems?*
6. *What opportunities can be found for improving international logistic incident management?*

1.4. Scope and constraints

The scope of this research is on the logistic support of incident management, both natural as man-made. Focus lies on incidents that have a large effect (many victims and damage) and in which many international actors have participated. This is done because these situations are the most difficult to
manage due to the large number of actors in combination with short reaction times; the output of improvements in these incidents will be larger then in smaller incidents. To compare the chosen cases the duration of the incidents must be about the same length in time; for instance incidents that last longer then a year involve semi permanent types of logistics, which makes it difficult to compare with incidents that last shorter. For these reasons some types of incidents are excluded from this research, namely aircrafts accidents and environmental disasters; both are usually solved by one nation and have a limited number of human fatalities. 

There are several limitations are set in the following in this research:

1. Number of cases taken into account: two cases;
2. Number of actors taken into account: three actors (Armed Forces, GO and a NGO);
3. Choice between modes of transport air, sea, road, nodes: all modes included;
4. Type of supply chains: temporary;
5. Elements of supply chains: choice for distribution channel;
6. Type of incidents: natural incidents and man-made incidents;
7. Level of management: strategic level and tactical level;
8. Type of products & services: all product and service types are involved;
9. Phases of incidents: the phasing of incidents will be explained in section 2.1. The measurement of performance will focus on the response phase, but the recommendations will cover all incident phases.

Another limitation is the amount of comparable data that can be provided by the different organizations; it may prove difficult to obtain a sufficient amount of data to be able to compare the performance of organizations or to present usable information for improving the logistic performance of organizations. In order to maximise the output assumptions are made if necessary.

Due to the time scale and the aim of the research to find ways to improve logistic incident management, a combination of qualitative research and quantitative research methods is seen as the most suitable approach for the collection of primary data. A prerequisite for this is that the organizations are able and willing to provide the necessary data, both qualitative as quantitative.

1.5. Methodology

This section will explain the methodology and the scientific methods that were chosen to collect and analyse the data for this research and links these methods to the research questions. In order to obtain the research goals a combination of scientific and application tools will be used. For this a general engineering design framework (Herder & Stikkelman, 2014) will be adapted for this research. The original general design framework exists of five phases:

1. In the first phase the design goals are developed from the problem statement and the research questions;
2. In the second phase objectives are derived from the design goals;
3. The third phase contains constraints and limitations for the design;
4. In phase four a test will be developed; for this research this will be a tool for logistic performance measurement;
5. The design space is described in phase five describes the design components and variables.

With the information from the five phases the test is performed to validate the method and to give recommendations on the subject of the research. The phases of the generic conceptual design framework is depicted in figure 4.
The generic conceptual design framework is adapted for this research. Phase 1 to 3 is already described in section 1.2 and 1.4. In phase 4 a balanced scorecard is developed from theoretical input on logistic incident management and performance measurement, to serve as a test to be used in a case study. Phase 5 contains the input for the test, which consists from two elements: 1. Two incidents are selected from an overview and 2. The role of three organizations in these incidents is described. These two elements serve as input for the test.

The test is a case study where the logistic performance of the three actors will be measured. A combination of the output of the case study and improvements for incident management logistics results in conclusions and recommendations on the usability of the balanced scorecard and improvement of logistic incident management. The design framework is depicted in figure 5.

In order to develop a tool to assess the logistic performance, a literature study is performed first and information is obtained from experts in incident management logistics. Logistic performance can be defined as the level of planning, realization and control of the different logistic activities (UK essays, 2015). This describes the main elements of the supply chain in incident management and performance measurement, which provides an answer for the first and second sub research question.

In order to perform a case study, incidents are selected. By performing a morphologic study, an overview of the most important crises of the last decade is generated. Two incidents from this
overview are selected for the case study. The selection is based on the characteristics of the crises and the availability and usability of data for this research. The overview and the selection of cases answer the third sub question. To be able to measure the performance of organizations in incidents, the role of the actors involved in this research RNLDAF, UNOCHA and Oxfam Novib is described as part of the description of the cases that are selected for the case study. This information is obtained from open sources and by interviews held with representatives of the three actors in this research, which answers the fourth sub research question.

In order to answer the fifth and sixth sub question the logistic performance of the actors will be measured on the selected incidents in a case study. Literature and interviews with experts provide opportunities for improving incident management logistics, including best practice and lessons learned.

Finally the combination of the results of the case study, literature study and interviews with subject matter experts will provide a tool for performance measurement and possibilities for improving incident management logistics, which answers the main research question.

1.6. Scientific contribution
In this research a scientific tool is developed and tested for incident management logistics. Although much research has been done on logistics, so far there is only limited amount of knowledge on the characteristics of incident management logistics. This research therefore contributes to science by providing insight in the field of incident management logistics and in performance measurement in this field.

1.7. Ethical considerations
There are several ethical considerations to be taken into account in the research. The most important consideration is about human lives versus costs: every incident has a certain amount victims that die or suffer due to the incident. Managing incidents are costly. When incident management is improved this will probably lead to a decrease in the number of victims, or at least in the amount of suffering that results from the incidents and hopefully also to a decrease in the costs. In this way more can be accomplished with less. It should however be kept in mind that efficiency never should increase the number of victims.

A second ethical consideration is confidentiality: this thesis has no security classification, which means that the content can be shared without restriction and no embargo needs to be imposed.

The last consideration is about the nature of this research: the goal is primarily to improve incident management logistics so as to solve crises and incidents faster, more effectively and more efficiently. This means that the outcomes should not be used to improve the competitive position of organizations.

1.8. Report structure
This report is structured in five chapters and several appendixes. First in chapter 1 the subject of incident management logistics is introduced and the research set-up is explained. Next, chapter 2 describes the outcomes of the literature study and interviews in term of supply chain theories in incident management together with theories on performance measurement from which a balanced scorecard is constructed. Chapter 3 focuses on the generation and description of cases from an overview of incidents, including the role of the actors. In chapter 4 the case study is performed for two cases, the earthquakes in Nepal in 2015 and in Haiti in 2010. Possible logistic improvements are added as to provide opportunities for improving incident management logistics. Finally in chapter 5
Conclusions are drawn from these results on which recommendations are given on how to improve incident management logistics (main research question). In figure 6 the report structure is visualized.

Figure 6: report structure.
2. Development of a balanced scorecard for incident management logistics

In this chapter the balanced scorecard for incident management logistics is developed as stated in figure 7. First definitions of incident management logistics are described in section 2.1. The actors and their roles in incident management are described in section 2.2. Then in section 2.3 the strategies that can be used in incident management are explained. Section 2.4 describes the performance measurement tools that can be used in incident management. The elements from these sections form a base for the development of a balanced scorecard that is set-up in section 2.5. Section 2.6 provides a conclusion for this chapter. The chapter structure is visualized in figure 8.

2.1 Incident management logistic definitions

To be able to identify the main performance indicators of incident management logistics, one first needs to understand the basic principles of logistics and the incident management supply chain. Therefore definitions on incident management logistics are stated and supply chain elements are explained on general logistics, the military field and the humanitarian field.

Logistics concerns “the process of planning, implementing, and controlling the efficient and effective flow and storage of goods, services, and related information from the point of origin to the point of consumption for the purpose of conforming to customer requirements.” Note that this definition
includes inbound, outbound, internal, and external movements, and return of materials for environmental purposes (logistic world, 2009). This process is executed in a network of hubs and links that is referred to as the supply chain:

All activities associated with the flow and transformation (production) of goods from the raw material stage to the end-user is referred to as the supply chain, which is depicted in figure 9 (European Union, unknown).

![Diagram of supply chain](image.png)

*Figure 9: The supply chain (European Union, unknown).*

Supply chain management is the integration of the described activities by improved relationships in the supply chain in order to achieve a sustainable competitive advantage (Nichols, 1998). The supply chain is divided in two main parts: the physical supply channel, which runs from the source of supply to the plants/operations and the physical distribution channel that runs from the plants/operations to the customers. Both elements overcome a gap in time and space between the elements of the supply chain. In this research focus lies mainly on the physical distribution channel.

Incident management logistics originated from the army where support of units in operations was viewed as very important, even essential, especially in case of long campaigns. In the military logistics can be defined as the science of planning and carrying out the movement and maintenance of forces. This includes those aspects of military operations that deal with the design and development, acquisition, storage, movement, distribution, maintenance, evacuation and disposition of material; movement, evacuation, and hospitalization of personnel; acquisition of construction, maintenance, operation and disposition of facilities; and acquisition of furnishing of services (logisticworld, 2016).

Logistics are meant to facilitate the military operation and make it possible to reach the goals of the campaign on all levels, strategic, operational and tactical. Logistics are reserves to make future use of force possible and for this reason are of vital importance.

The supply chain is divided in three elements:

1. Transportation of goods to the Point of Embarkation (POE) in the home nation;
2. Strategic transport from the POE to the Point of Disembarkation (POD) in or near the Area of operations (AOR);
3. In theatre transport from the POD to the destination, most often the base where the main body of the troops is stationed.

Depending on the campaign, transport usually runs via more then one Line of Communication (LOC). For each line the POE/D gets the letter of the mode added so that the LOCs are clear for all units; for instance air transport runs via APODs. The military supply chain is explained in figure 10.
Humanitarian incident management is generally defined by the aid and action designed to save lives, alleviate suffering and maintain and protect human dignity during and in the aftermath of man-made crises and natural disasters, as well as to prevent and strengthen preparedness for the occurrence of such situations. What marks it out from other forms of aid and foreign assistance is that it should be guided by the principles of:

1. Humanity: saving human lives and alleviating suffering wherever it is found;
2. Impartiality: acting solely on the basis of need, without discrimination between or within affected populations;
3. Neutrality: acting without favouring any side in an armed conflict or other dispute where such action is carried out;
4. Independence: the autonomy of humanitarian objectives from the political, economic, military or other objectives that any actor may hold with regard to areas where humanitarian action is being implemented.

Humanitarian incidents generally are defined by several phases. There are different sorts of phasing used in practice. For this research the four phases of FEMA are used, as depicted in figure 11 (Federal Emergency Management Agency (FEMA), 2010):

1. Mitigation: to prevent future emergencies or minimizing their effects. This includes all activities that prevent incidents, reduces the chance of incidents or reduces the amount of damage caused by incidents. These activities can take place before emergencies;
2. Preparedness: to prepare to handle an emergency, which includes all plans or preparations that are made to save lives and/or to help response or rescue operations. The preparation takes place before the occurrence of an incident;
3. Response: to respond safely to an emergency, which includes all actions to save lives and/or to prevent further damage to properties. The response takes place during the emergency. Activities in the supply chains commence after the a decision is made on delivering aid to the incident;
4. Recovery: to recover from an emergency, meaning every action taken to return to a normal or safer situation after an emergency occurred.

The measurement of performance in this research will focus on the response phase, but the recommendations will cover all incident phases.

2.2. Incident management actors & roles

It is important to understand what the main actors are in incident management: military and humanitarian, how they differ from regular businesses and what their role is in the business processes.

Military actors differ from regular organizations in many ways. The key players are divided in two groups: combatants and non-combatants. Combatants are any party that is involved in the conflict. These can be the opponent of the armed forces, but also partner forces or parties not directly for or against one of the opposing forces. Both can be regular armed forces, but also irregular such as militias. This last group is usually called ‘fence sitters’, who can be very important in the success of the operation/campaign since they can have a big impact on the people’s hearts and minds. Non-combatants involve governments both from the home nation and other countries, GOs, NGOs and of course the local population.

Concerning the actors in humanitarian operations, the customers are the victims of incidents, governments (national, regional and local) of the countries hit by the incidents and organizations that are active in solving the problems caused by the incident. This last group exist of a number of actors that can be involved in solving incidents:

1. Governmental Organizations (GO): these are organizations that are run by states with a mutual beneficial goal, such as the United Nations;
2. Non-Governmental Organizations (NGO): a non-governmental organization (NGO) is any non-profit, voluntary citizens' group, which is organized on a local, national or international level. Task-oriented and driven by people with a common interest, NGOs perform a variety of service and humanitarian functions, bring citizen concerns to Governments, advocate and monitor policies and encourage political participation through provision of information. Some are organized around specific issues, such as human rights, environment or health. They provide analysis and expertise; serve as early warning mechanisms and help monitor and implement international agreements. Their relationship with offices and agencies of the United Nations system differs depending on their goals, their venue and the mandate of a particular institution (ngo global network).
3. Governments: as part of international treaties or as a sign of solidarity countries often offer aid to the countries that are hit by an incident. This aid can be in the form of financial help or support with physical necessities such as food, but also by sending emergency rescue teams specifically trained to rescue people in the case of an emergency like earthquakes;
4. Armed Forces: when the incident is man-made, for instance a armed conflict in a country that can not be solved by the country itself, often help is asked and offered to subject the adversary and/or to help rebuild the country or region that was hit by the conflict. The only institute that can do this is, are military forces. These organizations have been trained and are equipped with specific skills and abilities to use violence and to work under extreme conditions. Also in the case of an incident of natural cause the military are frequently employed because of these abilities and skills;
5. Private organizations: often private organizations are hired in the solution of incidents, for instance to transport goods to the area hit by the incident or specific needs are bought by
private companies, such as tents needed for shelter for the victims. Sometimes these companies offer their services or products for free or at a lower rate than normal out of solidarity.

6. Donators: the GOs and NGOs are financed for a large part by donators. This group does not play a role in the aid operations, but are important stakeholders for GOs and NGOs since most budgets comes from donators. There is competition between organizations for donators.

The actors involved in this research, RNLDAF, UNOCHA and Oxfam Novib are selected because they represent the main actors in incident management; the RNLDAF is an organization that is one of the executive forces of the Dutch government, a national type of organization. UNOCHA is part of the United Nations, a Governmental organization (GO) in which all countries in the world have a representative, which functions as a global international platform where issues are addressed that concerns all members. Oxfam Novib is a Non-Governmental Organization that focuses on the aid to poor people in the world. These organizations represent the most important sorts of actors in emergency aid.

![Diagram of organizational context in incident management]

Figure 12: organizational context in incident management.

In case of an emergency the nation where the incident took place makes a request for emergency aid (usually together with or via the UN). After this request organizations determine what they can offer and what their need is. Donators are asked for support and cooperation with other organizations to set up the supply chain is initiated, by examples combined transport for several organizations and supply chain management. In order to have the most benefit from the model for performance measurement, it needs to work for all three types of organizations. The organizational context as explained is visualized in figure 12; the actor organizations are highlighted in blue.

To understand the way the incident management works and what the problems are, a power-interest diagram is set-up in figure 13. This shows that the victims of incidents have the most interest, but the lowest power; they are almost completely dependent on the support of the organizations that bring aid. On the other end there are the donators who have great power, but
small interest (not operational involvement, therefore shown with a dotted line); they decide what and where they donate, this makes the aid organizations dependent on the donators. In the middle are the governments who decide for themselves where they bring aid and they have a budget for it. The GOs are dependent on the governments and donators for funding, which make them less powerful than governments. NGOs are solely dependent on donators, which makes them vulnerable. This explains the growing political influence in incident management and the feedback that GOs and NGO are presenting to the donators: they want to keep the donators committed to their organization. Cultural aspects also play a role: GOs exist of people from all over the world and the organization is very big; this tends to lead to bureaucratism. NGOs exist from all kinds of different nationalities, which can lead to communicative issues. Also the attitude of NGOs range from tiny organizations with almost amateurism business plans to very large organizations that strive to be completely independent, for instance Médecins Sans Frontiers (MSF). Armed forces, who usually act on behalf of governments, are professionals in incident management. This mix of organizations is very difficult to manage in incidents because of the extreme differences that exist, combined with a language barrier.

![Diagram of incident management](image)

**Figure 13 Power interest diagram of incident management.**

### 2.3. Incident management strategy

A very important element in incident management logistics is strategy: logistics has a critical role in the primary process of organizations in providing the products and services needed at the location of the incident. For this reason adapting the right strategy in logistics is an (the most) important decision since it may provide an advantage or lead to more effectivity and efficiency in operations. Usually logistic strategy has one or more components of the following three elements (A. Rushton, 2010):

1. **Cost reduction:** minimize the costs of transport and storage through the right choice in transport modes, number and location of warehouses;
2. **Capital reduction:** minimize the level of logistic investment thus obtaining maximization on return on investments, obtained by making smart choices in operation set-up, for instance through just-in-time (JIT) management, direct shipping or outsourcing;
3. **Service improvement:** customer satisfaction depends on the level of service provided.
There are several theories in logistic strategy of which the most important ones are so-called logistic Pull system and Push system (Klaas, 1998). The pull system can be defined as a system where orders are the base for products to go through the supply chain. In order to fulfil these orders as fast as possible, intermediary stocks are held. Also recurrent planning is used which simplifies the planning task. The opposite of a pull system is a push system in which the future is constantly anticipated to define demand for products and products are ‘pushed’ through the supply chain in order to provide for the demand just in time. This planning of this system is more difficult; therefore software is used to determine the right amount of products and timing of the supply. These two strategies are visualized in figure 14.

![Diagram of Push versus Pull strategy](image)

**Figure 14: Push versus pull strategy (new charter university, 2012).**

In order for the logistic strategy and framework to work properly planning and control should be present through all three levels of the supply chain: strategic, tactical and operational. The elements belong to these three levels of management, which is visualized in figure 15 (A. Rushton, 2010).

![Diagram of Logistic elements divided over the three levels of management](image)

**Figure 15: Logistic elements divided over the three levels of management (A. Rushton, 2010).**

The strategic level is about the medium-to-long term decisions, with a timespan of usually one to five years (or more). Decisions concern trade-offs between company functions or other organizations and corporate finance and policy development into strategic plans. On the tactical level focus is on the short-to-medium term that is six month to one year (plus) in which decisions are made about sub systems and plans up to one year such as annual budgets worked out in an operational plan. The operational level concerns day-to-day decisions and implementation of the
operational plan. The operations are controlled through standards and rules that are reported on a periodic base (per week or month).

As stated earlier in this section logistics need to be taken into account in the overall strategy of organizations in order to improve its success. This can be achieved by integrate logistics in all elements of the corporate business plan by designing the logistic organization, network, process and information systems (A. Rushton, 2010):

1. Logistic organization: to ensure logistics to be managed adequately a manager for all logistic functions needs to be installed who is in charge of planning & control, operations and inventory management. In this way all functions of the company are focussed on the same goals and isolation of functions, through which sub-optimization could exist, is prevented;

2. Logistic process: the design of the logistic process is very important since it determines how the customer is served. The network design is derived from the process. The process described what the customer levels are, the location of the facilities, what the inventories should be and how transportation is managed. Since these areas are interrelated, they should be planned together in what is also called the triangle of logistic decision-making, which is visualized in figure 16.

![Figure 16: The triangle of logistic decision-making (H. Ballou, 2004).](image)

3. Logistic information systems: organizations nowadays rely to some account on IT systems, not only to provide information to make decisions, but also to manage all elements of the supplychain. The degree in which IT systems are used depends on several factors: ordering and manufacturing system, how much value is can add to the manufacturing of products, possibilities in internal transport and information on the whereabouts of the products. For the distribution part of the supply chain IT usually concerns Distribution Resource Planning (DRP), a system that covers the distribution of the organization and connects the different business units or functions of the organization. This ensures synchronization of the flow of all resources and management of all business processes. In this system all kinds of supporting modules can be added depending on where IT can add value tot the enterprise. Examples of supporting modules for distribution are:
   a. In transport Track-and-Trace (T&T) is used in order to keep control of the transportation process;
   b. Electronic Data Interchange (EDI) between companies;
   c. Radio Frequency Identification (RFID) to keep track of batches of products;
   d. Forecasting and inventory systems to control the inventory.
4. Logistic network: the way the products flow through the supply chain in terms of location of manufacturing, inventory, depots and end locations (customers). Also the way these locations are connected (also part of the information systems) and products are distributed.

In the company strategy transportation specifically focuses on customer satisfaction by on-time delivery with a minimum of damages, delays or damages. Next transportation adds to productivity efficiency by reducing transit times and lowering the variability of transit times so as to ease the prediction of arrival times. Finally transport costs are kept as low as possible by maximizing the vehicle-utility, minimizing the fuel consumption, overtimes and personnel costs.

Distribution networks should fulfil several requirements (A. Rushton, 2010). In the first place they should make product available for the customers (the right place) via the right channel. Next they should enforce the share of potential sale, which means that the products must be sold as best as possible. For this the distribution network should work optimally. For this the communication between shippers and customers should be in place. Order size, forecasting, vehicle size should all be accounted for. For order size Economic Order Quantity (EOQ) can be used for determining the optimal order quantity and frequency. When demand or lead-time varies, then a safety stock model should be used. Focus should be on improving the service level. This can be obtained by continuous cooperation between all actors in the supply chain. Furthermore the costs (general and logistic) should be minimized by adapting the supply chain to the product that is being processed in it. For example low priced goods that have a small margin in profit can only be made profitable by an optimal supply chain. Finally information should be accurate, on time and accessible at all times. This includes information of sales, inventories, costs and transport.

In the military, strategy is the conduct of warfare in order to obtain political and military aims. This is aimed at the centre of gravity of the enemy. Logistics are reserves in obtaining these aims. Operational art is the achievement of strategy by reaching military objectives, which are the enemy’s mass of force, command, control and communications. Next to reserves for future operations, logistics are the synergy to all elements of operational art and is part of the commander’s operational framework. Tactics involve battle to overcome the enemy, so this mainly concerns the fight against the enemy. In tactics logistics are used to affect the battle in progress (W.G. Pagonis, 1992). In order to obtain the goals set on all three levels operational art is generated into a complete plan in which all elements of operational art are addressed. These elements are theatre setting, objectives, concept of operations, intelligence, deception, manoeuver, operational fires, reserves, operational logistics and command.

Logistics in the military can be very demanding and challenging since in most cases information of the theatre of operations is unavailable or fragmentary at most. This makes it very difficult to plan and execute logistic operations. For example what is the amount of water available in the theatre and what is the quality. This has direct consequences on the number of troops that can be stationed or how much water must be imported into the theatre. In other words logistics are constraints for the operational commander. The commander already needs to take logistics into consideration from the preparation stage since strategic decisions determines how the force is transported towards the theatre, with what speed and what materiel is needed. Also during the campaign logistics are important in order to maintain momentum and initiative. After the campaign is over the redeployment is also a primarily logistic operation.

Another trend that has arisen the last decade is the growing application of outsourcing. Not only in the development of equipment, but also in the systems that are used in the armed forces and in certain services such as maintenance of equipment. This also goes for transport, especially in the
non-operational domain. Again the main reason for this is the lower costs when services are outsourced. Although the benefits are clear, there are also disadvantages to be taken into account when outsourcing is concerned (Pijpers, 2013): the risk of a monopoly position for certain logistic service providers could occur that has a negative influence on the flexibility for the commander.

As stated in section 2.1, humanitarian incidents can be divided in four phases. The response phase is characterized by limited availability of demand information from the area hit by the disaster. In this case, usually push-strategy can be appropriate. In this period the amount of materiel necessary to aid, is relatively limited depending on the scale of the disaster. The biggest issues are information about the number of people that are in need of aid and the possibilities of transporting through the ‘last mile’ to the target area. After this two-week period information of demand is usually assessed. This makes it possible to adapt logistics from push to pull strategy. The difficulty in this stage of incident management lies in coordinating all efforts from all aid-organizations involved in some way. Important players have been emphasising the need for the development of a multi-source overview of the supply network. This serves to provide a Humanitarian Common Logistic Picture (HCLOP) that enables managers to intervene and manage the supplychain and solve problems on time (P.C. Tatham, 2014).

There is a certain amount of reluctance to integrate the logistic process of multiple agencies and specifically to share information because of the competition between different organizations. Humanitarian logistics have the same issue as regular supply chains; how to make the supply chain more agile in order to improve responsiveness. Key prerequisites for agility are (Tatham, 2014):

1. Demand and event-driven: characterized by strategic use of capacity and inventory and implementation of lean principles, which is to cut of non-value added parts also referred to as waste. Examples of this are reduction of inventory or surplus capacity;
2. Network-based: using capacity, capability or resources from other units of the network can reduce costs and increase flexibility and efficiency. The United Nations Humanitarian Response Depot (UNHRD) has created such a resource sharing model;
3. Process-oriented: cross functionality makes rapid response possible instead of conventional structures that tend to be slow and inwards oriented;
4. Virtually integrated with shared information: a network can only be agile if there is a high level of connectivity based on share of information and cooperation. The challenge in virtual integration nowadays is most of all a trust issue, as stated before in this section.

2.4. Performance measurement methods for incident management

Performance measurement is not a goal on itself, but a means to an end in order to improve the organization (Behn, 2003). There are many different tools to assess or measure performance. For the purpose of this research several tools were reviewed, for instance the Cost Benefit Analysis (CBA) and a Multi Criteria Analysis (MCA). Both focus on the costs that come with any project or operation viewed against the returns. The difference between the two is that a CBA weighs the costs directly against the benefits, while the MCA uses weights for the different criteria to take into account the difference in importance of each criterion. This makes the MCA more suitable for situations where multiple effects need to be taken into account and where political issues are present (Annema, 2008). There are various sorts of MCAs; the most important tools reviewed for this research are the Supply Chain Operations Reference (SCOR) model and the balanced scorecard, which first are described and assessed in terms of applicability for the case study.
The SCOR model is a tool that links business elements from the supply chain elements with performance matrices, practices and peoples skills (Apics supply chain counsel, 2015) as visualized in figure 17. The SCOR model is focused around the five most important processes:

1. Plan: tune supply and demand to fit the goals of the business;
2. Source: purchasing of products or services to be able to satisfy the demand;
3. Make: transforming resources into products;
4. Deliver: translocation of products to the next actor in the supply chain;
5. Return: the return of goods in the supply chain for instance when there is a defect in the product.

![Figure 17: The SCOR model (Apics supply chain counsel, 2015).](image)

The balanced scorecard is a tool used extensively in business, government and non-profit organizations worldwide to align business activities to the vision and strategy of the organization, improve internal and external communications, and monitor organization performance against strategic goals. The framework is depicted in figure 18 (R. Kaplan, 2015).

![Figure 18: KPI Framework (R. Kaplan, 2015).](image)

The balanced scorecard can be used in the following way: by viewing the organization from four perspectives, by developing KPI’s for each perspective and by collecting and analysis of data it
enables measuring the organizations performance from a broad perspective from which strategy and policy can be improved as to serve the vision of the organization better. The perspectives are:

1. Financial performance: management of costs versus revenues and tracking of financial flows;
2. Customer satisfaction: how is the customer served best;
3. Internal Business process: keeping track on operations;
4. Organizational capacity: the learning and growth perspective; employee training and corporate cultural attitudes, related to individual and corporate self-improvement. Elements are mentorship, quality of internal communication and communication systems (R. Kaplan, 2015).

For this research the balanced scorecard is chosen to measure incident management logistics because the SCOR model is less appropriate for the humanitarian supply chain; it assesses all players from a competition point of view. Since in the current situation the use of performance assessment tools in the field of incident management is not yet applied very much, the risk that this tool is too complicated. Also the goal of the research is to measure the performance of organizations separately, while in the SCOR model focuses on the entire supply chain.

The KPIs used in the balanced scorecard are defined as measurable values that demonstrate how effectively a company is achieving key business objectives. Since the organisations involved in this research differ from each other, it may also be necessary to use different KPIs. There are many different KPIs used for measuring the performance of organizations. Table 1 contains a selection of the KPIs most used from theory and practice.

Table 1: selection KPI overview (Santarelli, 2013).

<table>
<thead>
<tr>
<th>Perspective</th>
<th>KPI</th>
<th>Expression</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financial performance</td>
<td>Distribution costs</td>
<td>€</td>
</tr>
<tr>
<td></td>
<td>Stock costs</td>
<td>€/hr</td>
</tr>
<tr>
<td></td>
<td>Handling costs</td>
<td>€/hr</td>
</tr>
<tr>
<td></td>
<td>Transport costs</td>
<td>€/km</td>
</tr>
<tr>
<td></td>
<td>Product costs</td>
<td>€/piece</td>
</tr>
<tr>
<td></td>
<td>Inventory costs</td>
<td>€</td>
</tr>
<tr>
<td></td>
<td>Holding costs</td>
<td>€</td>
</tr>
<tr>
<td></td>
<td>Order/set-up costs</td>
<td>€</td>
</tr>
<tr>
<td></td>
<td>Obsolescence costs</td>
<td>€</td>
</tr>
<tr>
<td>Customer satisfaction</td>
<td>Responsiveness</td>
<td>lead time in days</td>
</tr>
<tr>
<td></td>
<td>Right product</td>
<td>%</td>
</tr>
<tr>
<td></td>
<td>Right amount</td>
<td>%</td>
</tr>
<tr>
<td></td>
<td>Right place</td>
<td>%</td>
</tr>
<tr>
<td></td>
<td>Right time</td>
<td>%</td>
</tr>
<tr>
<td>Internal process</td>
<td>Need estimation</td>
<td>%</td>
</tr>
<tr>
<td></td>
<td>Internal communication</td>
<td>Qualitative index</td>
</tr>
<tr>
<td></td>
<td>Agility</td>
<td>Volume, products &amp; transport means</td>
</tr>
<tr>
<td>Operational process</td>
<td>Accessibility</td>
<td>Qualitative index</td>
</tr>
<tr>
<td></td>
<td>Operational safety</td>
<td>Qualitative index</td>
</tr>
<tr>
<td>External process</td>
<td>Connectivity</td>
<td>Qualitative index</td>
</tr>
<tr>
<td></td>
<td>External communication</td>
<td>Qualitative index</td>
</tr>
<tr>
<td></td>
<td>Standardization</td>
<td>Qualitative index</td>
</tr>
<tr>
<td>Learning &amp; Growth</td>
<td>Lessons Learned process</td>
<td>Qualitative index</td>
</tr>
</tbody>
</table>
When assessing the entire supply chain, one should use metrics that cover the entire (or a large part of) supply chain. These metrics are different from traditional logistics metrics because they measure inter-company performance rather than just internal performance therefore measures of performance must be common across the firms in the supply chain.

In any service market, the price-quality relationship is an important KPI in measuring the service. The demand of the customers must be delivered against low costs. In this way organizations will keep current customers and can attract more customers. This can be achieved by minimizing the transhipment time, so handling of the goods must be fast and reliable. Also the operations must be quick and reliable.

Research shows that reliability is the most important KPI in measuring the quality of terminals. Another important KPI is costs. Also flexibility can be a performance indicator. Responsiveness is a very important KPI for incident management since this indicates the ability of the organization to react on incidents. A fast reaction reduces the period that victims of incidents suffer (A. Widera, 2013). This can be used in several ways, for instance the time it takes from a donation to delivery time. For this research it suffices to consider the time from the incident until the goods are delivered to the designated area and people. Finally another critical performance indicator for continental terminal operators is ‘total service’, which is the ability to cover all elements within the terminal in combination of the aspects mentioned (B.W. Wiegmans, 2003-2004). Since humanitarian logistics are a specific type of supply chain this relationship can be used in an alternative way so to capture the supply chain specific goals.

Specifically developed KPIs for humanitarian supply chains are: appeal coverage, donation-to-delivery time, financial efficiency and assessment accuracy (Davidson, 2006):

1. Appeal coverage: this KPI exists of two parts, namely the percentage of items pledged by donors of the total number of items used in the operation. This part assesses the marketing quality of the organization, which is out of scope in this research as stated in chapter 1. The second part is the percent of items delivered from the total number of items necessary for the operation;
2. Donation-to-delivery-time: this KPI measures how long it takes for an item to be delivered from the moment a donor pledges a donation. In this research this can be redefined as how long it takes for products to be delivered from the moment an incident occurs;
3. Financial efficiency: this exists of three metrics:
   a. Absolute comparison between budget and actual prices paid for items;
   b. Relative comparison between budget and actual prices paid for items;
   c. Ratio of the total transportation costs over the total costs for delivered items;
4. Assessment accuracy: how accurate is the need for items assessed. This is measured by comparing the budget change during the operation.

2.5. Balanced Scorecard set-up
Based on the theory on logistics combined with the theory on performance measurement a scorecard is developed for measuring the performance of incident management. The scorecard is based upon the balanced scorecard of Kaplan as explained in section 2.4. The perspectives of Kaplan are adapted in order to fit incident management and the importance is changed, which is visualized in figure 19:

1. Aid output: since customer satisfaction is not a term usable for people in need of aid, this this perspective will be altered to aid output, which is defined by the amount and quality of help
provided for the beneficiaries because it is assumed that the right kind of help is defined by the need for help;

2. Organizational capacity: this perspective is a general aspect of the organization; therefore it does not need to be changed;

3. Supply chain performance: because this research is about supply chain performance, it is logical to change the perspective of the internal process into how the supply chain performs;

4. Financial efficiency: the financial performance perspective will be changed to the financial efficiency since the goal is not to make profit, but to provide as much help as possible to as many people as possible in the area hit by a disaster. In this perspective all available logistic metrics on costs are compared to the need fulfillment provided by the organization;

5. External process: as theory on humanitarian logistic shows in section 2.2 the quality of the aid given depends for a large part on external factors (organizations and actors). For this reason an extra perspective is added, namely the external process.

Figure 19: Adaptation of Kaplan’s balanced scorecard for incident management.

Based on the vision and strategy of each organization KPIs are set up for several perspectives. For each KPI four possible values will be taken into account:

1. Objectives: the goal set for this KPI, as a result of the organization’s vision and strategy;
2. Measures: the KPI value that is actually measured;
3. Targets: the actual value coming from the objective that is targeted;
4. Initiatives: the initiatives that are taken to reach the objective and target.

Through regular performance of the scorecard, insight is created in the key processes of the organization in direct respect to the vision and strategy. From this insight steps can be taken to improve the strategy by setting strategic objectives and initiatives in a strategic map. The perspectives from the balanced scorecard of Kaplan apply mostly to regular businesses. Therefore these perspectives are altered to fit the field of incident management logistics. In the setting of KPI’s it is very important to use KPI’s that meet several requirements:

1. The KPI represent the perspective it belongs to;
2. There is data available, or can be made available to determine the value of the KPI;
3. Since KPI’s are not used in the field of incident management it is important for the KPIs not to be overcomplicated and easy to use as to be able to add value to the organization using the balanced scorecard;

4. Another reason why the scorecard and the KPIs should not be too extensive are the circumstances in which data will have to be generated: in the area where aid is given it usually is chaos. In this situation it will be difficult to gather the data for filling in the KPI’s.

![Figure 20: The balanced scorecard for incident management logistics.](image)

The perspectives and KPIs are visualized in figure 20. The actors are also included in the choice of KPIs since there may be an assessment system in use and because KPIs depend on the strategy and the goals set by the management of the organization.

For each actor it is indicated which KPIs will be used. KPIs can be used for gaining insight on different levels in the organization: strategic, tactical and operational. It is important for organizations to use the KPIs on the right level, therefore for the KPIs in the balanced scorecard the most logical level is indicated in color; red for the strategic level and blue for tactical level. For the balanced scorecard no operational KPIs are used.

1. Aid output: the KPIs for this perspective are:
   a. Amount of help provided: the number of people that receive help;
   b. Right product: the coverage of the need in sorts of products (percentage);
   c. Right amount: the coverage of the need in number of products (percentage);
   d. Right place: the percentage of the need in location (percentage);

2. Organizational capacity: the KPI for this is:
   a. Learning & growth: the extend in which learning and growth is incorporated in the organizations structure and processes, calculated by the availability of courses for
personnel and the amount of evaluation meetings/processes (percentage of learning & growth).

3. Supply chain performance: the KPIs for this perspective are:
   a. Responsiveness: the lead-time between a disaster and the delivery of aid (number of days). Since emergency aid often exists out of different elements given by the same organization, the average lead-time will be used. This makes it possible to compare the lead-time of different organizations;
   b. Need estimation: the percentage of fit between the estimated need versus the actual need (percentage);
   c. Agility: the flexibility of the supply chain on three matters:
      i. Flexibility in weight: how much can be transported (percentage of free space in transport means);
      ii. Flexibility in types of aid (goods & services): how many different sorts of products and services can be provided (percentage of means to provide different types of aid goods & services);
   d. Supply chain robustness: to which extent can the supply chain cope with problems, measured by the percentage of the logistic performance after a show-stopping issue. This is a sensitivity analysis of the supply chain; it is assessed how well the organization dealt with issues. This can be affected by the amount and quality of contingency planning as used in practice (percentage effectiveness of contingency planning);

4. Financial efficiency: the KPIs for this perspective are:
   a. Distribution costs:
      i. Stock costs: the costs of the stocks in the supply chain (euro);
      ii. Handling costs: the costs of handling the supplies through the supply chain (euro);
      iii. Transport: the transport costs (euro);
   b. Inventory costs: the costs of having an inventory (euro);
   c. Obsolescence costs: the deterioration costs of materiel and products over time (euro);

5. External process: the KPIs for this perspective are:
   a. Connectivity: the amount of connectivity/communication between the organizations systems with external parties in terms of the number of interconnected systems with other organizations and the frequency of communication with other organizations (percentage of connectivity);
   b. Standardization: the level of standardization of the organizations business processes within the organization and with external parties (percentage of standardization).

2.6. Conclusion development of a balanced scorecard for incident management logistics
In chapter 2 a balanced scorecard was developed based on current theories on logistic incident management and theories of performance measurement. With this the first two sub research questions are answered:

1. What are the current theories of logistic incident management?
2. What are the requirements for a logistic performance tool and the indicators in order to measure the logistic performance of actors in the selected incidents?

The balanced scorecard is a toolbox from which every organization can use perspectives and KPIs that fit their organization. In the balanced scorecard for each KPI objectives, measures, targets and initiatives can be included. These elements are included in order to help the organization into putting the data into perspective of its vision and strategy.
3. Incident selection and description

As visualized in figure 21 and 22 chapter 3 provides the incidents that will be used in the case study. In section 3.1 the selection of incidents is explained. Section 3.2 describes the earthquake of Haiti in 2010, including the roles of the actors. In section 3.3 the Nepal earthquake of 2015 is described, including the actors roles. In section 3.4 a conclusion on this chapter is stated.

3.1. Selection of incidents for case study

In order to make a good selection of incidents for the case study a general overview of international incidents is generated. This overview contains the most important international crisis and incidents of the last decade. Note that events exist that fit the definition of an incident, like airplane crashes, but are not taken into consideration because these only concern intra state actors, therefore not suitable for this research. The overview is stated in appendix V.

From the overview two cases are choses for the case study. All three actors are involved in these incidents. Both cases have a large number of international actors victims, important because the
impact of possible improvements will be greatest. The cases are not out-dated in relation with the usability of improvements for the organizations and related to the availability of data. The final important issue in the case selection is the opinion of the actors; they have the highest knowledge and experience in incidents for choosing the best suitable cases. Taken in account all these elements, the cases selected for the case study are the earthquake in Haiti in 2010 and Nepal in 2015. There were several additional motives to choose specifically these two cases:

1. The two cases are several years apart from each other; this means that possible improvements made from the organizations as part of internal evaluation can be measured in the case study;
2. The earthquake in Nepal is very recent; this means that the logistic operation has been run with the latest strategies and systems. This means that the case gives the most current representation of the logistic performance of the organizations;
3. Although both cases are earthquakes, Haiti was a far bigger issue because there was also a political problem going on in the area, which was made worse because of the earthquake. For the case study this makes an interesting case to show the effect of two incidents on the aid given and the logistic performance of the aid.

3.2. Case description Haiti earthquake 2010

This section describes the 2010 Haiti earthquake including the role of the RNLDAAF, UNOCHA and Oxfam Novib, so that in the case study the logistic performance can be calculated for each organization.

On Tuesday the 12th of January 2010 an earthquake of 7.0 on the Richter scale struck Haiti at 16:53 hours, followed shortly by two aftershocks. The epicentre was located at 25 kilometres distance of the capital of Haiti, Port-au-Prince, a city with almost 2.2 million inhabitants. The magnitude of the damage caused by the earthquake was not clear immediately. The estimated number of victims was 300,000 fatalities and millions of people in need of help. Approximately one million people lost their homes, (Pallardy, 2016).
Figure 23 shows the intensity of the earthquake and the aftershocks. Due to the bad quality of buildings and infrastructure the damage was enormous. Government agencies and ministries were destroyed. The already very poor and unstable country was unable to manage the emergency aid and rebuild of the country. The airport of Port-au-Prince remained operational for emergency aid during daytime, but all roads to and from the city were destroyed. The seaport of Port-au-Prince was heavily damaged. In the disaster area armed gangs were pillowing the remaining buildings. This made the operations of emergency personnel unsafe; they could only work under the protection of UN-soldiers. Because the airport was closed several times the emergency aid was established slowly and the process was disturbed by the outbreak of cholera and the occurrence of hurricanes in the area. The general timeline of the earthquake and the emergency aid is visualized in figure 24.

Figure 24: General timeline Haiti earthquake.

3.2.1. Role of RNLDAF

Because the government of Haiti and the local UN management were hit by the earthquake, the communication in the first days after the disaster was unclear; information was scarce and diffuse (Inspectie Openbare Orde en Veiligheid, 2010). Although the ambassador of Haiti in the US stated that help was most welcome, the official request for help came in the afternoon of the 14th of January.

The request to the Netherlands was for search and rescue support. In advance of the request, the preparation for the deployment of the USAR team started: in the morning of 13 January the USAR management stated that the team would be sent. At 07:00 hours, the ministry of Foreign Affairs (MoFA) contacts the ministry of Defence (MoD) (point of contact National Operations) in order to facilitate the transport with a military aircraft. The same morning the MoFA communicates internally on the support of the emergency aid. At this point it was unclear whether the airport of Port-au-Prince was operational and if the team could be deployed effectively. In the afternoon it became clear that this is the case and that the airport was operational during daytime. The Americans would take over the management of the airport from the 14th of January.

The MoD provides a KDC-10 for the transport of the USAR team and materiel. The initial departure time was set on 18:30 hours. The USAR team went to Eindhoven airport, that is the usual location for departure for support missions. The materiel consisted of 81 box pallets. Because there are some dangerous goods involved, special clearance must be given through a Non-Dangerous-Goods declaration (NDGD) that can be given by a certified company. This proved to lead to a small delay. Next to the USAR team of 62 people, also two UNDAC members, two SCOT teams (Fast Deployable Consular Operational Team existing of 5 people) and five people from the press will travel with the
KDC-10. Because it is not clear if re-fuelling is possible on the airport of Port-au-Prince, there will be a short stop in the Dominican Republic.

The airplane departs eventually on 14 January at 10:15 hours. At 14:45 hours the airplane lands on the airport of Puerto Plata as scheduled. By then it is clear that the American authorities that have taken over the management of the airport of Port-au-Prince will give no permission to land in Haiti because it is not clear if an airplane with the size of a KDC-10 can land on the airport in the current circumstances. It was therefore decided that the team would go to Curacao to wait until permission is given to land on Haiti. Through the initiative and contacts of a soldier who is part of the USAR team, the permission is granted for the 15th of January to land on Port-au-Prince with alternative airplanes. The team and materiel is transported from Curacao in three flights with smaller aircrafts (one in in the morning, two in the evening).

The USAR On-Site Operations Coordination Centre (OSOCC), built up by the USAR team of Iceland is operational in the evening of the 15th of January. The Dutch USAR team will contribute to the management of the centre and assistance in the city. The groups of the team start their operations from 12:10 hours. On the 16th of January, the area has been assessed by the OSOCC and the USAR teams are dispatched to their designated areas of operation from where they operate until the 19th of January. Several people are rescued from under rubble and the remains of casualties are cleared.

On the 18th of January the Dutch Naval vessel Hs. Ms. Pelikaan arrives in the seaport of Port-au-Prince as the first ship. This ship brings Marines (for protection of the USAR teams) and aid goods from Curacao and Aruba. On the 20th of January a large group of adoption children is transported by the USAR team to the airport that is being brought to the Netherlands. The USAR team returns to the Netherlands, via Curacao, on the 22nd of January. The materiel used is left behind, to be used by the remaining units. The timeline of the earthquake and the emergency aid of the RNLDAF are visualized in figure 25.

**Figure 25: Timeline RNLDAF earthquake Haiti.**

### 3.2.2. Role of UNOCHA

The role of UNOCHA after the earthquake was the coordination of emergency aid and in structuring the rebuild development (Global Public Policy Institute, 2010). The OCHA country office was hit by the earthquake; therefore staff members from New York and Panama were mobilized almost immediately to support locally and to ensure coordination of support.
Within 24 hours after the earthquake struck, the UNDAC team arrived in the theatre. The USAR teams arrived spread out over several days; some had issues through the limitation of handling time slots, however more then 130 people were saved. Five key clusters (WASH, Non-food items, food, health and shelter) were mobilized and the first troops arrived within 48 hours. The first days the arrival and distribution of emergency hospitals, medical equipment and personnel was hindered by limited time slots.

Due to the presence of the UN (WFP stocks) and many NGO’s before the earthquake, it took only several days for the distribution of aid goods to start. Transport capacity provided by WFP includes personnel air transport (2 x 10 pax/day), an Antonov 12 from 22nd of January, air cargo transport (2x 4mtonnes/day) from 21st of January. For road transport 20 15 mtonnes trucks and 40 M6 trucks are contracted. The high number of NGOs operating in the area however was clogging the system, through which the coordination was slowed down.

In order to keep control of the coordination, OCHA established a coordination structure. Water trucking commenced on the 13th of January. In the first month the WASH cluster reported that over 900.000 people received approximately five litres of clean water each day in Port-au-Prince only. The fast response was possible through the activation of Prepositioned Emergency Response Units (ERU).

The seaport was accessible from the 18th of January, but because of lack of handling equipment and transport means, this aid was also severely hampered. Also the management of the docks was insufficient, which meant that the ships had to wait to dock. Through the quick reaction from the government of the Dominican Republic (the only country connected on land to Haiti), a lifeline to Haiti was created. The roads in Haiti however proved to be difficult to use. Next to that the road from the Dominican Republic also got congested. The roads were opened up through the intervention of various troops. After a couple of days a massive influx of aid occurred and with it the establishment of various coordination mechanisms.

After 24 hours the first American troops landed in Port-au-Prince, followed by troops of various nations. This response contained important logistical means for transport, port rehabilitation and heavy-duty equipment for debris removal to clear the main axes of the city. In total the UN and its partners delivered the following aid (up to 25th of January) (Congressional Research Service, 2010):

1. Shelter: plastic sheeting was distributed since the enormous shortage on tents; there will be a distribution of 200.000 family-sized tents;
2. WFP provided for a two-week food program for 2 million people; the government add to this by providing food for to 100.000 people on a daily basis;
3. There are 48 operational hospitals and an additional 12 field hospitals which are helping hundreds of people every day;
4. WASH: there still is great shortage for WASH facilities; up until the 25th of January there was sufficient for several thousand people;
5. Protection: the MINUSTAH mission suffered heavy damage and losses, after initial issues on what way to continue the mission given the changed circumstances, the troops protected the aid organizations in the field; the total number of people helped is estimated to be 100.000.

Although the emergency aid was considered successful, the response was delayed by lack of leadership and limited local ownership. There were difficulties in preparing for and responding to an urban disaster. The assessment of the humanitarian situation and needs was weak and there was a limited amount of communication possibilities.

The timeline of the earthquake and the UN emergency aid are visualized in figure 26.
3.2.3. Role of Oxfam Novib

Also Oxfam had a team present in Haiti since the country suffered from the consequences of political and social unrest (Oxfam international, 2010). The earthquake took the lives of two team members. Despite this loss, the team almost immediately directed its efforts to bringing aid to the needy in Haiti. Next to this Oxfam brought in additional personnel to make a team of 100 people, including 15 emergency specialists. The aid delivered mostly existed out of the following elements: delivering clean water, shelter and basic sanitation, providing community canteens in preparing of hot meals, paid employment to people in camps to keep the camps clean, build latrines and clear up destroyed neighbourhoods and donating money to people in order to provide for basic needs.

In total more then 300.000 people were reached within the first emergency period of 0-6 months (120.000 water, 25.000 shelter, 66.000 latrines and washing facilities and 115.000 cash for work and preparation of hot meals) (ALNAP, 2011). Next to the personnel losses, also a warehouse with water and sanitation equipment was destroyed. From day four Oxfam was tankering water to various camps in the area, closely followed by construction of sanitation activities and solid waste management. Within two weeks emergency food security and livelihoods (EFSL) operations were up and running. The fast response was made possible through the knowledge of local teams and collaboration with several community-based organizations. A problem that had to be overcome was the shortage on (expert) personnel. The timeline of the earthquake and the emergency aid of Oxfam are visualized in figure 27.
3.3. Case description Nepal earthquake 2015

The earthquake in Nepal in 2015 (international association for engineering geology and the enviroment, 2015): On the 25\textsuperscript{th} of April 2015 the Gorkha region in Nepal was struck by an earthquake at 11:52 AM. The epicentre lay at 77 km Northwest from Kathmandu, the capital of Nepal. This city has 1.5 million inhabitants. The earthquake had a force of 7.8 on the Richter scale (S.o.R.), which was the most powerful earthquake since 1934. UN report state that the lives of approximately eight million people have been affected by the natural disaster with more that 7,400 human fatalities.

Figure 28: Map earthquake Nepal 2015 (international association for engineering geology and the enviroment, 2015)

Figure 28 shows the map of the region that was affected by the earthquake. This region has a history of major earthquakes. The earthquake destroyed a lot of buildings and infrastructure and damaged even more structures. The earthquake resulted also in a number of landslides and even a major avalanche on the slopes of Mount Everest, about 160 km away from the epicentre. One day later on the 26\textsuperscript{th} of April a second earthquake hit the area with a force of 6.7 on the Richter scale, near Kathmandu. Furthermore the days after these earthquakes several aftershocks hit the region. The timeline for the earthquake is depicted in figure 29.

Figure 29: Nepal earthquake timeline.
3.3.1. Role of RNLDAF

Directly after the earthquake took place, the government of Nepal together with the United Nations send out a request to the world for emergency support. The Dutch government reacted with the offer for support concerning Search-and-rescue, emergency aid and development. The support consisted of the following elements:

1. The immediate support of Urban Search and Rescue teams (USAR) (USAR.nl, 2015): the team existed out of 62 people and 8 specially trained dogs. The team is trained specifically for searching and rescuing victims from underneath debris and wreckages and rubble. In normal life, the members of the team work with the Fire brigades, the Police, the Armed forces and in hospitals as medics. The team was sent as part of a larger supporting operation from the European Union (EU). The USAR team takes care of their own support, so not to put extra pressure on the local facilities. The equipment and goods taken to the disaster area was approximately 9 tonnes, containing large inflatable shelters tents;

2. Transport of five tonnes of emergency aid goods for Médecins Sans Frontières (MSF) existing of blankets, bandages and water;

3. Financial emergency support of four million euro through the Dutch Relief Alliance, which is a cooperation of several Dutch Relief organizations and the Netherlands Ministry of Foreign Affairs (MoFA).

The request for support was received at the Dutch government on the 25th of April. The next day it was decided to grant the request and bring aid to Nepal. On the 26th of April an airplane set of at 20:00 hours from Eindhoven Airport towards Kathmandu, the capital of Nepal. It arrived at Kathmandu airport at 04:30 hours the next morning. After arrival the USAR team consulted the local authorities on where the team was to be executing its task. A base camp was erected close to the airport. On this camp the coordination of all search-and-rescue work was coordinated until the arrival of the UN on the 30th of April. On the 1st of May, part of the team was dispatched to an area 60 kilometres outside of Kathmandu. On the 3rd of May, the government of Nepal decided to stop the search-and-rescue work, since no more victims were expected to be found alive. On the same day, the Dutch USAR team left. The timeline for the RNLDAF emergency aid is visualized in figure 30.

![Figure 30: Timeline RNLDAF Nepal earthquake.](image-url)
3.3.2. Role of UNOCHA

The role of UNOCHA during the aftermath of the earthquakes was the coordination of emergency aid and in structuring the rebuild development. The UNDAC has field support teams on stand-by especially to be deployed in case of large incidents. As stated in the description of UNOCHA in section 2.2, WFP takes care of all logistics next to the deliverance of food and other immediate relief in crisis areas.

In the area a Humanitarian Staging Area (HSA) was set up by the Government of Nepal (GoN) as well as a National Emergency Operating Centre (NEOC) (UNOCHA, 2015). The UNDAC team arrived on the 30\textsuperscript{th} of April and took over the coordination of the search-and-rescue work from the Dutch USAR team. WFP, following plan, provided the logistics.

Two main airports are operational: Kathmandu and Pokhara. The main roads are accessible. The side roads are damaged and have limited accessibility. Next to the hosting of all (N)GOs in the area, the emergency needs were assessed to be in the following items:

1. Medical teams, supplies and tenting for hospitals, and dead-body bags;
2. Heavy equipment for rubble removal;
3. Helicopters for transport and access to blocked areas.

Five shelter camps are established in areas of the armed police force with water sources. On the 26\textsuperscript{th} of April UNICEF WASH (Water, Sanitation & Hygiene) provided 20 tanks (30,000 litres) that will reach 1500 people in three major camps. Government has been requested but is still unclear on expedited customs clearance for emergency cargo and processes at the airport. Logistics are problematic as well as transportation. There is need of field hospital tents and blankets. Logistic Management Division has made a list of required supplies that are being purchased, but might run out of stock. Next to teams of DFID and USAID, World Health Organization (WHO) health support teams arrive on the 27\textsuperscript{th} of April to support the hospitals.

WFP delivered food for approximately two million people in the Nepal disaster areas up until the end of May 2015. By the end of July 17 temporary health clinics were built, 5900 porters are employed to carry aid goods to areas that are difficult to reach with motorized transport, six helicopters in operation to support for transport of goods and people, 270 village development committees in twelve districts and 120 kilometres of trails reopened (World Food Program, 2015). The timeline for the emergency aid in which the UNOCHA contributed is visualized in figure 31.

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{timeline_unocha_nepal_earthquake.png}
\caption{Timeline UNOCHA Nepal earthquake.}
\end{figure}
3.3.3. Role of Oxfam Novib
Immediately after the earthquake in Nepal, Oxfam reacted with emergency aid. The aid was part of the Dutch Relief Alliance (DRA), which exists of NGOs with a EU Framework Partnership Agreement (FPA). The budget provided by the Dutch government was €4.000.000 (Dutch government, 2015).

Oxfam coordinated the emergency aid of the twelve Dutch relief organizations already in place (Oxfam.org, 2016). A team of Oxfam India immediately was sent to the disaster area for damage assessment and to give emergency aid. From Oxfam Spain five tonnes of water and sanitation goods were sent from a central warehouse. After the initial assessment and deployment the Oxfam teams sent porters to the villages in the areas that were difficult to reach. Also shelter tents were delivered to the camps. All together the organization was able to shelter and provide water and sanitation for more than 30.000 people. In total aid was given to approximately 445.000 people in six months time, existing of 54.000 emergency aid kits and shelter, 50.000 sanitation kits, 8.000 toilets, clean drinking water for 35.000 people; and new seeds and storage for 34.000 farmers. The main issues in the operations were the shortages on fuel and the lack of usable roads for transport of aid goods. The timeline for the emergency aid in which Oxfam Novib contributed is visualized in figure 32.

Figure 32: Timeline Oxfam Novib Nepal earthquake.

3.4. Conclusion incidents selection & description
In this chapter a selection of two incidents is made, after which these two incidents are described including the role of the actors RNLAF, UNOCHA and Oxfam Novib. This answers the third and fourth sub research question:

3. What are the characteristics of incidents of the last fifteen years and which two incidents can be selected as input for a case study?

4. State of the practise: How do the actors, RNLDAF, UNOCHA and Oxfam Novib manage logistics in incidents?

From the description of incident management logistics in chapter two and the role description in the incident description it is clear that the actors operate in a larger conglomerate of organizations. In order to assess the performance of the actors in the cases as described in section 3.2 and 3.3 the performance of the RNLDAF will include the aid contribution of the Dutch USAR team, the UNOCHA performance will include all UN effort and for Oxfam Novib the contribution of Oxfam International will be included. In the next chapter the performance of the actors will be measurement by use of the balanced scorecard.
4. Case study of the earthquakes of Haiti and Nepal & possible improvements for incident management logistics

Chapter 4 presents the case study and possible improvements for incident management logistics as depicted in figure 33 and in more detail in figure 34. Section 4.1 and 4.2 cover the results of the Haiti and the Nepal case by description of the balanced scorecard output, by assessment of the incident management and by assessment of the scorecard usability. Then in section 4.3 the cross-case assessment is described. Section 4.4 describes possible improvements for logistic support of incidents. The chapter ends with a conclusion of the case study and possible improvements for incident management logistics.

There are several methods for testing the usability of the balanced scorecard (Baarda, 2013). Simulation is a way to test systems, especially effective when there is not much data from practice available. For this research however there is data available. Surveys are also possible; by asking the opinion of many experts, insight in the usability of the balanced scorecard could be provided (Sukamolson, 2009). The disadvantage of a survey however is that the value of expert opinions might be questionable for a relatively new subject. Next an option was a field test in which the
balanced scorecard could be tested in an incident that was occurring. Since no large international incidents were taking place, this was not possible. Finally a Benchmark test could have been performed in which existing tools for performance measurement are compared. This was not an option because the balanced scorecard for incident management differs too much from other tools. For the test of the balanced scorecard a case study was chosen because it allows the exploration and understanding of complex issues. It can be considered a robust research method particularly when a holistic, in-depth investigation is required, which is the case for incident management logistics (Zainal, 2007). A case study can be performed in several ways (Yin, 2014). In this research a multiple single case study is performed in which two cases are compared both qualitatively as quantitatively. The advantage of a multiple-case study is that it is more robust since evidence is more compelling. The disadvantage is that a multiple-case study requires more time. Robustness is in this case considered as more important than possible limitations in time since the latter issue can easily be overcome by follow-up research.

4.1. Assessment of the Haiti case

In the case study of the earthquake in Haiti of 2010 the balanced scorecard is put to practice; the data generated by the actors that is described in chapter 3, is used as input for the balanced scorecard. For each perspective of the balanced scorecard the results are stated and an assessment is made of the perspectives, including the KPIs. The calculations that lead to these results are described in detail in appendix VI. In case of lack of data, estimations and assumptions were made to maximise the output. In some cases there was no data available, in which case the assessment of the KPI was not possible. These KPIs are marked with an x in the diagram.

4.1.1. Aid output Haiti case

The output of the balanced scorecard for aid output for the Haiti case is depicted in table 2.

<table>
<thead>
<tr>
<th>amount of help provided (nr people)</th>
<th>RNLDAF</th>
<th>UNOCHA</th>
<th>Oxfam Novib</th>
</tr>
</thead>
<tbody>
<tr>
<td>1805</td>
<td>2110000</td>
<td>35500</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>right product</th>
<th>100%</th>
<th>100%</th>
<th>100%</th>
</tr>
</thead>
<tbody>
<tr>
<td>right amount</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>right place</td>
<td>95%</td>
<td>95%</td>
<td>95%</td>
</tr>
</tbody>
</table>

Amount of help provided: There was sufficient data to assess the amount of aid provided, however it was only possible to roughly estimate the number of people that were helped. It proved difficult because no detailed track is kept on the distribution of aid. This is caused by the lack of logistic information systems and on limited cooperation between aid organizations. The amount of help provided could be increased by increasing the level of cooperation and by keeping track on the distribution of aid. The UN should be the initiator of these improvements; with their mandate and connections they could reach most organizations to improve the amount of help provided.

The amount of aid delivered by the RNLDAF was relatively small compared to the UNOCHA and Oxfam Novib; this is because limited means were available for the Dutch government. This is logical because the aim of the RNLDAF is not specifically focused on bringing aid and budgets are generated after an incident occurs while UNOCHA and Oxfam Novib generate aid as a primary goal. Also it is more important that the Dutch government shows its willingness to help countries in need,
therefore the amount of aid provided is only important for aid organizations as a goal and to check if the goals are achieved.

Data on aid was available from the perspective from the aid organizations only. This is because the opinion of the victims is not taken into account. Experts on humanitarian logistics (S. Wijnhorst) state that the main responsibility is the feedback to the donators. Without this, the number of donations could drop, which means fewer budgets to provide aid; therefore there are no evaluations necessary from the perspective of the victims. Next to this it is hard to make evaluations objective when the interviewees have endured immense suffering and loss. There is however an advantage in taking into consideration the opinion of victims: this could show how well the aid was used in terms of right product/time/location, in other words more information on the quality of aid could be obtained and indications how to improve the aid process.

**Right product:** since the need for aid in large international incidents like in the Haiti case usually is high, the aid delivered in the response phase can almost always be considered as the right product. This is however a assumption; if data could be obtained on this KPI, it would become clear if the assumption is true and if there are chances for improving the aid distribution. Aid organizations should therefore strive to make this data available so they can improve the aid process.

**Right amount of products:** the aid in Haiti was given by many different organizations, which makes it impossible to let all organizations cooperate in the organization of the aid. Therefore this KPI cannot be calculated. Aid organizations should be able to indicate the amount of products that they provided and there should be one overview that captures the contribution of all organizations. As the KPI ‘right product’, information on the right amount of products indicates the quality of the aid. Because there is no data on this KPI in the Haiti case, there is no indication how to improve the aid.

**Right place:** because in the response phase of a large incident the need for aid usually is high in many places, most locations are suitable to bring aid to. This explains the relative high score for this KPI. It could be that the locations that are less easy to reach have a higher need for help, but with this is not assessable with the current data.

### 4.1.2. Organizational capacity Haiti case

The output of the balanced scorecard for organizational capacity for the Haiti case is depicted in table 3.

*Table 3: Organizational capacity Haiti case.*

<table>
<thead>
<tr>
<th>organizational capacity</th>
<th>RNLDADF</th>
<th>UNOCHA</th>
<th>Oxfam Novib</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning &amp; Growth</td>
<td>90%</td>
<td>60%</td>
<td>60%</td>
</tr>
</tbody>
</table>

**Learning and growth:** the RNLDADF have a relative high standard of learning and growth compared to UNOCHA and Oxfam Novib. This may be because the Armed Forces need to operate as effective as possible in order to win battles and survive wars. UNOCHA and Oxfam Novib could learn from the RNLDADF on how to implement learning and growth in their organization. This is possible through improving the cooperation between the organizations, for instance by combined training or by planning meetings on organizational capacity. Also external experts could be hired to improve this KPI for each organization. UNOCHA and Oxfam Novib should initiate this improvement within their own organization.
Furthermore it is assessed that all organizations do not use contingency planning in an optimal way since contingency planning only is used in the response phase of an incident. If contingency planning was used in the mitigation phase of an incident, time could be saved which would benefit the speed of aid, which is one of the most important elements in emergency aid (in the first period the most lives could be saved). This is the responsibility of every organization: to continually strive for improving the organization, its people and processes.

4.1.3. Supply chain performance Haiti case

The output of the balanced scorecard for supply chain performance for the Haiti case is depicted in table 4.

<table>
<thead>
<tr>
<th>supply chain performance</th>
<th>RNLDAF</th>
<th>UNOCHA</th>
<th>Oxfam Novib</th>
</tr>
</thead>
<tbody>
<tr>
<td>responsiveness (avg nr of days)</td>
<td>4.5</td>
<td>2</td>
<td>2.5</td>
</tr>
<tr>
<td>need estimation</td>
<td>95%</td>
<td>95%</td>
<td>95%</td>
</tr>
<tr>
<td>agility</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>flexibility in transport weight</td>
<td>23%</td>
<td>10%</td>
<td>10%</td>
</tr>
<tr>
<td>flexibility in types of aid</td>
<td>10%</td>
<td>100%</td>
<td>60%</td>
</tr>
<tr>
<td>supply chain robustness</td>
<td>80%</td>
<td>70%</td>
<td>70%</td>
</tr>
</tbody>
</table>

Responsiveness: the average lead-time of the RNLDAF is relatively high compared to UNOCHA and Oxfam Novib because the latter two organizations already had units working in Haiti at the time of the earthquake. The long reaction time of the support of the RNLDAF was caused by the late official request for help of the government of Haiti and the UN and slow political decision-making. The rules on when to provide aid should be changed by the Dutch government in order to prevent this sort of delays. This should be implemented by the Dutch Ministry of Foreign Affairs (the organizations that decides on providing aid).

Need estimation: currently organizations do not keep track of the estimated need versus the actual need. Therefore it is not possible to measure the performance of the need estimation. Directly after the incident an assessment is made (by UNDAC amongst others), which is used by other organizations to determine the composition of their support. It is ineffective to repeat this survey regularly, for the amount of damage and personnel deployed for the assessments. It could deliver good insight to have a high quality of need estimation because this would make the emergency aid much more plannable and therefore easier to manage, possibly resulting in more efficiency in the resolution of incidents. UNDAC should initiate this improvement because this organization is the most important organization for aid assessment.

Agility: data on these KPIs was too limited to make an exact indication of the performance; only for the RNLDAF it was possible to calculate the flexibility in weight. It is unknown if the data of UNOCHA was registered. S. Wijnhorst mentioned that the Oxfam data is available, but due to other priorities this data was not provided for by Oxfam Great Britain. For the KPI ‘flexibility in types of aid’ (goods & services) values indicate how larger the organization, the higher the different types of aid goods and services are provided. For the KPI ‘supply chain robustness’ the value of the RNLDAF is higher then for the other organizations. This is because the function of an army differs from other organizations; adaptability is part of the military DNA, for this is one of the most important capabilities of armed forces.
4.1.4. Financial efficiency Haiti case

The output of the balanced scorecard for financial efficiency for the Haiti case is depicted in table 5.

*Table 5: Financial efficiency Haiti case.*

<table>
<thead>
<tr>
<th>financial efficiency</th>
<th>RNLDAF</th>
<th>UNOCHA</th>
<th>Oxfam Novib</th>
</tr>
</thead>
<tbody>
<tr>
<td>distribution costs</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>stock costs</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>handling costs</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>transport costs</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>inventory costs</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>obsolescence costs</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
</tbody>
</table>

For this case no financial data was obtained. There is financial data in the organizations, but it proved to be impossible to obtain. This is assumed not to have to do with willingness of the organization to cooperate with the research or with security reasons, but because financial data currently is not used to measure the efficiency or effectiveness of the organization. This has to do with the state of some of the organizations; the expert of Oxfam Novib mentioned that there is no lack of funding, but the most important issue is to show the donators that their money is spent well. Visibility and accountability are therefore important, but making the operations effective and efficiently is also necessary. Therefore financial data should be included in performance measurement. This is possible by connecting financial information systems with logistical information systems and by changing the organizations strategy.

4.1.5. External process Haiti case

The output of the balanced scorecard for the external process of the Haiti case is depicted in table 6.

*Table 6: External process Haiti case.*

<table>
<thead>
<tr>
<th>external process</th>
<th>RNLDAF</th>
<th>UNOCHA</th>
<th>Oxfam Novib</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connectivity</td>
<td>80%</td>
<td>70%</td>
<td>70%</td>
</tr>
<tr>
<td>Standardization</td>
<td>80%</td>
<td>50%</td>
<td>60%</td>
</tr>
</tbody>
</table>

**Connectivity:** the values on connectivity show that all organizations have a reasonably high level of connectivity, but there is room for improvement. Also noteworthy is the fact that several sources stated that the communication in the overall coordination of the aid in Haiti was poor. The connectivity could be improved by increasing the level of communication with external parties, by implementing support systems that are able to communicate with each other. An example of doing this is by shaping the organizations into network organizations. Again the UN should have a leading role in this development.

**Standardization:** the values on standardization indicate that only the RNLDAF have a high level of standardization; this has to do with the responsibility that exists to accountability to the government.
4.2. Assessment of the Nepal case

In the case study of the earthquake in Nepal of 2015 the balanced scorecard is put to practice; the data generated by the actors and described in chapter 3, is used as input for the balanced scorecard. For each perspective of the balanced scorecard the results are stated, then an assessment is made of the perspectives, including the KPIs. The calculations that lead to these results are described in detail in appendix VI. In case of lack of data, estimations and assumptions were made to maximise the output. In some cases there was no data available, in which case the assessment of the KPI was not possible. These KPIs are marked with an x in the diagram. Since many results are the same as in the Haiti case, only differences are stated.

4.2.1. Aid output Nepal case

The output of the balanced scorecard for aid output for the Nepal case is depicted in table 7.

Table 7: Aid output Nepal case.

<table>
<thead>
<tr>
<th>aid output</th>
<th>RNLDAF</th>
<th>UNOCHA</th>
<th>Oxfam Novib</th>
</tr>
</thead>
<tbody>
<tr>
<td>amount of help provided (nr people)</td>
<td>11500</td>
<td>1078500</td>
<td>37264</td>
</tr>
<tr>
<td>right product</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>right amount</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>right place</td>
<td>95%</td>
<td>95%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Amount of help provided: the total number of people that received aid is smaller than in the Haiti case. This is caused by the fact that the magnitude of the Nepal earthquake was smaller. The amount of help provided by the RNLDAF was considerably larger than in the Haiti case. This is because part of the aid existed of financial aid. Money proves to be a flexible and efficient way of aid since anything can be bought at any given point in time. Money is also non-perishable so it can be used long after the incident occurs.

Right product: money as an aid good has a positive influence on the KPI ‘right product’ since any product that is needed can be bought as long as the product is available on the local market.

4.2.2. Organizational capacity Nepal case

The output of the balanced scorecard for organizational capacity for the Nepal case is depicted in table 8.

Table 8: Organizational capacity Nepal case.

<table>
<thead>
<tr>
<th>organizational capacity</th>
<th>RNLDAF</th>
<th>UNOCHA</th>
<th>Oxfam Novib</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning &amp; Growth</td>
<td>90%</td>
<td>60%</td>
<td>60%</td>
</tr>
</tbody>
</table>

The value of the KPI for learning & growth is for all organizations the same as in the Haiti case.
4.2.3. Supply chain performance Nepal case

The output of the balanced scorecard for supply chain performance for the Nepal case is depicted in table 9.

Table 9: Supply chain performance Nepal case.

<table>
<thead>
<tr>
<th>supply chain performance</th>
<th>RNLDAC</th>
<th>UNOCHA</th>
<th>Oxfam Novib</th>
</tr>
</thead>
<tbody>
<tr>
<td>responsiveness (average nr of days)</td>
<td>1.5</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>need estimation</td>
<td>95%</td>
<td>95%</td>
<td>95%</td>
</tr>
<tr>
<td>agility</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>flexibility in transport weight</td>
<td>4%</td>
<td>0%</td>
<td>10%</td>
</tr>
<tr>
<td>flexibility in types of aid</td>
<td>30%</td>
<td>100%</td>
<td>60%</td>
</tr>
<tr>
<td>supply chain robustness</td>
<td>80%</td>
<td>60%</td>
<td>70%</td>
</tr>
</tbody>
</table>

**Responsiveness:** the average lead-time of all three organizations is low. This could be caused by the fast request of the government of Nepal, but also because the reaction of all organizations was fast. This is a positive development since theory on humanitarian logistics from section 2.3 indicates that fast response results in saving more lives.

**Agility:** the agility was lower than in the case of Haiti because the flexibility in volume of the RNLDAC was smaller. Since there was only data obtained from the RNLDAC, this outcome is assessed as not significant.

**Supply chain robustness:** Since there were a lot of problems with the transport of aid goods on a tactical level, the supply chain robustness of UNOCHA is assessed to be lower then in the Haiti case. This is caused by the type of terrain in combination with lack of the right type of transport means (shortage of helicopters). The supply chain robustness of the other two organizations has the same value as in the Haiti case since both organizations adjusted their plans to the difficult transport situation.

4.2.4. Financial efficiency Nepal case

The output of the balanced scorecard for financial efficiency of the Nepal case is depicted in table 10.

Table 10: Financial efficiency Nepal case.

<table>
<thead>
<tr>
<th>financial efficiency</th>
<th>RNLDAC</th>
<th>UNOCHA</th>
<th>Oxfam Novib</th>
</tr>
</thead>
<tbody>
<tr>
<td>distribution costs</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>stock costs</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>handling costs</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>transport costs</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>inventory costs</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>obsolescence costs</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
</tbody>
</table>

As in the Haiti case for none of the organizations financial data was obtained in the Nepal case, therefore no value can be given for the KPIs on financial efficiency.
4.2.5. External process Nepal case

The output of the balanced scorecard for the external process of the Nepal case is depicted in table 11.

Table 11: External process Nepal case.

<table>
<thead>
<tr>
<th></th>
<th>INLJAF</th>
<th>UNOCHA</th>
<th>Orjim Norb</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connectivity</td>
<td>90%</td>
<td>80%</td>
<td>80%</td>
</tr>
<tr>
<td>Standardization</td>
<td>80%</td>
<td>50%</td>
<td>60%</td>
</tr>
</tbody>
</table>

Connectivity: The connectivity of all actors is higher then in Haiti; this has to do with the increase in cooperation in incident management and because the communication in Nepal was better then in Haiti. The UNDAC team arrived three days after the earthquake, but this was no issue because of the agreements made with the USAR teams on initial leadership; the Dutch USAR team was the first team in place, so they took on the lead in the coordination of the search-and-rescue until the arrival of the UNDAC team. This is an example of the improved cooperation between the actors. This is assessed as a positive development: although there still is much room for improvement this shows that there is a positive attitude towards cooperation with other organizations in order to improve incident management logistics.

4.3. Cross case assessment

As mentioned in section 4.1 the advantage of a multiple-case study is that it is usually more robust since evidence is more compelling. In this section the results of the two cases are therefore compared and described. First several differences in circumstances must be taken into account in order to identify the cause of differences in results of the balanced scorecards. The first difference is the characteristics of the disasters: in the Nepal case the number of fatalities was much smaller then in Haiti. Another difference is the effects of the disasters; in Haiti the climate is much warmer then in Nepal, therefore water and possible outbreaks of diseases were far bigger issues in Haiti then in Nepal. On the other hand the weather in Nepal can be much colder then in Haiti because of the height, therefore shelter was a bigger issue in Nepal then in Haiti (S. Wijnhorst). Between the two cases an increase in political influence in emergency aid is noticed (H. van de Ven). This political influence could impede the aid process. Another change is the increase of the media influence (S. Seen). The effect of this is that some aid organizations focus their aid on the location that has the highest media exposure.

In figure 35 the balanced scorecard is visualized with an indication on how well the KPIs worked in the case study; green for KPIs that function to expectations, orange for KPIs that function but need to be improved and red for KPIs that were impossible to assess. From this overview it can be concluded that the balanced scorecard functions and is usable for aid organizations to gain insight in their logistic performance in incident management. There are however several KPIs that cannot be assessed. The main issue for these KPIs are the availability of data. The aid organizations should put effort in making more data available for assessment of the performance of the aid process. This can be achieved by implementing logistic information systems and by connecting financial information systems to these logistic modules. This will also have a positive effect on the aid output as explained in the next section.
Aid output: In both cases the available of data was limited on the amount of aid provided and the KPIs on right product/time and location. The data quality is sufficient since it contains information for most KPIs. It is however not clear how the data presented by the aid organizations is generated. Although the available data in both cases was about the same, the amount of available data was slightly higher in the Nepal case. There are two possible explanations for this: 1. The Nepal case is more recent then the Haiti case; therefore the amount of electronic data is higher, 2. The change in accountability towards donators has grown; therefore the amount of data is higher. The amount of aid given by the RNLDAF was bigger in Nepal because of the financial aid that was given. The aid output could be improved by increasing the level of cooperation with other aid organizations and by implementing logistic information systems. There is a positive development between the two cases: the level of cooperation has been increased; this can be seen as an incentive for further improvement of incident management logistics.

Organizational capacity: it can be concluded that in both cases the contingency planning can be improved since contingency planning is only used in the response phase of an incident. If contingency planning was used in the mitigation phase of an incident, time could be saved which would benefit the speed of aid, which is one of the most important elements in emergency aid (in the first period the most lives could be saved).

Supply chain performance: the overall responsiveness of the Nepal case was much shorter in the Haiti case. This is an effect of improved cooperation between aid organizations (UNDAC with USAR teams). In Nepal the Oxfam level of planned stocks for emergency aid was higher the in earlier incidents (S. Wijnhorst). Also there is an increase in agreements with external logistic service providers, for instance in the supply of shelters. Unfortunately it was not possible to calculate the
effect of these improvements, because there was no available data on logistics. The supply chain performance could be improved in the same way as the aid output, since through cooperation and logistic information systems the organizations could make the supply chain more effective and efficient by making use of free capacity in the supply chain of the other organizations, for instance in transport means or by dividing the tasks more efficiently.

**Financial efficiency:** in both cases no financial data was obtained since this data is not used for improving the performance of the organization. By connecting financial and logistic information systems, the performance of organizations could be improved: by knowledge of the financial consequences of logistic choices, money can be saved, which can be spent on providing more aid.

**External process:** the connectivity and standardization can be improved in all three organizations, although the RNLDFAF performed slightly better the UNOCHA and Oxfam Novib.

### 4.4. Logistic improvements for incident management logistics

In order to improve incident management logistics, logistic theory was reviewed and experts were interviewed. Together with the output of the case study recommendations can be given. In the current economical situation organizations have been forced to adapt to changes. Due to the economical depression organizations focus on reducing costs while remaining the same level of customer service. This is done in several ways. A well-known way to reduce costs is by implementation of Lean-principles. This generally means cutting of excess (or waste) from the primary process of companies. This means that all activities must be run as short as possible and as efficient as possible. First by value-stream mapping, the primary process of the organization is analysed, after which management decides how to change the process and become more Lean.

Logistics can be improved by increasing the cooperation throughout the supply chain (J. Lund), or as it is also referred to as, the network. This mainly involves improving the connectivity of systems so that information is shared faster and better. By improving the information sharing, decisions can be made faster on how to get the product to the right location and on time via the best route, mode of transport and/or terminal (P. Muller). Also by keeping track of the location of the products in the supply chain makes it easier to manage the supply of goods to the designated area. This can be achieved by the implementation of systems such as Track-and-Trace (T&T) and/or Radio Frequency Identification (RFID). The first system uses barcodes on products, which are scanned each time they are transhipped. The system thus keeps track of the products in the supply chain. RFID works about the same, only for larger containers. On the container a tag is installed, which is read every time it passes through a gate that is installed at the entrance of a terminal.

Network integration is another way to improve the quality and effectivity in the supply chain: by increasing the connectivity between hubs in the network the different elements have an increased interdependency, which on its turn helps streamlining the supply chain. Benchmarking is a method in which organizations improve the cooperation with other organizations that operate in the same field. Hereby the management can learn other methods or systems that can be used in their field so as to improve the performance of the organization.

One of the major issues in the humanitarian field is the competition between organizations (H. van de Ven); every organization exists only by the grace of its donators, whom need to be convinced continually to support the organization (Vermeulen, 2014). This means that ‘showing the flag’ is a major item in bringing aid to areas hit by disaster or any other incident. It could occur that this competition influences the performance or output of the aid given. Here lies an opportunity for
improvement: through improved cooperation, for instance by forming alliances or through the creation of a Memorandum of Understanding (MoU).

Another issue is the humanitarian principles that are becoming less clear (S. Wijnhorst). For example in Syria it appeared strange that the humanitarian aid was funded by the same countries that caused a large part of the damage and problems by taking part in the joint mission against IS. Humanitarian aid is more and more used to win the hearts and minds of the local population according to Price-Jones from Oxfam Novib (Vermeulen, 2014).

In the humanitarian field logistics are perceived as an important factor to improve the overall performance of the aid. Research shows that humanitarian performance can be improved by defining its effects on those affected by crisis and according to core humanitarian principles. Integration of the approach to performance could help to overcome many of the perceived failures of humanitarian assistance (B. Ramalingen, 2009). This research states several possible improvements for the performance of humanitarian assistance:

1. Obtain unity of approach in humanitarian operations; although in 2005 the international development sector has adopted a system-wide performance agenda (the Millennium Development Goals and aid-effectiveness agenda), this is not implemented in the humanitarian sector;
2. The humanitarian has a high degree of interdependence. The increase in number of emergencies and the expectations together with comparatively limited response capacities, effective responses can only come through cooperation. Despite this, policy for reflecting on and improving collective performance within the humanitarian sector remains limited;
3. There is no shared focus in improving the performance of humanitarian aid. Also collection and analysis of data is at most fragmentarily used;
4. The humanitarian system does not include the views and opinions of key stakeholders in their evaluations, especially beneficiaries and affected populations. There is also lack of analysis on how contexts affects and can constrain performance, consideration of organisational capacities, especially in terms of capacity strengthening, partnerships and innovation and finally lack of focus on impact and outcomes.

In integration performance management in the humanitarian sector, the first step should be to integrate and balance the existing variety of concepts and methods.

4.5. Conclusion of the case study & possible improvements for incident management logistics

In chapter 4 the balanced scorecard was tested in a case study of the earthquakes in Haiti in 2010 and in Nepal in 2015. This assessment of this answers the fifth sub research question:

5. How did the actors, RNLDAF, UNOCHA and Oxfam Novib perform in the selected incidents: what went well and what were the problems?

Next possible improvements on incident management logistics were described, which answers the sixth sub research question:

6. What opportunities can be found for improving international logistic incident management?

In conclusion it can be stated that in both cases the balanced scorecard is able to generate insight in the performance of all three actors. The best results are for the KPI ‘amount of help provided’ for the perspective of aid output, the ‘learning and growth’ KPI for organizational capacity, the external
perspective and the KPI ‘responsiveness’ for the supply chain performance perspective. The balanced scorecard can be improved when more data is made available of the logistic processes. This can be achieved by increasing the cooperation among aid organizations and by implementing logistic information systems; the initiator for improvement should be the UN since its mandate and network are best suitable for improving the overall cooperation and aid process. Possibilities for improvement lie in management tools, the implementation of systems and in increasing the level of cooperation between the incident management organizations. An important conclusion is that logistic information systems have a double benefit: information availability and supply chain effectively and efficiency. The assessment of the case study and the possibilities for improving incident management logistics are combined to draw conclusions and make recommendations on incident management logistics and the usability of the balanced scorecard for aid organizations in chapter 5.
5. Conclusion

Visualized in figure 36 and in detail in figure 37 chapter 5 provides a conclusion of this research in section 5.1, existing of an assessment of incident management logistics and an assessment of the balanced scorecard. Section 5.2 provides recommendations for incident management logistics, on the use of the balanced scorecard and for further research.

5.1. Conclusions
The main research question of this research is:

*Which tool can be developed to measure the logistic performance of organizations in incident management and which concepts and measures can be found in order to improve the logistic processes of international incident management?*
In order to be able to answer the main research question several sub-questions were composed; these sub questions are:

1. **What are the current theories of logistic incident management?**

2. **What are the requirements for a logistic performance tool and the indicators in order to measure the logistic performance of actors in the selected incidents?**

3. **What are the characteristics of incidents of the last fifteen years and which two incidents can be selected as input for a case study?**

4. **State of the practise: How do the actors, RNLDAF, UNOCHA and Oxfam Novib manage logistics in incidents?**

5. **How did the actors, RNLDAF, UNOCHA and Oxfam Novib perform in the selected incidents: what went well and what were the problems?**

6. **What opportunities can be found for improving international logistic incident management?**

In chapter 2 a balanced scorecard was developed, based on current theories of logistic incident management and theories on performance measurement, thereby answering sub questions 1 and 2. Next in chapter 3 the earthquakes in Haiti in 2010 and in Nepal in 2015 were selected and described as cases for the case study, including the roles of the RNLDAF, UNOCHA and Oxfam Novib; this answered sub question 3 and 4. In chapter 4 a case study was performed in which the cases from chapter 3 were used as input for the balanced scorecard of chapter 2. The assessment of the results of this case study answered sub question 5. Finally possible improvements for incident management logistics were described in chapter 4, which answered sub question 6. This section provides a final assessment on incident management logistics and how possible improvements can be implemented. It will also provide an assessment of the balanced scorecard as a tool for aid organizations. With these assessments the main research question is answered. Finally recommendations are made on improving incident management logistics, the use of the balanced scorecard for aid organizations and for further research.

**5.1.1. Assessment of incident management logistics**

Since improving incident management logistics is one of the goals of this research, an assessment of incident management logistics describes the possibilities for each perspective of the balanced scorecard.

**Aid output:** The aid output of the three organizations could be improved by implementing the balanced scorecard for incident management logistics, by increasing the level of cooperation with other aid organizations and by implementing logistic information systems. In this way more data can be generated on logistic performance, which shows on what area the performance need be improved. The increase in cooperation makes it possible to make the supply chain more effective and efficient because free capacity can be used more efficiently. Since the level of cooperation already has increased over the last period this is an incentive for further improvement of incident management logistics and to overcome cultural differences between organizations. The implementation should be initiated within the top management of each organization by including logistic management in the management structure. From this level the logistic information systems and logistic cooperation should then be implemented through project management.
Between the two cases an increase in political (H. van de Ven) and media influence (S Seen) in emergency aid was observed, which could impede the aid process. This could be balanced by improving the cooperation and humanitarian agenda settings. This should be initiated and controlled by the UN; because of its organization it is deemed best suited for overall guidance and leadership.

In the Nepal case the aid of RNLDAF proved to have increased compared with the Haiti case due to the use of money as an aid good. Money is a flexible and effective means of aid, which should be used more in incident management to a certain extent, because there will always be a certain need of real aid goods, especially in the response phase of an incident. Each aid organization should therefore determine for itself to which extent money can be used as aid good.

**Organizational capacity:** it is assessed that the contingency planning should be improved in all three organizations. Since contingency planning currently is used only in the response phase of an incident time is lost to solve issues in the supply chain that could have been prevented. If contingency planning is used in the mitigation phase of an incident, time will be saved which benefits the speed of aid, which is one of the most important elements in emergency aid (in the first period the most lives could be saved).

**Supply chain performance:** the overall responsiveness has shortened in the last period. This is an effect of improved cooperation between aid organizations. Also the levels of planned stocks for emergency aid are higher then in earlier incidents and there are more agreements with external logistic service providers. The supply chain performance could be improved by setting through this trend of cooperation. Implementation of logistic information systems in the organizations could make the supply chain more effective and efficient by making use of free capacity in the supply chain of the other organizations.

**Financial efficiency:** in both cases no financial data was obtained since this data is not used for improving the performance of the organization. By connecting financial and logistic information systems, the performance of organizations could be improved: by knowledge of the financial consequences of logistic choices, money can be saved, which can be spent on providing more aid.

**External process:** the connectivity and standardization can be improved in all three organizations, although the RNLDAF performed slightly better the UNOCHA and Oxfam Novib. This could be improved by introducing structural elements for evaluation within each organization. The RNLDAF already have implemented these sorts of elements. This organization could improve the quality of these elements by creating an agenda for learning & growth.

5.1.2. **Assessment of the balanced scorecard**

Concerning the quality and usability of the balanced scorecard, from the case study results it is concluded that the balanced scorecard is able to give a general insight in the performance of organizations in incident management. The quality is sufficient since it contains data for most KPIs. It is however not clear how the data presented by the aid organizations is generated. The actors should be able to increase the quality of incident management logistics by implementing the balanced scorecard in the organization.

The elements that work best are the KPIs ‘amount of help provided’ for the perspective of aid output, the ‘learning and growth’ KPI for organizational capacity, the external perspective and the KPI ‘responsiveness’ for the supply chain performance perspective; these KPIs are quite easy to assess with the current available data and provides a clear overall insight in the overall (logistic) performance of the organizations.
There are however several KPIs that cannot be assessed: the financial efficiency perspective, the ‘right amount’ KPI of the aid output perspective and the KPI ‘supply chain agility.’ The main issue for these KPIs is the availability of data. The aid organizations should put effort in making more data available for assessment of the performance of the aid process. This can be achieved by implementing logistic information systems and by connecting financial information systems to these logistic modules. This will also have a positive effect on the aid output as explained in section 5.1.1. A positive development on this issue is the increase in feedback of the organizations to their donators; in this way more data is made available from the aid process, which is a chance for the organizations to make more data available on incident management logistics.

5.2. Recommendations
The goal of this research is twofold: to make recommendations to improve incident management logistics in practice and to provide a tool for incident management performance measurement. Therefore the recommendations will be given for both goals in section 5.2.1 and 5.2.2, in addition of recommendations for further research in section 5.2.3. Figure 38 shows all recommendations with a suggestion in which phase of incident management to implement. Additional research is not connected to a specific phase, therefore not linked to a phase in the overview.

5.2.1. Recommendations for incident management logistics
There are several recommendations in order to improve incident management logistics in practice. The recommendations are stated per balanced scorecard perspective including proposal for implementation and prioritization.

**Aid output:** it is recommended for RNLDAF, UNOCHA and Oxfam Novib to implement the balanced scorecard. By keeping track on performance and by connecting performance with the goals, strategy and vision of the organization the aid output can be improved. Implementation should be executed in the mitigation phase of an incident for it to work during operations. In integration performance management in the humanitarian sector, the first step should be to integrate and balance the existing variety of concepts and methods.

Next all three organizations are recommended to increase the level of cooperation with other aid organizations and by implementing logistic information systems. In this way more data will be generated on logistic performance, which shows what areas need to be improved. The increase in cooperation makes it possible to make the supply chain more effective and efficient because free capacity can be used more efficiently. This will also reduce the effect of influence of politics and
media. It is recommended to initiate the implementation within the top management of each organization by including logistic management in the management structure. From this level the logistic information systems and logistic cooperation should then be implemented through project management. The UN is recommended to take the overall lead in increasing cooperation; through its network and mandate this organization has the right position to impose changes in aid. Priority should be given to incorporating logistic management in the top management of aid organizations. This way knowledge and experience in logistics is added to the management, which makes it possible to make the right choices on logistics. The second priority should be given to the implementation of the balanced scorecard and of logistic information systems in combination with increasing cooperation with other aid organizations since this will have the biggest impact on improving the performance.

It is recommended to intensify financing the need; by using money as an aid good, the aid process will be more effective and efficient. Each aid organization should therefore determine for itself to which extent money can be used as aid good.

**Organizational capacity:** it is recommended that contingency planning should be improved in all three organizations (RNLDFAF, UNOCHA and Oxfam Novib). This will save time and benefits the speed of aid, which is one of the most important elements in emergency aid (in the first period the most lives could be saved).

**Supply chain performance:** the case study showed that the supply chain performance has improved (decrease of the overall responsiveness, improved cooperation and higher levels of planned stocks). It is recommended to set through this trend. Implementation of logistic information systems in the organizations could make the supply chain more effective and efficient by making use of free capacity in the supply chain of the other organizations. By improving the information sharing, decisions can be made faster on how to get the product to the right location and on time via the best route, mode of transport and/or terminal. By keeping track of the products in the supply chain management of the supply of goods to the designated area can be improved. This can be achieved by the implementation of systems such as Track-and-Trace (T&T) and/or Radio Frequency Identification (RFID). Supply chain integration can also reduce the issue of ‘showing the flag’ mentioned by the experts (appendix I: interviews) by agreements on the coordination and leadership in the management of incidents. Unity of approach is essential to improve the overall performance of aid.

Concerning the assessments of the need in incidents it is recommended to regularly adjust the need, but also to keep track of the distribution of aid goods and follow up of financing the build-up. This should provide for an improvement in the accuracy of the need assessment, and of the efficiency of the aid that was provided.

**Financial efficiency:** it is recommended to connect financial and logistic information systems. The performance of organizations could be improved in this way: by knowledge of the financial consequences of logistic choices, money can be saved, which can be spent on providing more aid. Connecting the financial and logistic information systems is only possible after financial and logistic information systems are implemented.

**External process:** it is recommended to improve the connectivity and standardization in all three organizations. This should be improved by introducing structural elements for evaluation within each organization and by creating an agenda for learning & growth. This recommendation should be
implemented along the development of the increased cooperation by making agreements on how the organizations cooperate.

5.2.2. Recommendations for use of the balanced scorecard
From the balanced scorecard assessment several recommendations are deducted.

**Data quality:** concerning the quality and usability, the balanced scorecard is able to provide insight in the performance of organizations in incident management. The quality is sufficient since it contains data for most KPIs. It is however not clear how the data presented by the aid organizations is generated. It is recommended to check how this data is generated. This could provide leads for improving the quality of the data and make additional data available.

**Data quantity:** Several KPIs could not be assessed because of lack of data. The aid organizations are recommended to put effort in making more data available for assessment of the performance of the aid process. This can be achieved by implementing logistic information systems and by connecting financial information systems to these logistic modules. This will also have a positive effect on the aid output as explained in section 5.2.1. The increase in feedback of the organizations to their donators is a chance for the organizations to make more data available on incident management logistics.

5.2.3. Recommendations for further research
This research contains the construction and testing of a balanced scorecard to measure the logistic performance of organizations in incident management. Although a positive result is achieved, further research is recommended on several subjects because incident management is a relatively uncharted field of expertise.

**Need assessment:** directly after the arrival of aid organizations at the site of an incident, an assessment is made on the needs in the area hit by the incident. The quality of this need assessment has not been examined. Also it is not clear how the work is divided between different aid organizations, therefore it is recommended to do further research on this subject.

**In depth research:** Since this research focused on a broad perspective of incident management, three aid organizations were involved. This way it was not possible to conduct an in-depth research a specific organization. It is recommended to conduct in-depth research for aid organizations. This can provide knowledge how to further improve incident management logistics.

Research on long-term incidents: due to the limitations in this research, it was impossible to assess the use of the balanced scorecard for long-term incidents. It is recommended to conduct research on the usability of the balanced scorecard for long-term incidents.
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Abbreviations

GO: Governmental Organisation
NGO: Non-Governmental Organisation
RNLDAF: Royal Netherlands Armed Forces
UNOCHA: United Nations Office for Coordination of Humanitarian Affairs
POE: Point of Embarkation
POD: Point of Disembarkation
AOR: Area Of Operations
LOC: Line Of Communication
FEMA: Federal Emergency Management Agency
MSF: Médecins Sans Frontiers
JIT: Just In Time
IT: Information Technology
DRP: Distribution Resource Planning
T&T: Track-and-Trace
EDI: Electronic Data Interchange
RFID: Radio Frequency Identification
EOQ: Economic Order Quantity
HCLP: Humanitarian Common Logistic Picture
UNHRD: United Nations Humanitarian Response Depot
CBA: Cost Benefit Analysis
MCA: Multi Criteria Analysis
SCOR: Supply Chain Operations Reference
KPI: Key Performance Indicator
USAR: Urban Search And Rescue
MoFA: Ministry of Foreign Affairs
MoD: Ministry of Defence
NDGD: Non-Dangerous-Goods declaration
UNDAC: United Nations Disaster Assessment & Coordination
SCOT: Snel inzetbaar Consulair Operationeel Team
WFP: World Food Program
HAS: Humanitarian Staging Area
GoN: Government of Nepal
NEOC: National Emergency Operating Centre
WASH: Water, Sanitation & Hygiene
WHO: World Health Organization
DRA: Dutch Relief Alliance
EU: European Union
FPA: Framework Partnership Agreement
Appendix I: Interviews

For the benefit of the research several interviews were conducted with representatives of the organizations involved in this research. The interviews contributed to the methodology, the incident selection, the content of the balanced scorecard and the possible improvements in incident management logistics mentioned in section 3.6.

Interview Ltcol J.W. van de Ven
Date of interview: 12-01-2016

Ltcol van de Ven is Deputy Commander of the Movement Coordination Cell Europe (MCCE) and also works for the United Nations in the assessment of humanitarian aid. As such he is highly experienced in humanitarian work as a soldier as well as a civilian. For example Ltcol van de Ven was the logistic commander of the MH-17 recovery mission in the Ukraine in 2014. For his experience concerning humanitarian logistics, Ltcol van de Ven is consulted as a subject matter expert.

First Ltcol van de Ven described the way the NLDAF take part in incident management. This fits with the description that is stated in the actor analysis: within the Dutch government the Ministry of Foreign Affairs decides upon participation in humanitarian aid. The Ministry of Defence is usually the party that executes the plan. Next he describes how the international support of humanitarian aid is organized. He suggests including UNOCHA in the research for their coordinating role in the work field.

Next a number of possible cases are discussed and selection elements on how to obtain the best cases for the case study that is to be performed in the research. The MH-17 mission is suggested not to be taken up for the case study since it largely only involved two actors that bi-laterally took care of the logistics (only Dutch materiel and equipment was used). The following selection elements were discussed:

– Length of the mission: missions that last longer are more difficult to analyse given the amount of data and actors. Also the logistic framework is different compared with shorter missions (up to one year);
– Actors involved: the actors involved in this research should have taken part in the missions chosen for the case study. Also the other organizations should be able to provide data. Without the data research is not possible.

As possible cases Ltcol van de Ven mentions the tsunami in the Philippines in 2014, the earthquake in Nepal in 2015 and in Haiti in 2010 and the hurricane Katrina in 2005.

There are several major issues in humanitarian logistics as stated by the Commander:

1. The number of actors and organizations involved in the work field: the number of aid organizations is growing, which causes a major issue in coordinating the right relief goods and facilitating all organizations in the area hit by disaster. It proves to be impossible to reach all organizations. This has a negative influence on the logistic support of humanitarian aid;
2. The involvement of governments is growing: with this humanitarian aid becomes more and more political. ‘Showing the flag’ is becoming an important factor in the emergency aid. This has a negative influence on the effectivity of humanitarian operations since areas where most journalists operate become more important than the areas where help is needed most. Also coordination becomes more difficult because the authority is not always accepted.
The feedback of is that the balanced scorecard is a tool that could improve incident management logistics for the RNLDAD, but several KPIs will not be used, namely the financial efficiency, because the organization is foremost structured for internal logistics.

**Interview J. Seen**  
Date of interview: 05-04-16

Mister J. Seen is a member of the United Nations Disaster Assessment and Coordination (UNDAC), which is part of the international emergency response system. UNDAC is active in the response phase of an emergency. In this phase they focus on assessment, coordination and information management.

Mister Seen explains how the different organizations cooperate when an incident occurs. UNOCHA is in charge, but they delegate tasks to different organizations in a cluster system as is explained in section 2.2. He indicates the role of the organization of logistics that is placed at the World Food Program (WFP). So for this research purpose it would be best to involve WFP since they should be able to produce sufficient data for the case study.

During the interview mister Seen suggests to take any of the following incidents as cases:

1. The earthquake in Nepal in 2015;
2. The typhoon Haiyan in the Philippines in 2014;
3. The earthquake in Haiti in 2010;
4. The hurricane Katrina in 2005 in the USA;
5. The tsunami in Japan in 2011.

As possible improvements in incident logistics mister Seen states the difficulties in incorporating all the new organizations under the authority of UNOCHA. Furthermore he endorses the issue of ‘showing the flag’ as stated by Ltcol van de Ven. He gives examples of situations where this problem occurred, such as during the typhoon in the Philippines in 2014 where a lot of relief organizations wanted to operate in the vicinity of the location of the international media in the area.

**Interview J.H. Lund**  
Date of interview: 12-04-16

Jesper Lund is part of UNOCHA, section chief of a Field Coordination Support Section and secretary of the INSARAG emergency service branch. In his work he cooperates with the UNDAC teams and manages the USAR team. This is managed by guidelines, training and exercises within a regional structure. Operational partners are facilitation support.

Considering possible KPIs for the balanced scorecard and data he suggests that mission reports and evaluations should provide basic (logistic) information of incidents. KPIs could be: uncertainty and need assessment. Currently the organizations are trying to set up a Common Operational Picture. This will show the daily situation of an incident. In case of an emergency a strategic response plan comes in action (objective, who, what, costs).

Possible improvements to the aid process could be in any of the following subjects:

1. Getting rid of irrelevant aid goods;
2. Use of airspace capacity;
3. Reducing customs by agreements;
4. Increase logistic focus in distribution of aid in POD (no logistic authority).
Interview P. Muller  
Date of interview 12-04-16

Peter Muller also works for UNOCHA. He is interviewed because of his previous work concerning humanitarian logistics. He takes part in a taskforce for improving logistics.

He suggests that the aid process could be improved by the implementation of logistic information systems. Currently there are some strategic stockpiles in place spread out over the world.

He also suggests contacting associates of WFP, since they take care of logistics for the UN in case of incidents.

Interview S. Wijnhorst  
Date of interview: 18-04-16

Sanne Wijnhorst is a logistic specialist of Oxfam Novib. He explains how Oxfam Novib operates in the confederacy of Oxfam: when an incident occurs, organizations decide how to address the incident and which unit will carry out the aid operations. He explains which unit organized the aid in Haiti and Nepal. Logistics are managed by a combination of prepared procedures and stocks and support initiated after an incident occurs. The need assessment of the UN is used to decide what aid to send.

Next he explains some of the issues in aid operations: in Nepal the need for shelter was high. Oxfam had a contract with a company in Pakistan to make tents. The government of Pakistan withdrew the permission for the tents to be moved across the border to Nepal because they assessed the need in their own country to be more important. This way Oxfam had to find alternative very fast to be of aid to the people in Nepal. Another issue is the low level of integration of supply chain management in the organization and the lack of logistic information systems. The increase in political influence is also mentioned; this means more donations, but also more evaluation responsibility.

There are possibilities in improving incident management logistics through increased cooperation, for instance in the Netherlands initiative of samenwerkende hulporganisaties.

The feedback on the usability of the balanced scorecard is that the tool could help Oxfam into improving the logistics in incident management. A prerequisite is however that the tool is used in the proper way.
Appendix II: Incident management supply chain elements

Terminals
All distribution networks exist of links and nodes or hubs. Basic insight in the network is important to be able to measure the performance of the organizations using it. Hubs are referred to as terminals that can be defined as facilities were loading / unloading, sorting and storage of transported commodities is taking place in order to efficiently utilize the transportation means; to reduce transportation costs by merging shipments (S. Papadimitriou, 2004). There are different sorts of terminals: ports, airports and train stations; all may be permanent or temporary.

Figure 39 shows the place and function of the terminal in the supply chain in a simplified form. Instead of inefficient transport from all origins directly to all destinations, commodities are transported to the terminal first where the goods are sorted, regrouped and transported to the destinations.

For terminals to function to an optimal level several issues will have to be taken into consideration. Transport to and from the terminals has to be adapted to the distance they travel; large trucks (with large product volumes) for long distances and smaller trucks for regional distances. The extra hub in the supply chain takes up some time, which will have to be taken into account for the traveltime. His does not necessarily have to be of negative influence as long as it is noticed. It can even have a positive effect because longer travel times mean that in the destination location deliveries arrive more spread through time. This means that there are less peaks in activity for which less personnel are necessary (so less costs in human resources). A negative effect that has to be considered is that the extra hub means an increase in damaged goods to a certain extend.

Roughly there are three different sorts of terminals (S. Papadimitriou, 2004). The first type is the independent terminal station (ITS) as visualized as the first part in figure 28. This terminal serves the entire supply chain, for this reason the productivity is high and the concentration of goods is high. The second type is the single level multiple terminal stations (SMTS), as depicted in the middle of figure 28. The total service area is split up into several areas, each with a terminal station that has its own collection and distribution points in the local area. Between the terminal stations a long distance connection exists. This form offers a higher customer service level since there are more terminals thus the distance to the customer is smaller. The productivity and concentration of goods per terminal are smaller than with the single terminal. Also the inventory costs are higher than in the case of a single terminal.
The third type of terminal, on the right side of figure 40, is the hierarchical multiple terminal stations (HMTS). In this situation there are different levels amongst the terminals, the collection and distribution points (CDP) and the transhipment stations (TS). The CDPs (lower level terminal) are the connection with the customer and can be connected with multiple transhipment stations. The transhipment stations only serve the line-haul transportation with other transhipment stations and form the higher-level terminal in the hierarchy. The installation costs are higher than the SMTS, but the transportation costs are lower through the number of CDPs. This form is used for instance when the goods are relatively small like in a parcel service in combination with longer distances.

The terminals used for military operations are the same terminals as are used in regular business logistics. The type of terminal that is used depends on the situation. In short-term engagements usually regular airports or military airports are used. The difference is since the Area of Operation (AOO) usually is unsafe, the military provide for their own security by employing forces specifically for this task. In case of longer engagements usually also other terminals such as ports and even train stations can be used to support the units. Personnel transport is almost always executed via air transport. Road transport is mostly used for the last mile to the army bases in the area.

For humanitarian operations it is important to have a short reaction time and to deliver support as fast as possible since in the first couple of days the need for support is most urgent: in case of natural disasters a lot of victims need to be rescued from flooded areas, or from underneath debris in case of an earthquake. For this reason aid organizations almost exclusively use airports as the point of disembarkation (POD) for delivering support in the response phase. For this both permanent and temporary terminals are used; the preference lies with permanent terminals since in these hubs all necessary functions are already in place, which saves time that can be spent on delivering aid.

**Transportation**

Transport through the supply chain of incident management is vital to translocate the necessary means to the location of demand/need. The distances between the links in the distribution network are covered by transportation. Transportation provides for the translocation of goods in the supply chain. Transportation exists of three components (Kasilingam, 1998), of which the first category are facilities from the user such as the terminals discussed in the section above, and common facilities such as roads, bridges, rail tracks and waterways. The second category is transportation equipment like trucks, trains, ships and aircrafts, but also handling equipment such as forklift trucks and containers. The third category is people necessary to make transportation happen, such as drivers, maintenance and logistic managers.
Organizations have different options to address transportation: to use private transportation means, make use of common carriers or making use of a freight forwarder (takes care of other functions next to transportation such as consolidation). Next to who executes the task of transportation there are different option for modes: air, rail, sea (waterways) and road. Each mode has its strong points and its weaknesses, which are summarized in figure 41.

<table>
<thead>
<tr>
<th>Type of Transport</th>
<th>Air</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Although air transportation is considered as expensive, it offers long-distance transportation in short time periods.</td>
</tr>
<tr>
<td></td>
<td>Air transportation depends heavily on weather conditions and delays schedule deviations may occur.</td>
</tr>
<tr>
<td></td>
<td>Sea Transportation offers the ability to carry large quantities of commodities (000 tones) using specialized cargo ships.</td>
</tr>
<tr>
<td></td>
<td>Sea Transportation offers low flexibility in determining routes and schedules.</td>
</tr>
<tr>
<td></td>
<td>Rail transportation is considered as a slow transport mode.</td>
</tr>
<tr>
<td></td>
<td>Many stops in local areas can be made in order to load / unload commodities.</td>
</tr>
<tr>
<td></td>
<td>Road</td>
</tr>
<tr>
<td></td>
<td>Offers lower capacity and quantity capabilities in comparison with rail transportation</td>
</tr>
<tr>
<td></td>
<td>Advantage of road transportation is the ability to offer door-to-door services and the existence of many different and specialized vehicles</td>
</tr>
<tr>
<td></td>
<td>Weather conditions do not influence rail operations.</td>
</tr>
</tbody>
</table>

Figure 41: The strengths and weaknesses of transportation modes (H. Ballou, 2004).

In most cases it is not possible to transport commodities via one single transportation mode, since geographical hindrances are in the way such as oceans or mountains. Other reasons for making use of more than one mode exist, for example lower cost can be achieved or higher level of customer service. There are several ways to accomplish this:

1. Multimodal transport: at least two transport modes are being used;
2. Intermodal transport: making use of one load unit and two or more modes;
3. Combined transport: intermodal transport where one mode is used the major share of the travel distance.

The last element that can have an impact on the quality of transport is the type of storage unit for goods. Depending on the type of storage unit or load unit the transportation costs is affected, are the goods susceptible to damaging and affects handling efficiency. Selection depends on the characteristics of the goods, the ability to stack and specific requirements for transport (such as the necessity of cooling the goods). The most important types of storage and loading units are (box) pallets and containers. International agreements have made transportation a lot more efficient throughout time.

Military transport initially involves military means, especially in the AOO, since these means are robust enough to handle any type of terrain and have adequate protection against possible damage due to enemy engagement. The means are also accustomed to the situation. So in case of a non-hostile environment for instance tanks are not used, since this might have a negative, too aggressive, impact on the population. Military means have the same capabilities as civilian means concerning issues such as load capacity. When there is insufficient military capacity, civilian means are used, usually via temporary contracts. Still these civilian means have to meet specific requirements in terms of safety, for instance all airplanes are required to have installed self-protection means (flares), so as to guarantee some degree of safety of personnel.
Since the means for strategic transport are scarce, especially in strategic air transport, countries make use of these means in a shared strategic airlift wing. This trend has been growing steadily in the last decade, mostly to minimise the effect of the limitations and cutbacks in budget. As mentioned in the section on terminals humanitarian operations almost solely make use of transport by air, especially in the response phase of an incident. For the last mile transport usually resorts to road transport with trucks or, when the distance or quality of the road does not permit road transport and if the means are provided, helicopters are used for the delivery of aid goods and search-and-rescue teams and to evacuate victims.

Supply chain activities
In order to make the supply chain function, numerous activities are executed along the chain. These activities concern two main types, namely core-activities and support activities. The core activities are customer service, transportation, inventory management and information management (ordering). These activities take place in every supply chain and contribute most to the logistic costs or are essential for the effective execution of the logistic task. The supporting activities support the core-activities and can consist of one or more of the following activities (H. Ballou, 2004), as visualized in figure 42:

1. Warehousing (determination of space, location and lay-out of the stocks);
2. Material handling (choice of material handling equipment, procedures for order-picking and storage);
3. Purchasing (choice of supplier, frequency of ordering and order quantities);
4. Protective packaging (for handling and storage in order to protect the product);
5. Cooperation within the supply chain in production or operations (indicate quantities);
6. Data management (collection, storage, analysis and control).

The activities in military logistics are not that different from business logistics. Next to the different goal of logistics as described in the section on definitions, it mainly concerns different security environment for which measures will always have to be taken. Just as in humanitarian logistics, uncertainty is a factor to be taken into account; responsiveness is also a key factor. Usually the campaign/operation leadership is active in the AOO. Logistics is an integrated part of the mission command. This will be shown in the example of military logistics in the section on strategy.

Figure 42: Key logistic components (A. Rushton, 2010).
Just as in military logistics, the activities in humanitarian operations are the same as in business logistics. The differences lie in the goal of the logistic operation; profit is not of interest, but to provide for basic needs in life is the main goal: food, shelter and protection. Next to these, there are differences that influence the way logistics are organized. In the first place there is always a large uncertainty concerning humanitarian incidents. It is impossible to predict when and where the next incident will occur and what the circumstances will be when a disaster occurs. This makes planning very difficult on the kind of products needed, stock levels and network layout. The second difference is the decoupling of financial and materiel flows; it is difficult to predict the demand for aid. Adding to this problem is the fact that relief organizations have to serve two different customers, namely the people directly suffering from the incident and the government of the area that was hit by the disaster. The third difference is the problem of damaged or destroyed infrastructures. It is not possible to foresee the damage that was done to the infrastructure, so deciding what transport means are best is impossible. Finally the price of failure in incidents can be unnecessary loss of life or prolonged suffering, which is immeasurably greater the price of reduced profits (P.C. Tatham, 2014).

Next to the design of the logistic network it is also important to determine the optimal form of the distribution network. There are a number of different ways to get the product from the manufacturer to the customer (A. Rushton, 2010), these main supply chain structures are:

1. Manufacturer direct to retailer: usually this is in order when perishable goods and food are the product;
2. Manufacturer to retailer via manufacturer distribution centres: Central Distribution Centres (CDC) or Decentral Distribution Centres (DDC) are used for instance in the motor industry. This type of distribution has become less used the last decades because of the relative high costs involved;
3. Manufacturer to retailer via retail distribution centres: this works the same way as in the use of manufacturer distribution centres, with the difference that the consolidation point (official transfer of ownership of the goods, including the responsibilities) lies at the entrance of the beginning of the retailers distribution centre instead of at the end of the manufacturers distribution network;
4. Manufacturer via wholesaler to retailer: this works the same way as the manufacturer via distribution centres to retailer, only with the wholesaler as intermediary.
5. Manufacturer via third party distribution to retailer: the use of third party logistics is a way to reduce costs in the supplychain since these specialized organizations usually can offer lower prices then the costs of other ways of distribution. For this reason this structure is increasingly popular the last decade;
6. Manufacturer via small parcel service to retailer: this structure uses specialized organization for distribution of small parcels. In this way the product can travel very fast, the so-called next-day delivery (UPS, Fedex);
7. Manufacturer via broker to retailer: the broker has the same role as a wholesaler, but is more interested in the marketing aspects of the product instead if the distribution, which can even be outsourced to a third party;
8. Manufacturer directly to customer: there are several ways to bypass the retailer. This is mostly done to reduce costs or speed. This can also used when the customer is large enough to bypass the retailers. There are several ways to bypass the retailer:
   a. Mail order: this is another increasingly popular structure to distribute products since it is reasonably affordable for the customers and fast;
   b. Factory direct to home: this is possible when it concerns a one-time production;
c. Internet and shopping from home: this works almost the same way as mail ordering, only the orders are placed directly on a website. This has the same benefits as mail ordering, so also very popular;  

d. Factory-to-factory / business-to-business: this includes the movement of all industrial products. The structure of distribution depends on the type of product and the arrangement of the companies involved. This means that some of the above-mentioned structures, such as third party logistics, are also used.

Logistic decision-making mainly concerns choices between alternatives and the consequences of these choices, the so-called trade-offs since the choice for one alternative might have a negative effect on other elements in the supply chain. For example the choice for several warehouses reduces the responsiveness in demand, but increases the costs for storage. There are four levels of trade-offs (A. Rushton, 2010):

1. Within distribution components: all choices affecting the same distribution components;
2. Between distribution components: choices for one component affects other components;
3. Between company functions: choices within one company function have an effect on other functions in the company;
4. Between the company and external organizations: the choice within the supply chain of one company affects other organizations.

Desert storm

A good example of what logistics can mean for obtaining the military objectives was shown in the Golf War (W.G. Pagonis, 1992). In this war the United States liberated Kuwait and defeated Iraq. In order to deal with the Iraqi defence forces, which were deployed in Kuwait and at the border of Saudi-Arabia, General Swartzkopf decided upon the following strategy: the first objective was to prevent Iraqi troops to invade Saudi-Arabia. By the fast application of strategic mobility this was prevented. This was made possible by engaging the civilian air reserve fleet and the military reserve sealift fleet in transporting all personnel and equipment to the Gulf region with which more then 400.000 tonnes of ammunition was transported. Next to this local airports and docks were used to facilitate this fleet. The Reception, staging, onward movement and integration (RSOI) of all units could only be made possible by the use of Host Nation Support; Saudi-Arabia provided for the forces basic needs. For the transport in Saudi-Arabia itself all available trucks were contracted and used. The concept of operations and the scheme of manoeuvre General Schwarzkopf planned first to blind the enemy with an air campaign, followed by convincing the Iraqis into believing that the attack would come from the Persian Gulf with an amphibious launch. Then by outflanking the Iraqi forces he would cut off and destroy the main threat, which was the Iraqi Republican Guard Forces. This concept of operations is visualized in figure 43.

The strategy of General Swartzkopf relied heavily upon logistics: first a logistic build-up of stocks as preparation for the phases to come. This was made possible by the introduction of the one-stop logistical command responsibility, a way to integrate logistics in the top management of the operation. Just in time management (JIT) was used in order to keep the mobility as high as possible. The most important observations pointed out the need for a sound organizational and command structure, sufficient means of transport, communication and handling equipment.
At the operational level logistics focussed on the military objectives, conditioned by limitations in time and space and on the need to first deter the enemy before fighting them. The first part of the operation, the deterrence, the logistic footprint was built up further into preparing for the next phase, the offensive. Since the second phase was based on misleading the enemy, the logistic preparations for this phase were not to be noticed by anyone so not to give the enemy notice of the commander’s intent. Next to the already daunting task of moving the huge amounts of mostly ammunition and fuel, this made the logistic operation formidable and almost impossible.

The final logistic plan was as follows: a 21-day plan into pushing forward plentiful amounts of supplies to two forward logistic bases. This was carried out almost completely with trucks via one single route in a non-stop flow for 18 days. Also two army corps was to reposition in this timeframe. Finally not all materiel was completely suited for desert warfare, for which reason a lot of vehicles needed to be repainted and some weapon systems (Abram M1 tanks) needed to be replaced for newer types with improved weapon range and protection against chemical warfare. To reach all this mobility was key; high combat system readiness, practice of fully integrated maintenance and distribution and integrated supplychain management made this possible. To maintain mobility the supplies of ammunition remained on wheels until delivered on the right moment and location (Just-In-Time management) at the tactical unit. So as not to delay the operational pace planned forward logistic bases were used only as transfer points for supplies and refuelling vehicles.

An important factor in integrating and improving the logistic command was the introduction of the one-stop logistical command responsibility. In this way command for plans and operations were centralized, while the execution was decentralized. Communication was executed through the most modern types of ICT systems. Also daily reporting on the logistic situation (via logsitreps) provided command with the right amount of information in leading and controlling the logistic operation. These elements added to the unity and concentration of effort.

Logistics were the main element in the reserves in the operation. Units that were engaged and worn in battle, were rearmed, refuelled and reenergized so as to act as future fighting power. Logistics provided for these planned reconstitutions of units throughout the entire campaign. Finally the redeployment of troops was mostly made possible by the use of reserve troops.
Finally the main observations made in the logistic support of Dessert Storm were as follows (W.G. Pagonis, 1992):

1. Lift capacity and mobility in operations are key to success;
2. Support in vehicles is critical for success;
3. Host nation support was critical in the campaign;
4. Operational planning at a centralized level made it possible to facilitate sufficient level of service;
5. Contractor support and deployment of military department civilians made up the bulk of the logistic support;
6. The use of theatre army area command structure and single logistic command were applied successful;
7. There was a lack of materiel handling equipment;
8. Convoy support centres need to be added to military doctrine;
9. Infrastructure planning (resource management, contract support and host nation capabilities) should be part of theatre fast forward-deployment capability;
10. Logistic notice to move capacity should be present to prepare any future mission;
11. Allied logistic efforts should be fully integrated in operational logistics;
12. The ‘total force’ concept (national guard and national army reserve units) works.
Appendix III: KPI overview

In measuring the performance of organizations there are many different KPIs that can be used. In table 12 a general overview list is provided with possible KPIs. The KPIs that are used for the measurement of logistic performance are explained in section 3.7.

Table 12: general KPI overview (E. Krauth).

<table>
<thead>
<tr>
<th>Internal perspective – management point of view</th>
<th>Effectiveness</th>
<th>Efficiency</th>
<th>Satisfaction</th>
<th>IT and innovation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revenues</td>
<td>Total nr of orders, Nr of customers, Nr of new customers</td>
<td>Total distribution costs, Labour utilization, Overhead percentage, Overtime hours, % absent employees, Salaries &amp; benefits, Controllable expenses, Non-controllable expenses, Customer service costs, Order management costs, Inventories, Nr of trucks in use, Total delivery costs</td>
<td>Attrition of drivers, Personnel moral, On-time delivery performance, Nr of customers complaints, Overall customer satisfaction, % orders scheduled-request</td>
<td>Information system costs, Up-to-date performance, Information availability, Utilization of IT equipment, IT training costs, Nr of new products, % IT info exchange, % employees with IT training, Availability of IT equipment, % IT assets used, % of invoices through EDI, avg. time for new product, avg. costs for new product</td>
</tr>
<tr>
<td>Profit margins</td>
<td></td>
<td>Average fuel use per km, Avg delivery re-planning time, Marketing costs, Failure costs, Prevention costs, Appraisal/inspection costs, % of failed orders, Performance measure costs, Human resource costs, Variable asset costs, Fixed asset costs, Information system costs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capacity utilization</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Km per day</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Labour productivity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Price</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Turnover per km</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nr of deliveries</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Benefit per delivery</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trips per period</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perfect order fulfilment</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Total delivery costs                          |                                                                               |                                                                               |                                                                               |                                                                                  |
| Satisfaction                                  |                                                                               |                                                                               |                                                                               |                                                                                  |
| Attrition of drivers                          | Nr of customers complaints, Overall customer satisfaction, % orders scheduled-request |                                                                               |                                                                               |                                                                                  |
| Personnel moral                               |                                                                               |                                                                               |                                                                               |                                                                                  |
| On-time delivery performance                  |                                                                               |                                                                               |                                                                               |                                                                                  |

| IT and innovation                             |                                                                               |                                                                               |                                                                               |                                                                                  |

| Internal perspective – employees point of view |                                                                                 |                                                                                 |                                                                                 |                                                                                  |
| Km p. trip                                    | Weight to load p. labour hour, Salaries and benefits                            |                                                                               |                                                                                 |                                                                                  |
| Working conditions                            |                                                                               |                                                                               |                                                                                 |                                                                                  |

| Transportation price                          | Transparency, Service variety                                                  |                                                                               |                                                                                 |                                                                                  |

| External perspective – customers point of view |                                                                                 |                                                                                 |                                                                                 |                                                                                  |

| Transportation price                          | Transparency, Service variety                                                  |                                                                               |                                                                                 |                                                                                  |

<p>| 86 |</p>
<table>
<thead>
<tr>
<th>Insurance price</th>
<th>Types of communication</th>
<th>Order configuration flexibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary service price</td>
<td>Types of goods insurance</td>
<td>Possibility to change orders</td>
</tr>
<tr>
<td>Goods safety</td>
<td>Order size flexibility</td>
<td>Additional service price</td>
</tr>
<tr>
<td>Product variety</td>
<td>Timelines of goods delivery</td>
<td>Nr of contact points</td>
</tr>
<tr>
<td>Response time</td>
<td>Order configuration flexibility</td>
<td></td>
</tr>
</tbody>
</table>

**External perspective – Society’s point of view**

<table>
<thead>
<tr>
<th>Level of CO2 emission</th>
<th>Solid particles emission</th>
<th>Competition level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Society satisfaction</td>
<td>Taxes to the national treasury</td>
<td>Care for animals/children</td>
</tr>
<tr>
<td>Wasting resources</td>
<td>Participation in charities</td>
<td>Use of innovation technologies</td>
</tr>
<tr>
<td>Recycling level</td>
<td>Reputation of a company</td>
<td>Development of innovation technologies</td>
</tr>
<tr>
<td>Employees satisfaction</td>
<td>Road maintenance costs</td>
<td>Cooperation other companies</td>
</tr>
<tr>
<td>Disaster risk</td>
<td>Nr of available workplaces</td>
<td></td>
</tr>
</tbody>
</table>
Appendix IV: Incident overview

In chapter 3 a selection of incidents is made for the case study. The overview used for this is described as follows. For every case the following general items are stated:

1. Location: the location or area where the incident or crisis took place. It is important to be aware of the exact location of an incident because of the magnitude of the problem it causes and which kind of people it affects. For instance when a disaster hit the south pole, the problems are much less severe then when Los Angeles is hit by an earthquake;
2. Incident: the kind of incident that took place. For the same reason as it is important to know where a incident takes place, it should also be known what kind of incident it is because it defines how help can be offered. For instance in case of a man-made incident such as a war, protection against armed factions or armies is absolutely necessary in order to bring aid to the needy;
3. Fatalities: the estimated reported number of fatalities due to the incident, including combatants and non-combatants must be known in order to determine the amount of need that is required;
4. Parties: the main parties involved in the crisis or incident need to be known because cooperation with local authorities is essential for bringing aid;
5. When: the period in which the incident took place is necessary so as to determine if a incident is out-dated. In some cases where there was so debate on the period, expert opinions were used to set the period;
6. Actor: because the role of three actors in incidents in analysed, it did the actors involved in this research play a role in the assistance after the incident?
7. Cause: it is necessary to know the cause of the incident because this indicates where solutions for future incidents should be found (natural or man-made).

All events in the overview have taken place in the past fifteen years. This period was chosen as this is deemed to contain sufficient amount of cases while being practical for the goals of this research.

<table>
<thead>
<tr>
<th>Location</th>
<th>Incident</th>
<th>Fatalities</th>
<th>Parties</th>
<th>When</th>
<th>Actor</th>
<th>Cause</th>
</tr>
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<tr>
<td>Nepal</td>
<td>Earthquake</td>
<td>7580</td>
<td>Nepal Surrounding countries</td>
<td>2015</td>
<td>UNOCHA RNLDAF OXFAM NOVIB</td>
<td>Natural</td>
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<tr>
<td>Donbass</td>
<td>Separatist war in Ukraine</td>
<td>4,000</td>
<td>Pro-Russian separatists Russia Ukraine</td>
<td>2014-2015</td>
<td>No</td>
<td>Man-made</td>
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<tr>
<td>Libyan</td>
<td>Civil war</td>
<td>2,500</td>
<td>Different factions</td>
<td>2014-2015</td>
<td>No</td>
<td>Man-made</td>
</tr>
<tr>
<td>Ukraine</td>
<td>MH17 crash</td>
<td>298</td>
<td>Netherlands Australia Malaysia Ukraine Russia</td>
<td>2014</td>
<td>RNLDAF</td>
<td>Man-made</td>
</tr>
<tr>
<td>Philippines</td>
<td>Typhoon</td>
<td>7,000</td>
<td>Nation</td>
<td>2013</td>
<td>UNOCHA RNLDAF OXFAM NOVIB</td>
<td>Natural</td>
</tr>
<tr>
<td>Country</td>
<td>Event</td>
<td>Casualties</td>
<td>Location</td>
<td>Year</td>
<td>Organisations Providing Assistance</td>
<td>Nature of Event</td>
</tr>
<tr>
<td>---------------------</td>
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<td>------------------</td>
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<tr>
<td>CAR</td>
<td>Sectarian conflict</td>
<td>2,099</td>
<td>Government Sectarian groups</td>
<td>2012-2015</td>
<td>No</td>
<td>Man-made</td>
</tr>
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<td>South Sudan</td>
<td>Civil war</td>
<td>1,755</td>
<td>Government Rebel groups</td>
<td>2011-2015</td>
<td>No</td>
<td>Man-made</td>
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<tr>
<td>Syria</td>
<td>Civil war</td>
<td>43,195</td>
<td>Government Islamic State Different factions International Community</td>
<td>2011-present</td>
<td>UNOCHA OXFAM NOVIB</td>
<td>Man-made</td>
</tr>
<tr>
<td>East Africa</td>
<td>Drought</td>
<td>260,000</td>
<td>Horn of Africa</td>
<td>2011</td>
<td>UNOCHA OXFAM NOVIB</td>
<td>Natural</td>
</tr>
<tr>
<td>New Zealand</td>
<td>Earthquake</td>
<td>425</td>
<td>New Zealand</td>
<td>2011</td>
<td>UNOCHA OXFAM NOVIB</td>
<td>Natural</td>
</tr>
<tr>
<td>Japan</td>
<td>Earthquake, Tsunami</td>
<td>16,000</td>
<td>Japan</td>
<td>2011</td>
<td>UNOCHA OXFAM NOVIB</td>
<td>Natural</td>
</tr>
<tr>
<td>Haiti</td>
<td>Earthquake</td>
<td>200,000</td>
<td>Haiti</td>
<td>2010</td>
<td>RNLDAF UNOCHA OXFAM NOVIB</td>
<td>Natural</td>
</tr>
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<td>Nigeria</td>
<td>Sectarian war</td>
<td>4,627</td>
<td>Government Boko Haram</td>
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<td>No</td>
<td>Man-made</td>
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<td>Blizzard</td>
<td>1,337</td>
<td>Afghanistan</td>
<td>2008</td>
<td>No</td>
<td>Natural</td>
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<td>Waziristan</td>
<td>Sectarian war</td>
<td>23,494</td>
<td>Government Different factions</td>
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<td>No</td>
<td>Man-made</td>
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<tr>
<td>Mexico</td>
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<td>92,880</td>
<td>Government Several drugs gangs</td>
<td>2006-present</td>
<td>No</td>
<td>Man-made</td>
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<td>United States</td>
<td>Hurricane</td>
<td>1,836</td>
<td>United States</td>
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<td>Iraq</td>
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<td>Man-made</td>
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<td>Earthquake and Tsunami</td>
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<td>Natural</td>
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<td>Insurgency</td>
<td>53,925</td>
<td>Government Taliban International community</td>
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<td>No</td>
<td>Man-made</td>
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<td>2001</td>
<td>No</td>
<td>Natural</td>
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<td>Turkey</td>
<td>Separatist war Kurds</td>
<td>28,655</td>
<td>Government PKK</td>
<td>1984-present</td>
<td>No</td>
<td>Man-made</td>
</tr>
<tr>
<td>Somalia</td>
<td>Civil war</td>
<td>39,545</td>
<td>Government Shabaab Africa Force</td>
<td>1982-present</td>
<td>No</td>
<td>Man-made</td>
</tr>
<tr>
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<td>Inter state war</td>
<td>15,216</td>
<td>Governments International Community</td>
<td>1949-present</td>
<td>No</td>
<td>Man-made</td>
</tr>
<tr>
<td>Yemen</td>
<td>Insurgency</td>
<td>4,270</td>
<td>Government El-Qaida</td>
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<td>No</td>
<td>Man-made</td>
</tr>
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<td>Country</td>
<td>Event Type</td>
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<td>Location Description</td>
<td>Year</td>
<td>Agency</td>
<td>Type</td>
</tr>
<tr>
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<td>84,500</td>
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<td>Natural</td>
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<td>10,105</td>
<td>Congo Rwanda International community</td>
<td>2006-2013</td>
<td>No</td>
<td>Man-made</td>
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<td>Pakistan</td>
<td>Earthquake</td>
<td>75,000</td>
<td>Pakistan Surrounding countries</td>
<td>2005</td>
<td>UNOCHA RNLDAF OXFAM NOVIB</td>
<td>Natural</td>
</tr>
<tr>
<td>El-Qaida</td>
<td>Terrorist war on US and allies</td>
<td>7,649</td>
<td>El-Qaida United States and allies</td>
<td>2001-2015</td>
<td>No</td>
<td>Man-made</td>
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<tr>
<td>Chechnya</td>
<td>Separatist war against Russia</td>
<td>23,217</td>
<td>Chechnya Russia</td>
<td>1994-2013</td>
<td>No</td>
<td>Man-made</td>
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<tr>
<td>Algeria</td>
<td>Rebellion</td>
<td>20,533</td>
<td>Government Islamic groups</td>
<td>1991-2013</td>
<td>No</td>
<td>Man-made</td>
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<tr>
<td>India</td>
<td>Maoist rebellion</td>
<td>6,854</td>
<td>Government Maoist group</td>
<td>1990-2013</td>
<td>No</td>
<td>Man-made</td>
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<tr>
<td>India-Pakistan</td>
<td>Intra state war over Kashmir</td>
<td>23,476</td>
<td>Government India &amp; Pakistan</td>
<td>1984-2013</td>
<td>No</td>
<td>Man-made</td>
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<td>Sudan</td>
<td>Civil war</td>
<td>97,099</td>
<td>Government Several Militias</td>
<td>1983-2013</td>
<td>No</td>
<td>Man-made</td>
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<tr>
<td>Uganda</td>
<td>Civil war</td>
<td>127,529</td>
<td>Government Several factions</td>
<td>1980-2013</td>
<td>No</td>
<td>Man-made</td>
</tr>
<tr>
<td>Mozambique</td>
<td>Separatist war</td>
<td>115,889</td>
<td>Government Separatist groups</td>
<td>1977-2013</td>
<td>No</td>
<td>Man-made</td>
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<tr>
<td>Ethiopia</td>
<td>Rebellion</td>
<td>26,000</td>
<td>Government Oromia &amp; Ogadeni rebels</td>
<td>1976-2013</td>
<td>No</td>
<td>Man-made</td>
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<td>Philippines</td>
<td>Rebellion</td>
<td>42,019</td>
<td>Government Mindanao &amp; CCP rebels</td>
<td>1969-2013</td>
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<td>Man-made</td>
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<td>26,875</td>
<td>Government FARC</td>
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<td>Man-made</td>
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<tr>
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<td>Separatist war</td>
<td>49,862</td>
<td>Government Guerrillas</td>
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<td>No</td>
<td>Man-made</td>
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<td>Civil war</td>
<td>2,082</td>
<td>Government Arab spring</td>
<td>2011-2011</td>
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<td>Man-made</td>
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<td>1,657</td>
<td>Government MFDC</td>
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<td>Man-made</td>
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<td>5,035</td>
<td>Government Several rebel groups</td>
<td>1979-2011</td>
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<td>Civil war</td>
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<td>Government Several rebel groups</td>
<td>1966-2010</td>
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<td>Man-made</td>
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<td>Rebellion</td>
<td>17,250</td>
<td>Government Two rebel groups</td>
<td>1965-2010</td>
<td>No</td>
<td>Man-made</td>
</tr>
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<td>Rebellion</td>
<td>73,818</td>
<td>Government</td>
<td>1984-2009</td>
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<td>Man-made</td>
</tr>
<tr>
<td>Country</td>
<td>Type of War</td>
<td>Casualties</td>
<td>Side 1</td>
<td>Side 2</td>
<td>Made by</td>
<td></td>
</tr>
<tr>
<td>-------------</td>
<td>------------------------</td>
<td>------------</td>
<td>---------------------------------</td>
<td>---------------------------------</td>
<td>-----------</td>
<td></td>
</tr>
<tr>
<td>Burundi</td>
<td>Civil war</td>
<td>15,651</td>
<td>Huti government/</td>
<td>Tutsi rebels</td>
<td>1991-2008</td>
<td>RNLDAF</td>
</tr>
<tr>
<td>Nepal</td>
<td>Civil war</td>
<td>12,274</td>
<td>Government/</td>
<td>Maoist rebels</td>
<td>1996-2006</td>
<td>No</td>
</tr>
<tr>
<td>South-Lebanon</td>
<td>Intra state war with Israel</td>
<td>1,712</td>
<td>Lebanon/</td>
<td>Israel</td>
<td>1990-2006</td>
<td>No</td>
</tr>
</tbody>
</table>
Appendix V: Actor analysis

In chapter 3 the role of the actors RNLDAF, UNOCHA and Oxfam Novib is described in two incidents. In this section a more elaborate actor analysis is performed.

The Royal Netherlands Armed Forces

The RNLDAF is the most important instrument concerning security in the Netherlands. This organization is necessary to keep the Netherlands safe, to contribute to international security in the interest of the Netherlands and to help people in the event of a disaster (Defensie, 2016).

The RNLDAF exists of four operational parts: The Royal Navy, the Royal Air Force, the Royal Army and the Royal Marechaussee. Next to these there are two supporting parts: the Support Command Centre and the Defence Materiel Organization. The RNLDAF resorts under the command of a Central Staff that resorts under the Ministry of Defence (MoD). The RNLDAF organization is depicted in figure 44.

The RNLDAF has three main tasks:

1. Protection of the national territory and of its allies;
2. Promote (international) justice and stability;
3. Support aid at (international) disasters and crises.

To be able to execute all tasks the organization of the RNLDAF is specifically designed in strong hierarchical network with clear rules and guidelines on how to perform its tasks. As highest military advisor and corporate operator, the Commander of the Armed Forces (CDS) is in charge of the operational units of the Armed Forces. The Defence Operational Management Board (DOPS) from the Governance Staff (BS) supports the CDS in this task by leading all missions, under command of the Director Operations. The tasks of the DOPS are:

1. Advise and support the CDS on missions and mission readiness;
2. Execute military-strategic and military-operational planning;
The DOPS exists of ten sections, each for a specific field of expertise, of which section J4 is in charge over all matters concerning logistics. Since the RNLDAF mostly operates with multiple parts (joint), interdepartmental (comprehensive approach) and also with international partners (combined), it is essential to coordinate planning and operations between all units. To accommodate this, the Operational Planning Process (OPP) is used. Logistics are described in a separate instruction, the Joint Logistic Instruction (JOLI) This instruction is shortly described in the following section.

The JOLI exists of two parts (Ministerie van Defensie, 2014): the description of the phasing used in the Operational Planning Process (OPP) and the joint logistical guidelines for the preparation and execution of missions. There are five phases in the OPP as visualised in figure 45.

![Figure 45: Phasing of the Operational Planning Process (Ministerie van Defensie, 2014).](image)

1. Decision making and planning: in this phase the OPP is run and the prerequisites for the readiness of the troops is determined and the composition of the supply chain is determined. The phase starts as soon as an international request to the government is made for support in any kind of operation. First the NLD government has to decide on the support and the composition of the supporting units. The logistic orientation starts directly when a request is received. The orientation consists of an analysis of the Area of Operations (AOO), on the Lines of Communication (LOC), the expected conditions & limitations, the length and nature of the mission. Also the necessary capacities and capabilities are estimated. First a desk-study is performed, then a Fact-Finding-Mission (FFM) is executed and possible multi-national cooperation is checked, as well as Host Nation Support (HNS) and commercial cooperation. The decision-making ends with the military advice on the participation given by the CDS to the Minister of Defence. The planning consists of the composition of the Operational Instruction (OA), containing the national guidelines for the mission/operation together with the assignment, tasks, responsibilities and the Transfer of Authority (TOA) to the operational commander. The planning runs to the TOA, depending on the complexity of the mission;

2. Preparation: in this phase the operational units are being trained from operational capable (OG) to mission capable (IG) by mission specific education and training. The logistic unit is tailored specifically for the mission and trained together with the operational unit(s). The necessary equipment is gathered on a Formation Location. Also the final plan for strategic transportation is set-up;

3. Deployment: during the deployment the strategic transportation and the logistic build-up take place combined with the start of the operation. This includes the RSOI (Reception, Staging, Onward movement and Integration) of all units. The logistic build-up exists of the establishment of infrastructures, the realisation of the logistic footprint and the build-up of stocks. The deployment ends with the Transfer of Authority (TOA);

4. Maintain: from the TOA on until the tasks and responsibility are transferred to local authorities or other nations, the units are supplied and served, maintenance keeps the equipment operational. This also means taking care of the health of the personnel so they can keep executing their job. Part of this is the relieve of units during the mission;

5. Redeployment: the redeployment is for the most part a logistic operation in redeploying the troops and materiel to the home country. Depending on the situation this can be quite a large operation that requires precise planning of tasks and making available the equipment and
means to execute the operation while maintaining an acceptable level of security. Part of the materiel will have to be sold, contracts will have to be unwound and the strategic transportation will have to be prepared. Also after the troops and materiel is returned home safely, the personnel need to recuperate and the materiel needs maintenance to return the equipment to the regular units.

Next to the JOLI, every mission has specific rules and deviations from normal operating procedures due to the local situation or agreements with other parties (partners, governments or organizations). For this reason for every mission a Mission Specific Logistic Instruction is composed to describe the all these deviations and agreements.

The United Nations Office for Coordination of Humanitarian Affairs

The UN OCHA is part of the United Nation family organization that is responsible for the cooperation between actors in humanitarian aid. By bringing these actors together they pursue to ensure coherent response to international emergencies. UNOCHA has constructed a framework in which humanitarian aid organizations can contribute to the overall response effort (UNOCHA, 2016). In the framework OCHA is the connecting factor between all clusters in the coordination of humanitarian aid, which is shown in figure 46. The phasing as shown in figure xx will be explained later on in chapter 3; for now if suffices to state that UNOCHA focuses on the phases preparedness, disaster, response and recovery.

![Figure 46: The clusters in humanitarian aid (UNOCHA, 2016).](image)

It is OCHA’s role to closely work together with lead agencies, GO’s and NGO’s to develop policies, coordinate inter-cluster matters, to guide operations and organize support in the field. At this level, OCHA helps ensure optimal functioning of the humanitarian system in support of the Humanitarian Coordinator’s (HC) leadership and the Humanitarian Country Team. OCHA also helps to ensure coordination between clusters at all phases of the response, including needs assessments, joint planning, and monitoring and evaluation. Figure 41 also shows that the World Food Program (WFP) usually manages logistics. This is important information, for the case study focuses at logistics.
The mission of OCHA is:

1. To mobilize and coordinate effective and principled humanitarian action in partnership with national and international actors in order to alleviate human suffering in disasters and emergencies;
2. Advocate the rights of people in need;
3. Promote preparedness and prevention;
4. Facilitate sustainable solutions.

With every great incident UNCHA constructs a strategic support plan, which states how much funding is needed for every cluster. Governments and other donors can subscribe to contribute to the funding. The clusters then decide how the funding is spent. Jens Laerke, spokesperson of UNOCHA, estimates that about 75 percent of all aid is coordinated by the clusters.

OCHA’s added value is its ability to serve as a neutral authority through its mandate and experience. The success of OCHA’s therefor lies in its partnerships with the humanitarian responders and collocutors. To reach its mission OCHA has spread out its organization all over the world, as is shown in figure 47.

One of the most important elements of efficient humanitarian aid is a realistic and timely needs-assessment. This helps in saving lives and restoring people's livelihoods. Along with emergency preparedness, the timeliness and quality of assessments help determine an effective humanitarian response. Coordinated assessment is planned and carried out in partnership by humanitarian actors, in order to document the impact of a particular crisis and to identify the needs of affected populations. Credible and accurate assessment results form the basis for needs-based strategic planning and system-wide monitoring (UNOCHA, 2016).
In its continuing endeavour to reach this mission OCHA has a strategic plan in which the goals are stated and how the organization strives to reach effectiveness and reform. The goals that OCHA set up until 2017 are (UN OCHA, 2013):

1. Field effectiveness: more effective and principles humanitarian action that meets the needs of the affected people;
2. Fit for the future: a more divers and adaptable humanitarian sector, spanning a variety of existing and emerging responder-and-partner networks.

The goals are underpinned by ten objectives (UN OCHA, 2013):

1. Leadership: humanitarian actions are led by empowered, competent and experienced professionals;
2. Situational awareness: decision-making is based upon a common situational awareness;
3. Assessment, planning & monitoring: actions are guided by joint strategic response planning based on prioritized needs;
4. Coordination mechanisms: coordination is adaptive to the context and able to support effective, coherent humanitarian aid;
5. Humanitarian financing: financing is predictable, timely and allocated based on priority needs;
6. Protection and access to assistance: in emergencies people are protected from harm and have access to assistance as a result of advocacy and coordination;
7. Emergency response preparedness: international partners are ready to respond to humanitarian emergencies without delay and with the right assistance;
8. Diversity: a more diverse set of actors engage in and provides political, technical and material support to collective humanitarian action;
9. Interoperability: all actors are able to deploy well-coordinated and interoperable humanitarian response capacities within agreed frameworks;
10. Innovation: innovation to promote improvement is consistently fostered and brought to scale in the humanitarian sector.

The UN General Assembly adopted resolution 46/180 in 1991 on the guidelines for humanitarian action in which the Emergency Relief Coordinator (ERC) plays a central role together with the Inter-Agency Standing Committee (IASC). The organization continually strives to improve the process of humanitarian aid through reforms (UN OCHA, 2013): between 2005 – 2011 the financing was made predictable and multilateral coordination mechanisms were made more effective, in 2012 the IASC Principals agreed on a Transformative Agenda in order to make the humanitarian leadership stronger, to streamline the coordinative mechanisms and to ensure the accountability of the collective delivery of humanitarian response efforts. Nowadays several initiatives are underway so as to further strengthen the humanitarian aid: the Millennium Development Goals and the Hyogo Framework for Action on Disaster Risk Reduction are reviewed and in July this year, during the World Humanitarian Summit the humanitarian and the development agendas are expected to be integrated.

Currently the provision of humanitarian assistance is changing: cash transfer is incorporated in the humanitarian response more effectively. It is not a question if but how cash can be used best in humanitarian assistance.

The increasing use of technology has several consequences for humanitarian aid: through the multitude of people using mobile phones, new possibilities arise on the assessment of needs directly after an incident occurs. In order for this to work, several aspects need to be taken into
consideration, namely the role of telecommunication and Internet providers who have to be assimilated in the cooperation structures/networks. This way local communities change the way humanitarian aid works.

At this time there is no common theory or framework that defines humanitarian effectiveness while reflecting the complexity of humanitarian work. Different constitutions prioritize different elements of effectiveness and accountability. Also the measure of effectiveness depends on the particular humanitarian context. OCHA will implement the strategic plan through support of partners by coordination, advocacy, policy, information management and humanitarian finance services.

**Oxfam Novib**

Oxfam Novib is a worldwide development organisation that mobilizes the power of people against poverty (OXFAM NOVIB, 2016). The mission of the organization is clear and simple: a just world, without poverty. People have the right to sustainable livelihood resources, to basic social services, to life and security, to social and political participation and identity. The mission of Oxfam Novib is based on empowerment, accountability and inclusiveness: Empowerment of people to built on their own livelihood without poverty, accountability of the powerbrokers, such as governments, donors, supporters and volunteers, to take poor people into consideration and inclusiveness of all groups of the population and gender justice.

Three years after the big flooding of Zeeland in 1953, Father Simon Jelsma, together with several people founded the Netherlands Organisation for International Assistance (Novib) so as to support poor countries in their struggle to bring prosperity to its people. Over the years several large projects were brought to success. The will to cooperate with other companies in the humanitarian field led to affiliation in 1996 with Oxfam International and the change of the name to Oxfam Novib. The latest organizational developments are the decentralization to field offices together with joining in the Oxfam confederation’s Single Management Structure, which should secure greater impact and efficiency. Oxfam Novib’s strategy is to use an integrated approach, by addressing the causes of poverty on all levels. Also by saving human lives in humanitarian crises and by stimulating development while simultaneously linking local action with campaigning in support of policies and practice that underpin justice and well-being (Oxfam Novib, 2016). The organization is spread out over the world; especially in areas where the level of poverty is higher as is shown in figure 48.

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**Figure 48**: the Oxfam Novib organogram (Oxfam Novib, 2016).
For this they cooperate with local partner organizations that are most aware of the local situation and issues. By sharing experience and funding projects they build networks, which are then used to reach the goals of the organization. This can only be done when simultaneous working together with governments and the private sector in taking responsibility for their policies and business operations. Campaigning is also used to motivate the public into making the right choices.

One of the main aspects in the work of Oxfam Novib is humanitarian aid. Their expertise covers two areas: emergency food security and livelihoods (EFSL), and water, sanitation and hygiene (WASH). Efficient emergency response is stimulated through acting impartial, independent and sensitive under all circumstances. The work in this area goes further then only delivering aid in emergency situations; getting rid of the root causes of incidents is an important factor, as well as making communities more resilient against future crises.
Appendix VI: Balanced scorecard calculations

In chapter four the logistic performance of three actors, RNLDAF, UNOCHA and Oxfam Novib is measured for two cases; the earthquakes in Haiti in 2010 and in Nepal in 2015. For each organization the measurements are visualized in the balanced scorecard. This appendix describes all calculations that lead to the values shown in the balanced scorecards of chapter 4.

Earthquake Haiti calculations

RNLDAF

1. **Aid output**: the aid provided by the RNLDAF is measured up until the end of January.
   a. Amount of help provided: the USAR team saved several people (5) from under the rubble and cleared debris in this process, that helped people in clearing their properties (45). Also the USAR team helped a large group (100+) of orphan children to the airport. Next to this the Marines brought aid to the area and helped securing the emergency aid teams in the area (500). It is unknown how many aid goods was brought to the area, but it must have been at least food, water and shelter material for an estimated total of 500 people.
   b. Total aid output = 5 + 200 + 100 + 500 + 1000 = 1805 people that received help;
   c. Right product: because the extent of the disaster there was need of almost all basic needs in the first few weeks. Therefore all aid was the right product.
   d. Coverage right product is assumed to be 100%;
   e. Right amount: because the need of almost all basic products was so large the amount of products and aid of one single organization will only cover a very small fraction of the needed number of products. It is also impossible to determine what the exact percentage is. Therefore the coverage of the need in number of products (percentage) will have no value;
   f. Right place: after arrival the USAR team was put to work as soon as possible in an area where they were able to help people and even safe some people from under the rubble. It could be that they could have helped even more people on other locations, but it is impossible to determine if this is the case. Also it must be kept in mind that it may also be impossible to reach areas where help can be put to use better. The aid brought by the Marines was put to good work in providing help were needed. Because of this the percentage of the need in location (percentage) is assumed to be close to the maximum, so 95%;

2. **Supply chain performance**
   a. Responsiveness: the USAR team starts their rescue work somewhere during the 15th of January, while the earthquake struck Haiti on the 12th of January at 16:53 hours. The lead-time is approximately 3 days. The Marines arrived on the 18th of January and started their work the same day; their lead-time is approximately 6 days. The average lead-time = (3 + 6) / 2 = 4.5 days;
   b. Need estimation: almost all organizations that give emergency aid to large incidents use the need estimation of the UN. This need estimation changes from day to day since each consecutive day after the incident it becomes clearer what the impact is and what help is needed. Considering the need of search-and-rescue the stated need was that not only help was needed from the surrounding countries of Haiti, but also of other countries. Considering the help the Netherlands USAR team was able to provide, the percentage of actual need versus estimated need is assumed to be close to the maximum, so
approximately 95%. For the rest of the need there was however insufficient data to assess the fit between the estimated need and actual need;

c. Agility:
   i. Flexibility in weight: the total loading capacity of a KDC-10 is 35.000 kg of which there was only one flight. This flight contained 82 m3 of box pallets (weight is assumed to be 25 tonnes) and in total 79 passengers, which makes a total load weight of 26 tonnes. This leaves about 9.000 kg of weight flexibility, which is about 23%. The composition of the aid goods that the Hr. Ms. Pelikaan is unknown, so this cannot be taken into account;
   ii. Flexibility in types of aid (goods & services): the KDC-10 mostly transported equipment and materiel used for search-and-rescue work. Therefore the number of different sorts of products is 1. The aid goods of Hr. Ms. Pelikaan were assumed to exist of food, water and shelter materiel. Therefore the number of different products is 3. The flexibility in number of products and services was not very large since the aid consisted of only one airplane and one ship with aid, that both made one run to Haiti. This means that the free space could have been used for additional products, but only to a small account. The flexibility is therefore assessed as 10%

d. Supply chain robustness: in case of the transport of the USAR team to Haiti there actually was a show breaking event since the airplane was not allowed to land on the airport of Port-au-Prince. Despite this issue, the team managed to get to the area of operations one day later and was able to execute operations as planned. The second issue in Haiti was the situation of the seaport, which was not operational. This delayed the arrival of Hr. Ms. Pelikaan, but still she was able to dock on the 18th of January, even as the first ship to arrive. Since in both cases the supply chain proved to be robust, with only a delay of 1 day per transport mean. For both cases there was however no contingency planning, but solutions were made possible by the creativity of the local management. The total robustness is assessed to be 80%;

3. Financial efficiency
   a. Distribution costs: for this case no financial data was available. There must undoubtedly be some kind of financial data somewhere in the organization; it proved to be impossible to obtain this data. This is assumed not to have to do with willingness of the organization to cooperate with the research or with security reasons, but because financial data currently is not used to measure the efficiency or effectivity of the organization;

4. External process
   a. Connectivity: within the Netherlands government the connectivity of systems is very low. There is however a structural communication between the different departments on different levels. The communication of the RNLDaF with other parties is on a daily basis in case of large incidents such as the earthquake in Haiti. Next to the structural meetings, there is also a lot of bi-lateral communication. In the case of Haiti, evaluation of the deployment of the USAR team showed that the interdepartmental communication was not optimal because the majority of communications was done bilateral and in the preparation of the deployment, the external communication could have been better. In total the connectivity is assessed as 80%;
   b. Standardization: the RNLDaF use guidelines for interdepartmental cooperation such as the Operational Planning Process (OPP) and the Joint Logistic Instruction (JOLI). Also when cooperating with other countries and organizations Memorandum of
Understanding are made. This adds up to a high level of standardized business processes with external parties with a percentage of 80%.

5. Organizational capacity
   a. Learning & growth: in the RNLDAF, on the level of the DOPS a section is incorporated that specifically focuses on evaluations and the Lessons Learned process. Usually for each mission evaluations are being held and also personnel satisfaction surveys. For the mission to Haiti an external evaluation was held on the deployment of the USAR team. The RNLDAF has this kind of sections in every part of the organization, as are guidelines and processes used especially to constantly improve the organization. Next for every mission personnel follows special trainings so as to be prepared for their task as best as possible. In practice however the process of reflection and self-renewal does not always work because of lack of time for training or priorities for other work. Because of this the mark for learning and growth has a percentage of 90%.

UNOCHA

6. Aid output
   7. Amount of help provided: UNOCHA coordinated the overall UN support of the mission. UN reports state the following results up until the end of January:
      i. Shelter: plastic sheeting was distributed since the enormous shortage on tents; there will be a distribution of 200.000 family-sized tents. It is estimated that in the first period only a small portion of the shelter was provided through the plastic sheeting and some tents, the number of people helped with this is about 50.000 people;
      ii. WFP provided for a two-week food program for 2 million people;
      iii. There are 48 operational hospitals and an additional 12 field hospitals, which are helping hundreds of people every day. The estimated number of people helped is 5000;
      iv. WASH: there still is great shortage for WASH facilities; up until the 25th of January there was sufficient for several thousand people, estimated number is 5000 people;
      v. Protection: the MINUSTAH mission was already in Haiti before the earthquake stuck; although they suffered heavy damage and losses, after initial issues on what way to continue the mission given the changed circumstances, the troops protected the aid organizations in the field, in total the number of people helped is estimated to be 50.000.
   b. The total aid output = 50.000 + 2.000.000 + 5000 + 5000 + 50.000 = 2.110.000 people that received help;
   c. Right product: because the extent of the disaster there was need of almost all basic needs in the first few weeks. Therefore all aid was the right product; coverage of the right product is assumed to be 100%;
   d. Right amount: because the need of almost all basic products was so large the amount of products and aid of one single organization will only cover part of the needed number of products. It is impossible to determine what the exact percentage is. The coverage of the need in number of products (percentage) therefore has no value;
   e. Right place: all UN aid was given on locations directed by the OSOCC. It can be assumed that the locations were mostly the right place. Footnote to this is that there were a lot of locations that were initially impossible to reach although help was also needed. It is
assessed that in the first period all aid was brought to locations where help was needed most; the percentage is 95%.

8. **Supply chain performance**
   a. Responsiveness: the UNDAC team arrived within 24 hours after the earthquake hit Haiti on the 12th of January at 16:53 hours; their lead-time is 1 day. UNOCHA, WFP, MINUSTA and other large NGOs arrived within 48 hours; their lead-time is 2 days. The USAR teams started their rescue work somewhere during the 15th of January. The lead-time is approximately 3 days. The average lead-time = (1 + 2 + 3) / 3 = 2 days;
   b. Need estimation: the UN usually determines the need of large incidents. This need estimation changes from day to day since each consecutive day after the incident it becomes clearer what the impact is and what help is needed. The estimated number of victims was 300,000 fatalities and millions of people in need of help. Approximately one million people lost their homes. Because of the high amount of damage to roads and buildings the need for search-and-rescue was higher than usually. There is however insufficient data on the actual need, therefore it only possible to assess the fit between the estimated need and actual need roughly, which is 95%;
   c. Agility:
      i. Flexibility in weight: UNOCHA coordinates many organizations in the aid operation; therefor it is not possible to assess the exact amount of transport flexibility. It is however possible to roughly assess the weight flexibility of the transport means provided by the WFP, since data was obtained from this organization: personnel air transport (2 x 10 pax/day), an Antonov 12 from 22nd of January, air cargo transport (2x 4mtonnes/day) from 21st of January. For road transport 20 15 mtonnes trucks and 40 M6 trucks are contracted. It is however not possible to determine how well this transport capacity was put to use because there is no data on the deployment of the transport capacity. It can be assumed that the capacity was used maximally because of the very great need for aid goods, especially in the first weeks of the aid operation and the initial shortage in transport means. For this reason transport flexibility is assessed as to be 10%;
      ii. Flexibility in types of aid (goods & services): the UN effort provided all types of aid goods and services through its 11 clusters. The flexibility in number of products therefore is maximized. This means a flexibility of 100%;
   d. Supply chain robustness: The airport of Port-au-Prince was only partially operational in the first days after the earthquake. Also the roads were heavily damaged and the seaport was not operational. The key elements of UN organizations were able to arrive in the area very fast. It took some time however for the aid operational to run smoothly because of all the problems. The supply chain proved to be quite robust, with only a delay of a couple of days in transport. For all cases there was however no contingency plans available, but solutions were made possible by the creativity of the local management. The total robustness is assessed to be 70%;

9. **Financial efficiency**
   a. Distribution costs: for this case no financial data was available. There must undoubtedly be some kind of financial data somewhere in the organization; it proved to be impossible to obtain this data. This is assumed not to have to do with willingness of the organization to cooperate with the research or with security reasons, but because financial data currently is not used to measure the efficiency or effectiveness of the organization;
10. External process
   a. Connectivity: between the different UN organizations the connectivity of systems is very low. There are not that many systems in use. There is however a structural communication between the different departments on different levels. In case of operations such as the earthquake in Haiti, there is a daily coordination meeting between all aid organizations chaired by UNDAC/UNOCHA. Next to the structural meetings, there is also a lot of bi-lateral communication. In the case of Haiti, evaluation showed that there was a shortage on means of communication. In total the connectivity is assessed at being 70%;
   b. Standardization: the UN relies on the agreements and structures of the cluster system made between all the agencies involved in bringing aid. There are guidelines on which organization is responsible for each task and how to communicate. Because of the multitude of aid organizations that work under the wing of the UN, it is very hard to coordinate the operation effectively, also because there is a large percentage that does not cooperate with the UN. This adds up to a medium level of standardized business processes with external parties with a percentage of 50%;

11. Organizational capacity
   a. Learning & growth: The UN tries to improve its performance through evaluations of operations, long-term work groups and through special training for its personnel on different areas of expertise. There is however no element in the organization that specifically focuses on the process of renewal and improvement. Because of this the percentage for learning and growth is 60%.

12. Oxfam Novib

13. Aid output
14. Amount of help provided: Oxfam provided for the following aid in the first six months: in total more then 300.000 people were reached (120.000 water, 25.000 shelter, 66.000 latrines and washing facilities and 115.000 cash for work and preparation of hot meals). To assess how much aid was brought in the first two weeks, this number will be divided through twelve.
   a. The total aid output = (120.000 + 25.000 + 66.000 + 115.000)/12 = 35.500 people that received help;
   b. Right product: because the extent of the disaster there was need of almost all basic needs in the first few weeks. Therefore all aid was the right product; coverage of the right product is assumed to be 100%;
   c. Right amount: because the need of almost all basic products was so large the amount of products and aid of one single organization will only cover part of the needed number of products. Since in the first couple of weeks only the areas were reached that were accessible, it is assumed that the Oxfam aid covered a small part of the need of about 5%. It is however at this time impossible to determine what the exact percentage is;
   d. Right place: all Oxfam aid was given on locations where people gathered in camps. It can be assumed that these locations were mostly the right place. Footnote to this is that there were a lot of locations that were initially impossible to reach although help was also needed. It is assessed that in the first period all aid was brought to locations where help was needed most; the percentage is 95%;

15. Supply chain performance
   a. Responsiveness: Oxfam already had a team in Haiti before the earthquake hit Haiti on the 12th of January at 16:53 hours; within a day this team was active in bringing aid on a local scale, which makes their lead-time 1 day. The additional team arrived within 48
hours and started their operations on the fourth day; their lead-time is 4 days. The average lead-time = (1 + 4) / 2 = 2.5 days;
b. Need estimation: Oxfam uses the need estimation of the UN, therefore the score on need estimation is the same as the UN score that is roughly 95%;
c. Agility:
   i. Flexibility in weight: No data was obtained on the transport capacity of Oxfam, however because of the very great need for aid goods, especially in the first weeks of the aid operation and the initial shortage in transport means, transport flexibility is assessed as to be 10%;
   ii. Flexibility in types of aid (goods & services): Oxfam provided aid mostly WASH facilities, shelter, food and water. The flexibility in number of products therefore is not as large as for instance the UN, but still substantial. This means a flexibility of 60%;
d. Supply chain robustness: The airport of Port-au-Prince was only partially operational in the first days after the earthquake. Also the roads were heavily damaged and the seaport was not operational. Despite this the team on site was operational within one day, the additional team arrived within 48 hours and the aid operation started within four days. The supply chain proved to be quite robust, with only a delay of a couple of days in in-theatre transport. For all cases there was however no contingency plans available, but solutions were made possible by the creativity of the local management. The total robustness is assessed to be 70%;

16. Financial efficiency
   a. Distribution costs: for this case no financial data was available. There must undoubtedly be some kind of financial data somewhere in the organization; it proved to be impossible to obtain this data. This is assumed not to have to do with willingness of the organization to cooperate with the research or with security reasons, but because financial data currently is not used to measure the efficiency or effectivity of the organization;

17. External process
   a. Connectivity: between the different Oxfam elements the connectivity of systems is low (verwijzing interview Sanne Wijnhart), but there are not many applications in use. There is a structural communication between the different departments on different levels, for instance in the Dutch cooperation in the so-called ‘cooperative aid organizations’ (samenwerkende hulp organisaties). The downside of this sort of co-operation is the negative effect on decision-making. In case of operations such as the earthquake in Haiti, there is a daily coordination meeting between all organizations present in the area, chaired by UNDAC/UNOCHA. Next to the structural meetings, there is also a lot of bi-lateral communication. In the case of Haiti, evaluation showed that there was a shortage on means of communication. In total the connectivity is assessed at being 70%;
   b. Standardization: Oxfam has a number of framework contracts with logistic service providers, as most NGOs have. There are agreements and structures on a national level between all the agencies involved in bringing aid. There are guidelines on which part of the organization is responsible for each task and how to communicate. The standardization is assessed at a percentage of 60%;

18. Organizational capacity
   a. Learning & growth: Oxfam works on improving its performance through evaluations of operations, long-term work groups and through special training for its personnel on different areas of expertise. There is however no element in the organization that
specifically focuses on the process of renewal and improvement. Because of this the percentage for learning and growth is 60%.

Earthquake Nepal calculations

RNLDFA

1. Aid output: the aid provided by the RNLD AF is measured up until the 3rd of May 2015.
   a. Amount of help provided: the USAR team saved no people from under the rubble and cleared debris in this process, that helped people in clearing their properties (estimated 500 people). More importantly the USAR team lead the search & rescue operation until arrival of the UNDAC. Next blankets, bandages and water were distributed amongst the needy (estimated 1000 people). Finally financial emergency support of four million euro from the Dutch Relief Alliance was distributed among people to buy necessities in order to survive the winter (estimated 10,000 people).
   b. Total aid output = 500 + 1000 + 10,000 = 11,500 people that received help;
   c. Right product: because the extent of the disaster there was need of almost all basic needs in the first few weeks. Therefore all aid was the right product.
   d. Coverage right product is assumed to be 100%;
   e. Right amount: because the need of almost all basic products was so large the amount of products and aid of one single organization will only cover a very small fraction of the needed number of products. It is also impossible to determine what the exact percentage is. Therefore the coverage of the need in number of products (percentage) will have no value;
   f. Right place: the USAR team arrived very early after the earthquake; their work in setting up the OSOCC was vital to a good set-up of the search-and-rescue operation. This work was for certain the right place. After the take-over by the UN, the team was assigned another location. On this location no people were saved from under debris, therefor it is debatable if this location was the right place to operate at the given time. Also it must be kept in mind that it may also be impossible to reach areas where help can be put to use better. It is unknown where the aid goods and the money were distributed. It can be assumed that this was in locations where there was a large concentration of people in need. In the given circumstances this is very likely to be the right place. Taken all matters into consideration, the percentage of the need in the right place is assessed to be close to the maximum, so 95%;

2. Supply chain performance
   a. Responsiveness: the USAR team arrived very soon after the earthquake, on the 27th of April, which means a lead-time of 1.5 day;
   b. Need estimation: almost all organizations that give emergency aid to large incidents use the need estimation of the UN. The initial need was stated as follows:
      i. Medical teams, supplies and tenting for hospitals, and dead-body bags;
      ii. Heavy equipment for rubble removal;
      iii. Helicopters for transport and access to blocked areas.
   c. This need estimation changes from day to day since each consecutive day after the incident it becomes clearer what the impact is and what help is needed. Considering the help the Netherlands USAR team was able to provide, the percentage of actual need versus estimated need is assumed to be close to the maximum, so approximately 95%. For the rest of the need there was however insufficient data to assess the fit between the estimated need and actual need;
   d. Agility:
i. Flexibility in weight: the total loading capacity of a KDC-10 is 35.000 kg of which there was only one flight. This flight contained 9 tonnes of USAR materiel and aid goods of about 15 tonnes and in total 62 passengers plus 8 dogs, which makes a total load weight of 34 tonnes. This leaves only 1.000 kg of weight flexibility, which is about 4%;

ii. Flexibility in types of aid (goods & services): the KDC-10 transported equipment and materiel used for search-and-rescue work, blankets, bandages, water and tents. Therefore the number of different sorts of products is 5. The flexibility in number of products and services was not very large since the aid consisted of only one airplane with aid that made one run to Nepal. This means that the free space could have been used for additional products, but only to a very small account. The flexibility is therefor assessed as 30%

e. Supply chain robustness: the USAR team arrived very early in the area of operations and was able to execute operations as planned. The roads in the area were heavily damaged, but this only had an effect on the secondary roads and the more distant locations. The supply chain proved to be robust. There was however no contingency planning, but solutions were made possible by the creativity of the local management. The total robustness is assessed to be 80%;

3. Financial efficiency
   a. Distribution costs: for this case no financial data was available. There must undoubtedly be some kind of financial data somewhere in the organization; it proved to be impossible to obtain this data. This is assumed not to have to do with willingness of the organization to cooperate with the research or with security reasons, but because financial data currently is not used to measure the efficiency or effectivity of the organization;

4. External process
   a. Connectivity: within the Netherlands government the connectivity of systems is very low. There is however a structural communication between the different departments on different levels. The communication of the RNLDAF with other parties is on a daily basis in case of large incidents such as the earthquake in Nepal. Next to the structural meetings, there is also a lot of bi-lateral communication. In total the connectivity is assessed as 90%;

   b. Standardization: the RNLDAF use guidelines for interdepartmental cooperation such as the Operational Planning Process (OPP) and the Joint Logistic Instruction (JOLI). Also when cooperating with other countries and organizations Memorandum of Understanding are made. This adds up to a high level of standardized business processes with external parties with a percentage of 80%;

5. Organizational capacity
   a. Learning & growth: in the RNLDAF, on the level of the DOPS a section is incorporated that specifically focuses on evaluations and the Lessons Learned process. Usually for each mission evaluations are being held and also personnel satisfaction surveys. The RNLDAF has this kind of sections in every part of the organization, as are guidelines and processes used especially to constantly improve the organization. Next for every mission personnel follows special trainings so as to be prepared for their task as best as possible. In practice however the process of reflection and self-renewal does not always work because of lack of time for training or priorities for other work. Because of this the mark for learning and growth has a percentage of 90%.

6. UNOCHA
7. **Aid output**

a. Amount of help provided: UNOCHA coordinated the overall UN support of the mission. UN reports stated the following results in the first two weeks:
   
i. Five shelter camps were established in areas of the armed police force with water sources (50,000 people helped);
   
ii. On the 26th of April UNICEF WASH (Water, Sanitation & Hygiene) provided 20 tanks (30,000 litres) that will reach 1500 people in three major camps;
   
iii. Next to teams of DFID and USAID, World Health Organization (WHO) health support teams arrive on the 27th of April to support the hospitals (5,000 people helped);
   
iv. WFP delivered food for approximately two million people in the Nepal disaster areas up until the end of May 2015 (1,000,000 people in two weeks);
   
v. By the end of July, 17 temporary health clinics were built (2,000 people helped);
   
vi. 5900 porters are employed to carry aid goods to areas that are difficult to reach with motorized transport, six helicopters in operation to support for transport of goods and people (10,000 people helped);
   
vii. 270 village development committees in twelve districts and 120 kilometres of trails were reopened (10,000 people helped);

b. The total aid output = 50,000 + 1,500 + 5,000 + 1,000,000 + 2,000 + 10,000 + 10,000 = 1,078,500 people that received help;

c. Right product: because the extent of the disaster there was need of almost all basic needs in the first few weeks. Therefore all aid was the right product; coverage of the right product is assumed to be 100%;

d. Right amount: because the need of almost all basic products was so large the amount of products and aid of one single organization will only cover part of the needed number of products. Since in the first couple of weeks only the areas were reached that were accessible, it is assumed that the UN aid covered a substantial part of the need, but certainly no more then 50%. It is impossible to determine what the exact percentage is. The coverage of the need in number of products (percentage) is assessed as 40%;

e. Right place: all UN aid was given on locations directed by the OSOCC. It can be assumed that the locations were mostly the right place. Footnote to this is that there were a lot of locations that were initially impossible to reach although help was also needed. It is assessed that in the first period all aid was brought to locations where help was needed most; the percentage is 95%;

8. **Supply chain performance**

a. Responsiveness: the UNDAC team arrived after 4 days after the earthquake hit Nepal; their lead-time is 4 days. WFP and large NGOs arrived after 3 days; their lead-time is 3 days. The USAR teams started their rescue work on the second day after the earthquake; the lead-time is 2 days. The average lead-time = (4 + 3 + 2) / 3 = 3 days;

b. Need estimation: the UN usually determines the need of large incidents. This need estimation changes from day to day since each consecutive day after the incident it becomes clearer what the impact is and what help is needed. The estimated number of victims was 7,400 fatalities and 8 million people in need of help. Because of the high amount of damage to roads and buildings the need for search-and-rescue was high. There is however insufficient data on the actual need, therefore it only possible to assess the fit between the estimated need and actual need roughly, which is 95%;

c. Agility:
i. Flexibility in weight: UNOCHA coordinates many organizations in the aid operation; therefore it is not possible to assess the exact amount of transport flexibility. Also on the transport capabilities of the WFP there is limited data available: there were six transport helicopters in use for the transport of people and cargo, with a very large group of 5900 porters. This was essential for the road conditions were very bad, so transport relied heavily on porters and helicopters. It is not possible to determine how well this transport capacity was put to use because there is no data on the deployment of the transport capacity. It can be assumed that the capacity was used maximally because of the very great need for aid goods, especially in the first weeks of the aid operation and the initial shortage in transport means and possibilities. For this reason transport flexibility is assessed as to be 0%.

ii. Flexibility in types of aid (goods & services): the UN effort provided all types of aid goods and services through its 11 clusters. The flexibility in number of products therefore is maximized. This means a flexibility of 100%.

d. Supply chain robustness: The airport of Kathmandu remained operational during and after the earthquake. The roads however were heavily damaged. The key elements of UN organizations arrived in the area after a few days. It took some time however for the aid operational to run smoothly because of all the transport problems. The supply chain proved to be weak on a tactical level. There were no contingency plans available, but solutions were made possible by the creativity of the local management. The total robustness is assessed to be 60%.

9. Financial efficiency
   a. Distribution costs: for this case no financial data was available. There must undoubtedly be some kind of financial data somewhere in the organization; it proved to be impossible to obtain this data. This is assumed not to have to do with willingness of the organization to cooperate with the research or with security reasons, but because financial data currently is not used to measure the efficiency or effectivity of the organization;

10. External process
    a. Connectivity: between the different UN organizations the connectivity of systems is very low. There are not that many systems in use. There is however a structural communication between the different departments on different levels. In case of operations such as the earthquake in Nepal, there is at least one daily coordination meeting between all aid organizations chaired by UNDAC/UNOCHA. Next to the structural meetings, there is also a lot of bi-lateral communication. In total the connectivity is assessed at being 80%.
    b. Standardization: the UN relies on the agreements and structures of the cluster system made between all the agencies involved in bringing aid. There are guidelines on which organization is responsible for each task and how to communicate. Because of the multitude of aid organizations that work under the wing of the UN, it is very hard to coordinate the operation effectively, also because there is a large percentage that does not cooperate with the UN. This adds up to a medium level of standardized business processes with external parties with a percentage of 50%.

11. Organizational capacity
    a. Learning & growth: The UN tries to improve its performance through evaluations of operations, long-term work groups and through special training for its personnel on different areas of expertise. There is however no element in the organization that
specifically focuses on the process of renewal and improvement. Because of this the percentage for learning and growth is 60%.

12. Oxfam Novib

13. Aid output

a. Amount of help provided: Oxfam coordinated the emergency aid of the twelve Dutch relief organizations already in place. A team of Oxfam India immediately was sent to the disaster area for damage assessment and to give aid. From Oxfam Spain five tonnes on water and sanitation goods was sent from a central warehouse. After the initial assessment and deployment the Oxfam teams sent porters to the villages in the areas that were difficult to reach. Also shelter tents were delivered to the camps. All together the organization was able to shelter and provide water and sanitation for more than 30,000 people. In total aid was given to 445,000 people in six months by:
   i. 54,000 emergency aid kits and shelter;
   ii. 50,000 sanitation kits;
   iii. 8,000 toilets;
   iv. Clean drinking water for 35,000 people;
   v. New seeds and storage for 34,000 farmers.

b. To assess how much aid was brought in the first two weeks, this number will be divided through twelve. The total aid output = 445,000/12 = 37,264 people that received help;

c. Right product: because the extent of the disaster there was need of almost all basic needs in the first few weeks. Therefore all aid was the right product; coverage of the right product is assumed to be 100%;

d. Right amount: because the need of almost all basic products was so large the amount of products and aid of one single organization will only cover part of the needed number of products. Since Oxfam also made an effort to reach areas that were difficult to reach, it is assumed that the Oxfam aid covered a reasonably large part of the need of about 10%. It is however at this time impossible to determine what the exact percentage is;

e. Right place: all Oxfam aid was given on locations where people gathered in camps, also in areas that were difficult to reach. It can be assumed that these locations were mostly the right place. It is assessed that in the first period all aid was brought to locations where help was needed most; the percentage is 100%;

14. Supply chain performance

a. Responsiveness: after the earthquake Oxfam India immediately sent a team to the area, which arrived within one day after the disaster; their lead-time is 1 day. The additional team and aid goods arrived on the third day after the disaster; their lead-time is 3 days. The average lead-time = (1 + 3) / 2 = 2 days;

b. Need estimation: Oxfam uses the need estimation of the UN, therefore the score on need estimation is the same as the UN score that is roughly 95%;

c. Agility:
   i. Flexibility in weight: No data was obtained on the transport capacity of Oxfam, however because of the very great need for aid goods, especially in the first weeks of the aid operation and the initial shortage in transport means, transport flexibility is assessed as to be 10%;
   ii. Flexibility in types of aid (goods & services): Oxfam a rather broad variety of aid goods and services, mostly WASH facilities, shelter, food and water. The flexibility in number of products therefore is not as large as for instance the UN, but still substantial. This means a flexibility of 60%;
d. Supply chain robustness: The airport of Kathmandu remained operational. The roads were heavily damaged. Despite this the team was operational within one day, the additional team arrived within three days. During the aid operation the Government of Pakistan decided to refuse the transport of shelter tents through their country in order to protect their own market. This problem was solved by obtaining shelter tents from a lot of different locations. This shows that the supply chain proved to be quite robust. For all cases there was however no contingency plans available, but solutions were made possible by the creativity of the local management. The total robustness is assessed to be 70%.

15. Financial efficiency
   a. Distribution costs: for this case no financial data was available. There must undoubtedly be some kind of financial data somewhere in the organization; it proved to be impossible to obtain this data. This is assumed not to have to do with willingness of the organization to cooperate with the research or with security reasons, but because financial data currently is not used to measure the efficiency or effectivity of the organization;

16. External process
   a. Connectivity: between the different Oxfam elements the connectivity of systems is low (verwijzing interview Sanne Wijnhart) and there are not many applications in use. There is a structural communication between the different departments on different levels, for instance in the Dutch cooperation in the so-called ‘cooperative aid organizations’ (samenwerkende hulp organisaties). The downside of this sort of co-operation is the negative effect (delaying) on decision-making. In case of operations such as the earthquake in Nepal, there is a daily coordination meeting between all organizations present in the area, chaired by UNDAC/UNOCHA. Next to the structural meetings, there is also a lot of bi-lateral communication. In total the connectivity is assessed at being 80%;
   b. Standardization: Oxfam has a number of framework contracts with logistic service providers, as most NGOs have. There are agreements and structures on a national level between all the agencies involved in bringing aid. There are guidelines on which part of the organization is responsible for each task and how to communicate. The standardization is assessed at a percentage of 60%;

17. Organizational capacity
   a. Learning & growth: Oxfam works on improving its performance through evaluations of operations, long-term work groups and through special training for its personnel on different areas of expertise. There is however no element in the organization that specifically focuses on the process of renewal and improvement. Because of this the percentage for learning and growth is 60%.