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Disaster Supply Chain: A Comparison between Developing and Developed Countries

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A *Dissertation* submitted to the School of Mechanical, Industrial and Aeronautical Engineering in the Faculty of Engineering and the Built Environment, University of the Witwatersrand, in fulfilment of the requirements for the degree of *Masters in Engineering*.

October 2021

DECLARATION

I declare that this dissertation is my own unaided work. It is being submitted to the Degree of Master of Science to the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination to any other University.

..FMarais.....

(Signature of Candidate)

..2nd.... day of ..October....., ...2021.....

(day) (month) (year)

ABSTRACT

Millions of people are affected by natural disasters every year, with a significant impact on people's lives and livelihoods as well as the infrastructure of the affected countries.

This research explores the similarities and differences between sudden-onset natural disaster supply chain networks in developing and developed countries. This is achieved through a thorough investigation of the available literature in the form of a structured literature review, followed by a holistic multi-case study where four comparable disaster events were investigated. The identified events are the Iran (2012), Italy (2016), Nepal (2015), and Japan (2011) earthquakes, respectively. Finally, a cross-case analysis of the four identified cases was conducted.

Notable findings from the study are first, that the disaster relief effort can be classified as a supply network, secondly that there are three distinct sub-phases during disaster response namely: search and rescue, relief and recovery and finally it can be concluded that disaster response supply chain networks are different in developing and developed countries.

DEDICATION

First and foremost: to my Lord and Saviour, Jesus Christ: without You nothing is possible.

You blessed me as you blessed Bezalel – "*filled with the Spirit of God, with wisdom, with understanding, with knowledge and with all kinds of skills"*

Exodus 35:31

And to my precious family: André, Eliana and Danielle

May this work give you faith in the impossible.

ACKNOWLEDGEMENTS

I would like to express my deepest gratitude to those who have supported me throughout this journey.

My dearest husband, André, for your unwavering love, support, and countless cups of coffee through difficult times. You are the best husband, dad, and MS Word formator I know. I love you to the moon and back.

Those who believe in me much more than I believe in myself: André, Ma Elize, Marise, Sophia, and Frans.

Ma Elize and Pa Dawie who offered a writing haven when I needed it most.

Frans, who came over for gluten-free pancakes and planted this crazy idea in my head, and André and Sophia who fanned the flame…

My precious light tribe: Angie, Ellenore, Felicity, Desiré, Soekie, Sophia, and Stefanie. Your practical, physical and spiritual support kept me going when I knew I had nothing left. Thank you for being my Aaron and Hur: *"Aaron and Hur held his hands up – one on the one side, one on the other – so that his hands remained steady until sunset."* Exodus 17:12b

Bernadette, thank you for 'getting' my idea and gently guiding me through academic writing.

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NOMENCLATURE

ACTED	Agency for technical cooperation and development
ALNAP	Active Learning Network for accountability and Performance in Humanitarian Action
BRC	British red cross
CAFOD	Catholic agency for overseas deployment
CCCM	Camp coordination and camp management cluster
CRED	Centre of Research on the Epidemiology of Disaster
CRS	Catholic relief services
DART	Disaster assistance response team
DHL DRT	DHL Disaster response team
DOD	US department of defence
DRO	Disaster Response Organisation
DSC	Disaster Supply Chain
DSM	Disaster Supply Chain Management
DWW	Doctors worldwide
EC	European commission
EOC	Emergency centre with SAR equipment, wireless radio communication system, computers and printers.
ERT	Emergency response team
FCCS	Field coordination support section
FMT	Foreign medical team
GM	Global medicine

GOC	Government of China
GOI	Government of India
GOJ	Government of Japan
GON	Government of Nepal
HCT	Humanitarian country team
Helo	Helicopter
HS	Humanitarian System
HS	Humanitarian Supply Chain
IAEA	International atomic energy agency
ICPD	Italian Civil Protection Agency
IFRC	International Federation of Red Cross and Red Crescent societies
IHP	International humanitarian partnership
IOM	International organisation for migration
IRC	Italian red cross
IRCF	International red cross federation
IRCRC	International red cross and red crescent movement
IRCS	Iranian red crescent society
ISDR	UN International Strategy for Disaster Reduction
JHAST	Joint humanitarian assessment support team.
JICA	Japan international cooperation agency
JRCS	Japanese red cross society
LC	Logistics cluster
LWR	Lutheran world relief

MC	Mercy corps
MDM	Medecins du monde (doctors of the world)
MM	Mercy Malaysia
MOHME	Ministry of health and medical education
MSF	Medecins Sans Frontieres
MSU	Mobile storage unit
NCPS	National civil protection agency
NDMO	National disaster management organisation
NEOC	National emergency operations centre
NGA	National Governors' Association Centre for Policy Research
NGO	Non-government organisation
NRC	Norwegian Refugee council
NRCS	Nepal red cross society
OCHA	United nations office for the coordination of humanitarian affairs
OSOCC	On-site operations coordination centre
OSOCC	Off-site operations coordination centre
RFL	Restore family links
SAR	Search and rescue
SARAIS	Search and rescue in disasters
SC	Save the children
SCOR	Supply Chain Operations Reference model
SHA	Swiss humanitarian agency
SOND	Sudden Onset Natural Disaster

TIA	Tribhuvan International Airport
TSF	Telecoms sans frontieres
UN	United Nations
UNDAC	UN disaster assessment and coordination
UNEP	UN Environmental program
UNFPA	UN Population fund
UNHCR	UN high commission of refugees
UNRC	UN Resident coordinators office
USAR	Urban search and rescue
USG	United States Government
WFP	UN world food program
WHO	World health organisation

1 INTRODUCTION

1.1 Research Background/Context

Every year hundreds of natural disasters occur across the globe: thousands of people lose their lives, millions are affected, and billions of dollars of damage is incurred (CRED, 2015). With the occurrence of such an event, the global community – from countries and large organisations to individual benefactors – provides assistance to the afflicted country. This assistance is either in the form of monetary donations, relief provisions such as food, water, and shelter, or physical teams of relief workers that aim to assist with rescue operations, medical assistance, or distribution of relief provisions (ALNAP, 2018)

For example, the Gorkha earthquake in Nepal which took place on 25 April 2015 (Regan, 2015): by 28 April 2015, 20 countries as well as the EU, The World Food Program, UNICEF, and UN had committed and mobilised at least the following aid (based on published numbers only, more resources were reported to be sent but not explicitly stated):

- 39.9 Million USD
- 344 tonnes of relief provisions (blankets, shelter, water, food, and medical supplies)
- 1572 relief and medical personnel
- 4 field hospitals
- 17 aircraft
- 17 helicopters

Relief aid continued to pour into Nepal from all over the world. The challenge with this situation, as well as most other disaster situations, is coordinating the sheer number of governments, organisations, people, aircraft, and volume of goods flooding into a situation that is already, by its very nature, unstable (Anyadike, 2015).

1.2 Motivation

This situation is not unique as millions of people are affected by natural disasters every year. In these situations, many entities such as local government, international governments, military, NGOs, humanitarian organisations, and volunteers enter the disaster situation to assist victims and offer relief. Relief can be in the form of rescue operations, medical assistance, or provision of food and shelter – to name a few.

The primary challenge is the inherent instability in the aftermath of a large-scale natural disaster. This is then compounded by a lack of coordination of stakeholders, a lack of communication due to damage to infrastructure, inexperienced volunteers and organisations, and tons of superfluous goods being brought into an already clogged and badly managed system. The result is a situation where the entities aiming to aid victims end up worsening the situation and causing more complexity and problems than they solve (Barnes, 2015, Al Jazeera, 2015)

The disaster relief effort - getting provisions and services to those who are most in need – may, thus, be envisaged as a complex and time-critical supply chain or supply network.

Considering typical differences in infrastructure and resources between developing and developed countries, one would expect that developed countries are better equipped to handle large-scale natural disasters than developing countries. This research aims to ascertain differences in the management of large-scale natural disasters.

1.3 Research question

Research Question: How do disaster response supply networks compare, when considering sudden-onset natural disasters in developing and developed countries?

1.4 Research Objectives

This study will aim to compare disaster response supply chains in developing and developed countries to ascertain the similarities and differences between the approach and execution of such efforts within the two economic frameworks. This will be accomplished by,

1. Identifying the key factors, variables, and concepts relevant to disaster relief supply networks.
2. Investigate each disaster event separately to gain an in-depth understanding of how the disaster unfolded and the resultant relief effort and subsequent supply chain network.
3. Describing the similarities and differences between disaster response supply chains in developing and developed countries.

1.5 Summary of Research Method

A mixed-method approach was followed for this study (Streefkerk, 2019) with the primary analysis following a qualitative case study method as outlined by Yin (2009a). With the unit of analysis (case) a single, sudden-onset natural disaster event (Baxter and Jack, 2008). Selected cases were analyzed and compared using a holistic multi-case study design (Yin, 2009a).

Quantitative methods were used to identify comparable cases and evaluate comparative analysis results (Trochim, 2002). Once the cases were identified, secondary data (Kabir, 2018) from trusted sources were used to conduct a systematic data review (Center for Evidence Synthesis in Health, 2017) for each case.

Selected data were then analyzed through a multi-phase pattern matching technique (Trochim, 2002; Yin, 2009b) for individual analysis and compared using timeline, sentiment, process, and stakeholder analysis (Trochim, 2002) for the cross-case analysis (Yin, 2009b).

Ethics clearance was not required as sources were published in the public domain.

1.6 Delimitations

This study is limited to sudden-onset natural disasters occurring in the last decade (2010 – 2020). Sudden-onset natural disasters were selected as these events are unpredictable and typically require a rapid, large-scale response within a constrained timeframe which in turn results in unique supply chain conditions (CRED, 2009). Various other types of disasters also require a response but due to the slower onset e.g., drought, relief organizations are not subject to the urgency observed with sudden-onset events(CRED, 2009). "Man-made" disasters were not considered as these events were not covered in the available dataset (CRED, 2009).

Although disaster classification data was available for the period 1900 to 2020 (EM-DAT, 2020a) only the last 10 years were considered. This was due to concerns regarding the reliability of available data for older events.

Only the process and ecosystem around the physical supply chain of relief were considered. Processes regarding the funding of the relief system were not considered.

1.7 Outline of Chapters

Chapter 1 introduces the subject of study and details the context thereof. This chapter also formulates the research question and specifies the research objectives of the study.

In Chapter 2, key concepts and factors relevant to the disaster relief supply chain network were identified and explored by investigating the available body of knowledge related to the subject under study.

The selected study methods, protocols, and analytics methods are discussed in Chapter 3 along with data quality tests and ethical considerations.

Chapter 4 explores an overview of disaster events over the last decade and details the method used to select the four cases used for further analysis.

Each case is investigated in Chapter 5 according to the developed analysis framework.

In Chapter 6 a cross-case analysis is conducted comparing the four cases to identify the similarities and differences between developing and developed countries.

A discussion is presented in Chapter 7 highlighting the significance of the findings outlined in the cross-case analysis.

Chapter 8 concludes the research by reviewing the research question posed in Chapter 1 and presents the conclusions from the completed analysis. The chapter also details the challenges of the research as well as discussing further work.

2 LITERATURE REVIEW

The purpose of this chapter is to investigate literature pertaining to disaster relief supply chain networks. The literature review follows the principles of a systematic literature review (Center for Evidence Synthesis in Health, 2017; Xiao and Watson, 2019) it has been structured to address pertinent topics such as: "Anatomy of disaster", "Disaster management" and "Supply chain evaluation criteria". Further topics were, however, emergent during research, and sections were added for "the humanitarian system" as well as a special section dedicated to material from the Journal of Humanitarian Logistics and Supply Chain Management.

2.1 Systematic Literature Review Method

A systematic literature review was selected as *"*Systematic reviews are more rigorous than a traditional literature review because they use a systematic approach to search, select, and appraise the produced evidence*."* (ten Ham-Baloyi and Jordan, 2016, p. 123)

Steps followed in the systematic literature review (Center for Evidence Synthesis in Health, 2017; Xiao and Watson, 2019) were as follows:

1. Formulation and definition of the topic to be studied.
2. Development and validation of the review protocol (search criteria) to identify relevant literature.
3. Application of search criteria identified in step 2 to search the literature and identify applicable sources.
4. Screening identified literature for relevance (inclusion or exclusion) in the study.
5. Assessment of the quality of included sources.
6. Data extraction from included literature.
7. Analysis and synthesizing of extracted data.
8. Reporting of research findings.

The research question presented in Chapter 1 served as the topic to be studied through the systematic literature review. The research question was further developed into a set of theoretical questions which were in turn translated into a set of study themes for the literature review as depicted in diagram Figure 2.1 below.

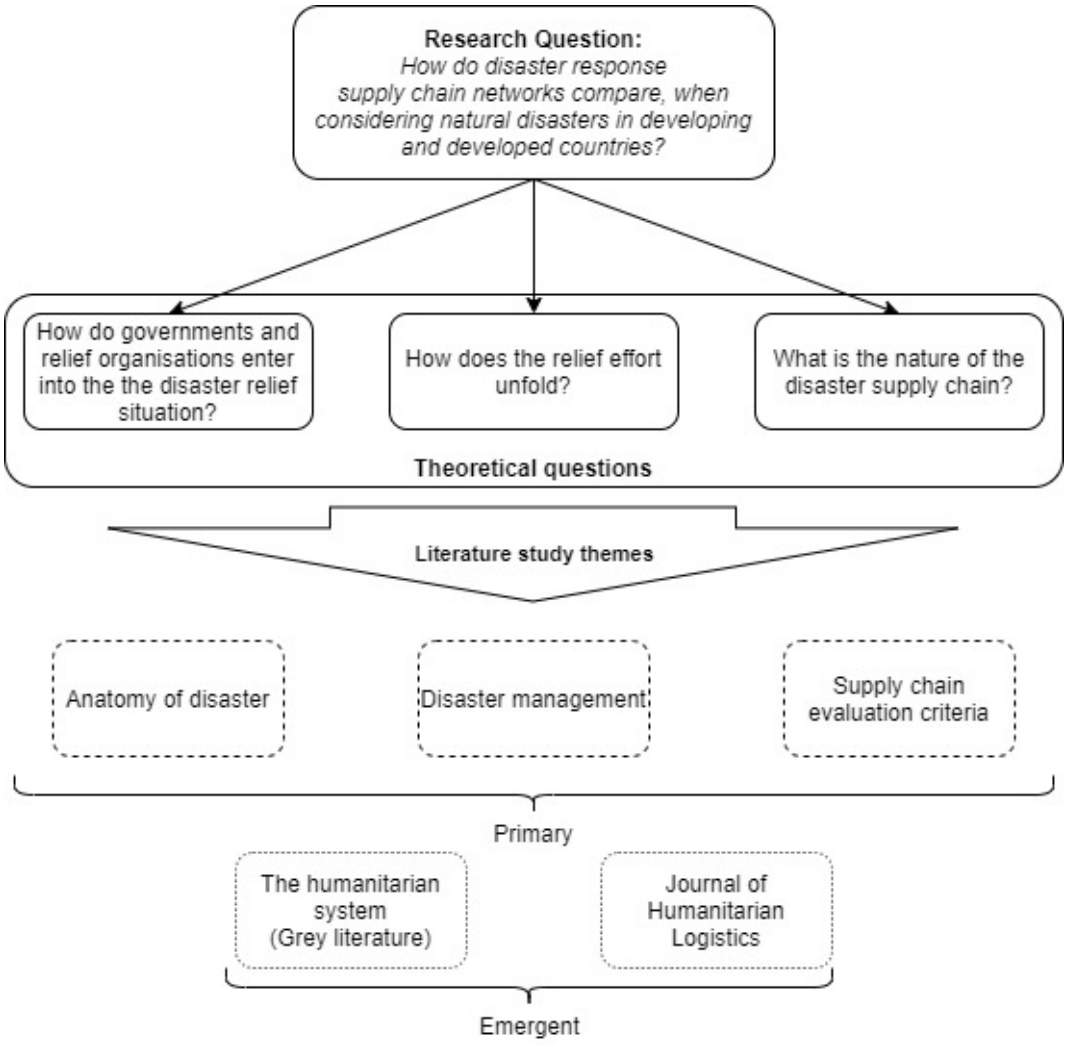


Figure 2.1: Topic definition diagram (developed by author)

Once the themes had been identified, search parameters and criteria for the primary themes described above were developed. These are included in

APPENDIX A. Using the search criteria, relevant literature was identified in the ProQuest database. ProQuest was the database of choice as it contained the largest number of relevant sources. Various rounds of searches were conducted with increasing levels of specificity to obtain a manageable volume of sources.

The process detailed below was followed to evaluate sources – screening for inclusion and assessing the quality of the work:

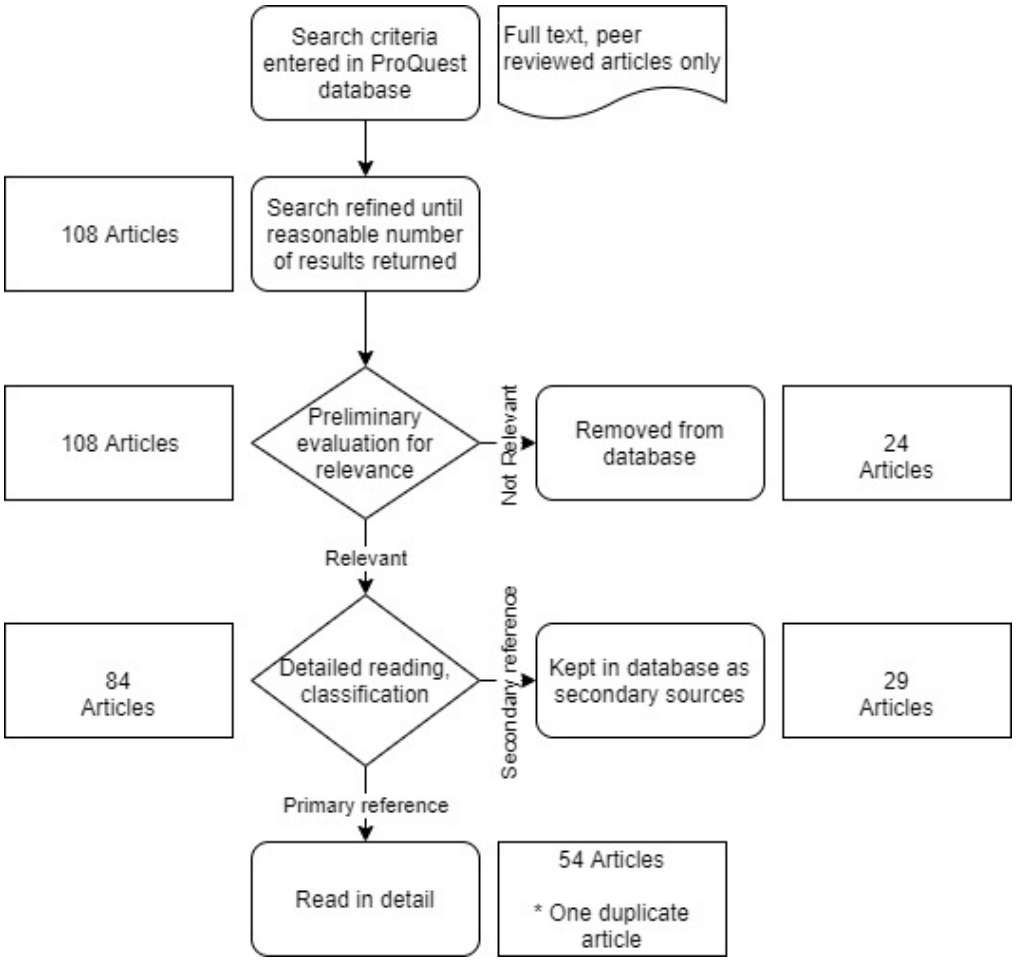


Figure 2.2: Literature review process (Research Shorts, 2017)

Once formal academic sources had been exhausted, it appeared that there were gaps in the information. As a result, grey literature was included in the study. Grey literature sources were identified by searching phrases such as “disaster types” in the Google search engine and selecting trusted sources e.g. The International Federation of the Red Cross and Red Crescent Societies (IFRC),

World Health Organization (WHO), Centre of Research on the Epidemiology of Disaster (CRED) and United Nations Office for the Coordination of Humanitarian Affairs (OCHA).

At this point, a comprehensive and robust body of literature had been collected from which relevant data were extracted and analyzed. Findings from the analysis are reported in the rest of this chapter.

Upon systematic review of the literature, it became apparent that the nature of humanitarian relief work, of which Disaster Supply Chain Management (DSM) is a subset, is multi-disciplinary. The diagram below shows the landscape of various fields of study related to humanitarian relief.

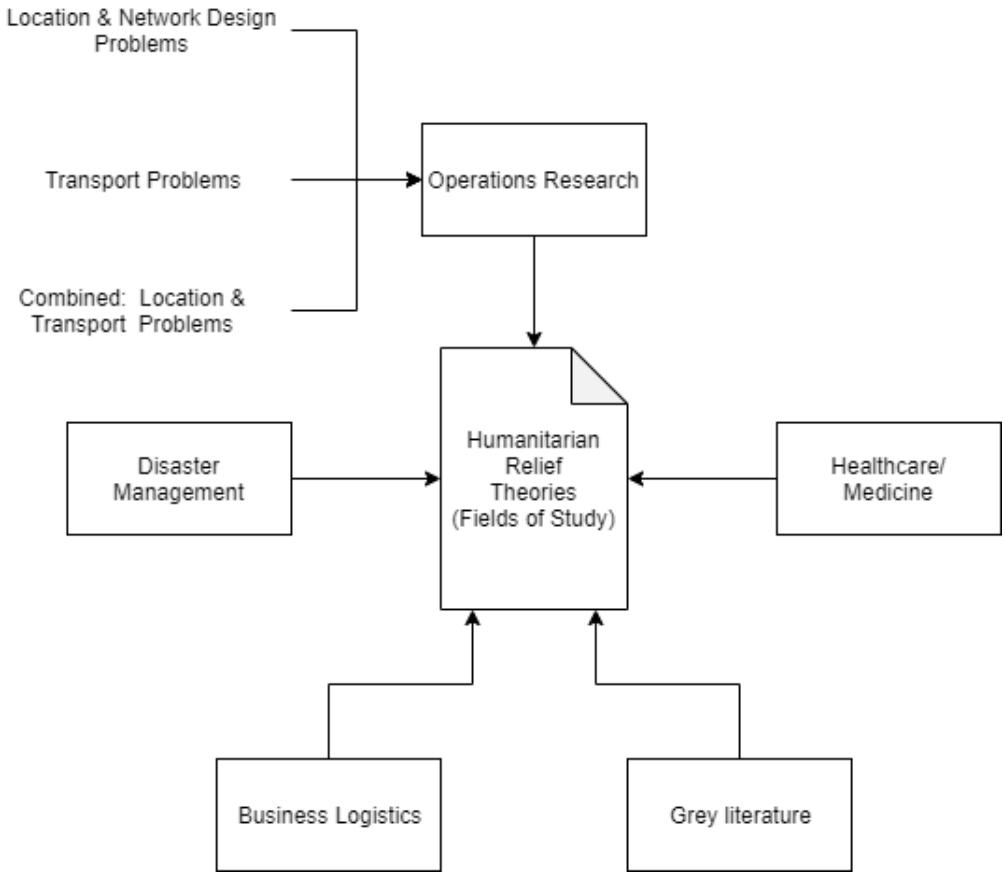


Figure 2.3: Landscape of study fields, based on Anaya-arenas et al. (2014) and Tabaklar et al. (2015)

It was interesting to note that while literature had been written from multiple fields and points of view, emergent themes were notably similar. The literature review was conducted using NVIVO, a software program designed for qualitative and mixed-method studies, specifically the analysis of unstructured text, audio, video, and image data (Yeager, 2021). Relevant literature was captured in Zotero (an open-source reference management software package (Zotero, 2021)) and transferred to NVIVO. All sources were reviewed, relevant themes were identified, and this data was added to the literature through the coding functionality in NVIVO. Once the literature was completed, emergent themes were identified and structured into the framework that the literature review will follow (Figure 2.4: Framework of Emergent Themes).

The following diagram is a schematic view of emergent themes in the literature, which form the framework of this literature review.

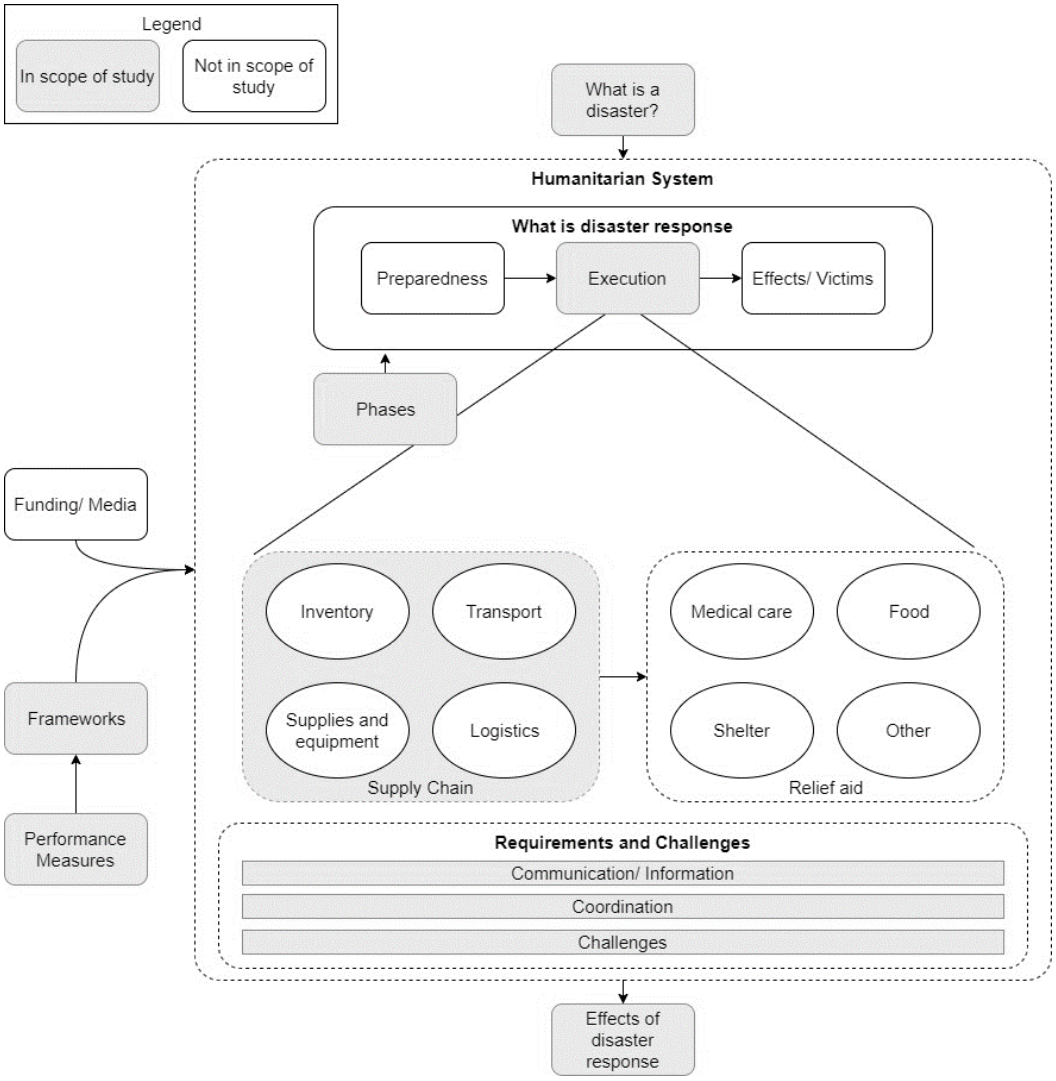


Figure 2.4: Framework of Emergent Themes

The subsequent parts of this chapter will elaborate on each of the sections highlighted above as part of the scope of the study. Themes that fall out of the scope of the study are shown above for context but are not discussed.

2.2 What is a disaster?

The Centre of Research on the Epidemiology of Disaster defines disaster as "a situation or event that overwhelms local capacity, necessitating a request at the national or international level for external assistance; an unforeseen and often sudden event that causes great damage, destruction and human suffering". (EM-DAT, 2021)

Disasters are classified into natural, technological, and complex disaster groups. This study will not consider complex disasters, thus Table 2.1 below classifies natural and technological disasters into each group's subgroup and disaster main type.

Table 2.1: EM-DAT disaster classifications (EM-DAT, 2020a)

Disaster Group	Disaster Subgroup	Disaster Main Type
Natural	Geophysical	Earthquake
		Mass Movement (dry)
		Volcanic activity
	Meteorological	Extreme Temperature
		Fog
		Storm
	Hydrological	Flood
		Landslide
		Wave action
	Climatological	Drought
		Glacial Lake Outburst
		Wildfire
	Biological	Epidemic
		Insect infestation
		Animal Accident
	Extra-terrestrial	Impact
		Space weather

Technological	Industrial accident	Chemical spill
		Collapse
		Explosion
		Fire
		Gas leak
		Poisoning
		Radiation
		Oil spill
		Other
		Air
		Road
		Rail
		Water
	Miscellaneous accident	Collapse
		Explosion
		Fire
		Other

Disasters are further classified into sudden-onset and slow-onset disasters. (OCHA, 2011a) defines a slow-onset disaster as "one that does not emerge from a single, distinct event but one that emerges gradually over time, often based on a confluence of different events" for example drought or displacement of people due to civil unrest. In contrast, a sudden-onset disaster is caused by a catastrophic, sudden-onset event such as a tropical storm, earthquake, or tsunami (OCHA, 2011a).

Typically, sudden-onset disasters lead to powerful images being published by international media spurring a flurry of donations globally. This spike in attention also puts pressure on national and international agencies to respond and lend aid to the affected country, which in turn leads to pressure on the country's organizational and logistics systems creating a unique set of circumstances (Overstreet et al., 2011). This highlights the criticality and complexity of the supply network of aid into the affected region. For this reason, this study will focus on sudden-onset natural disasters only.

2.3 Phases of disaster

Disaster management, which broadly mirrors a risk management approach, is typically divided into four phases (FEMA, n.d.):

- Mitigation
- Preparedness
- Response and
- Recovery

These phases follow upon each other as show*n* in Figure 2.5: Phases of disaster below.

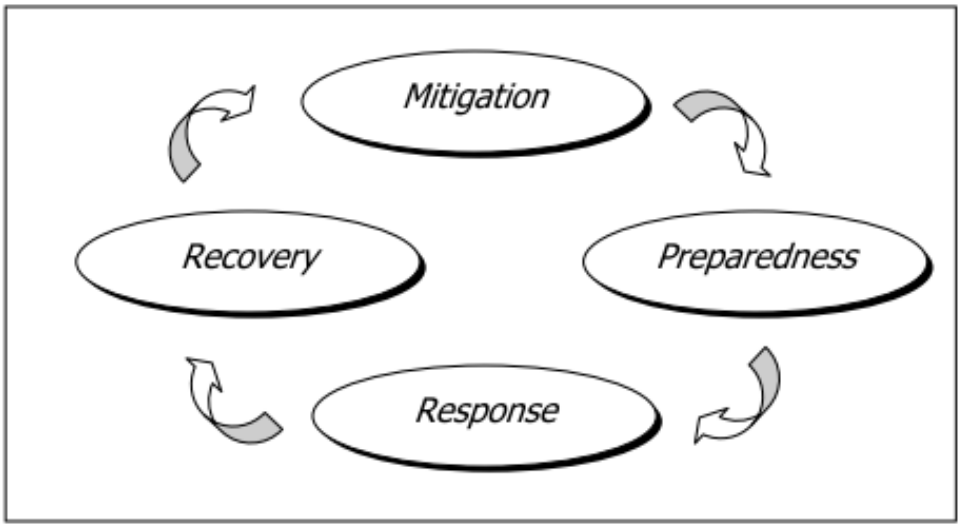


Figure 2.5: Phases of disaster (FEMA, n.d.)

Proactive Phases:

Mitigation and preparedness are phases that take place before an event occurs. The mitigation phase consists of activities aimed at preventing a disaster from happening entirely or lessening the impact of a potential disaster. The preparedness phase aims to prepare for a potential disaster and to make sure that the country or region has sufficient capacity to cope with the eventuality of such an event. (Chou and Chen, 2013; İlhan, 2011)

Reactive Phases:

Response and recovery take place after the disaster event has occurred. The response phase of the disaster is what this study will focus on. During the response phase critical personnel, equipment and supplies need to reach the hardest-hit areas as timeously and effectively as possible. Response efforts last up to six months. This again emphasizes the criticality of the response supply network. The key to this supply network is the humanitarian system, outlined in section 2.5 below.

The recovery phase follows the response phase and focuses on rebuilding the affected environment to its former state of functionality. Recovery, also known as development projects, typically has a lifespan of one to ten years. (Abir et al., 2017; Besiou et al., 2011; İlhan, 2011)

2.4 Disaster response

To understand the response to a disaster, one must first understand how a disaster typically unfolds. In this section, the elements and sequence of a sudden onset natural disaster and the resulting disaster response activities, are identified.

Literature detailing the sequence of events in the very early stages of a disaster is primarily available from a medical perspective. It is apparent from the literature that many challenges exist in the early hours and days after a disaster has hit. The most significant challenge is the availability of data and information and how the aforementioned is communicated to relevant stakeholders. This information is critical for decision-making as disaster events unfold. First responders, engaged in mission-critical activities such as search and rescue, treating patients, and stabilizing the environment, have the added responsibility of assessing and evaluating conditions on an ongoing basis, communicating to stakeholders, and amending response efforts accordingly (Birnbaum et al, 2016).

The following diagram structures an outline of events typically following a large-scale natural disaster.

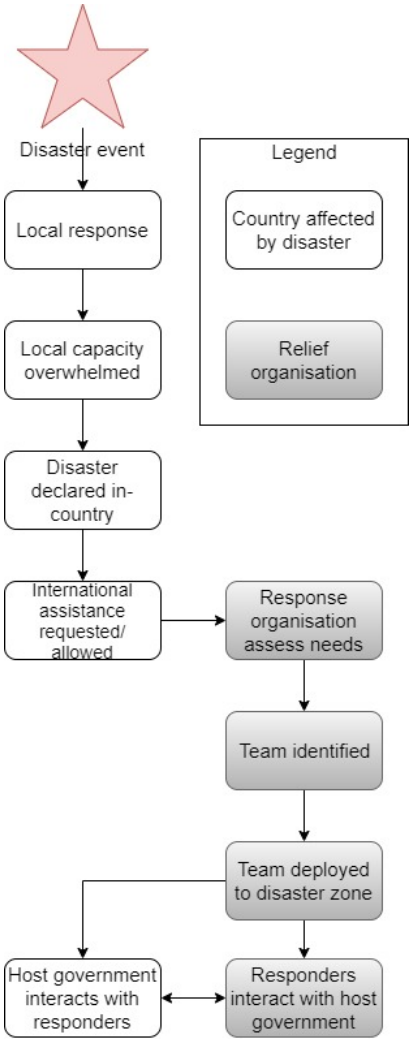


Figure 2.6: Basic disaster response, inspired by Anaya-arenas et al. (2014)

This diagram is an oversimplified view of what disaster response should look like. Once the complexities of the humanitarian system (section 2.5) are added, however, the picture changes drastically.

2.5 The humanitarian system

Active Learning Network for Accountability and Performance in Humanitarian Action (ALNAP) defines the humanitarian system as: "The **network** of inter-connected institutional and operational entities that receive funds, directly or indirectly from public donors and private sources, to enhance, support or

substitute for in-country responses in the provision of humanitarian assistance and protection to a population in crisis." (ALNAP, 2018, p. 32)

After the 1994 genocide in Rwanda, there was a sense that the humanitarian system (HS) had failed in response to this crisis, which led to demands for increased professionalism in the humanitarian sector (ALNAP, 2020). As a result, the ALNAP organization was formed in 1997 to enable more rigorous evaluation of humanitarian actions around the globe as well as improved communication of learnings and good practices within the sector. To this end, ALNAP regularly publishes a State of the Humanitarian System (SOHS) report detailing the humanitarian system, at the time of publication, using a pre-defined set of measures.

The ALNAP SOHS report is mainly concerned with 4 things:

1. Humanitarian needs over the preceding period
2. Supply of funding and how funding was spent
3. Size and structure of the Humanitarian System
4. Assessment of the performance of the Humanitarian System

Although global humanitarian needs and funding thereof are important elements of the HS this study will focus primarily on the latter elements of the report, namely, the structure and assessment of the HS or supply network.

Upon closer inspection of the various stakeholders involved in humanitarian relief, a complex system begins to emerge. Table 2.2: *Humanitarian System Stakeholders* (ALNAP 2018) below gives an overview of the stakeholders typically involved in the HS and Figure 2.7 depicts these entities in relation to each other denoted by dotted lines in the diagram, highlighting the complexity of the system.

Table 2.2: Humanitarian System Stakeholders (ALNAP 2018)

Humanitarian organizations and NGOs	Donors	Other
Local NGOs	Government agencies	Host government agencies and authorities
National NGOs	Trusts	Regional intergovernmental agencies
International NGOs	Private donors	Militaries and civil defense groups
UN humanitarian agencies		Development actors
International Red Cross and Red Crescent Movement		Private sector
		Civil societies (e.g. faith groups)
		Media
		Academia
		Diaspora groups

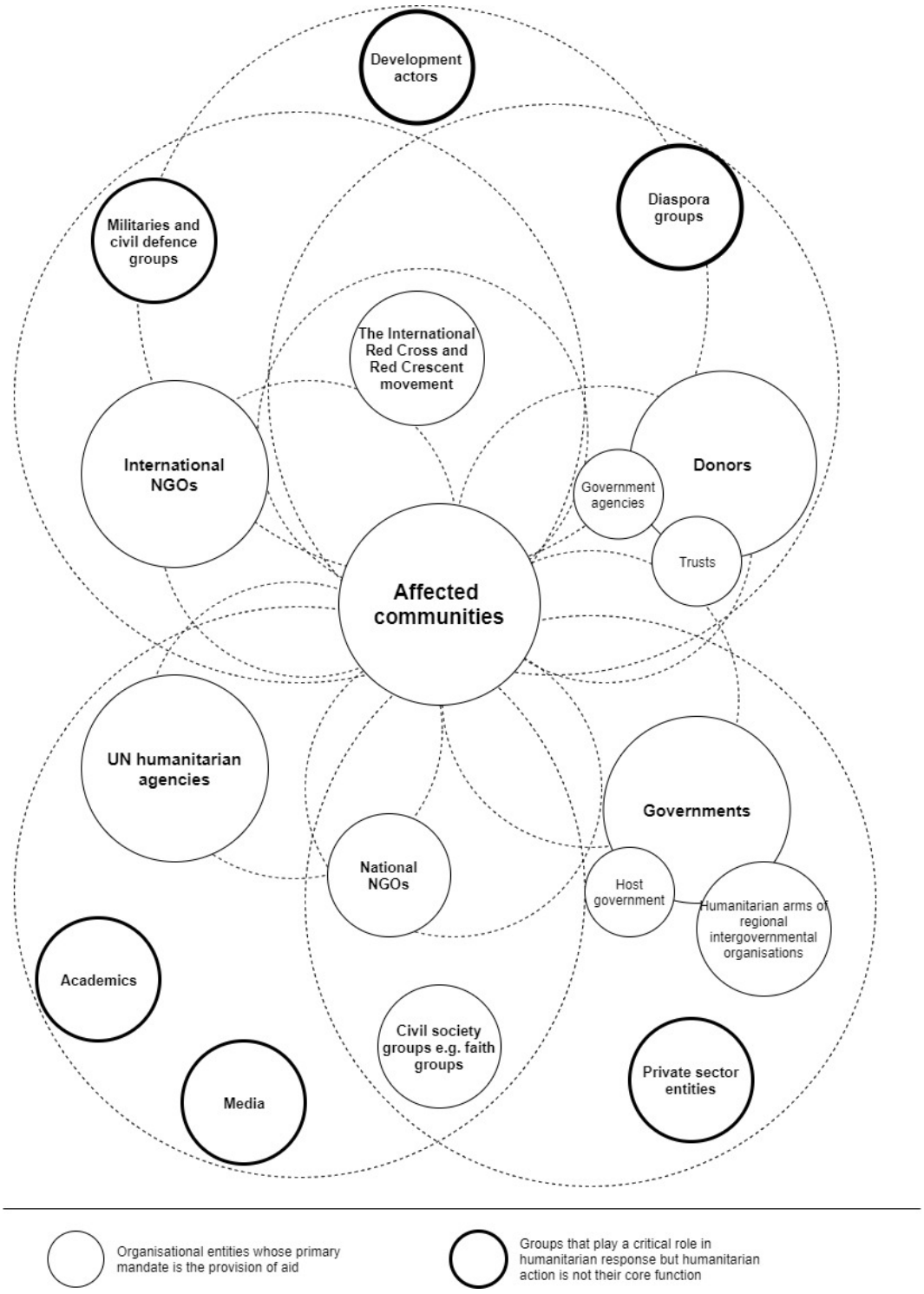


Figure 2.7 Organizational entities in the humanitarian system (ALNAP, 2018)

If Figure 2.6*: Basic disaster response* is considered through the lens of the complex humanitarian system, the situation depicted in Figure 2.8 will be an

expected occurrence in the event of a disaster response situation. Fig 2.8 describes a system with three (3) stakeholders and considering the example of the Nepal earthquake in 2015, where 450 relief organizations responded to the crisis, the complexity of the system and the coordination thereof becomes apparent. With each additional stakeholder in the system, communication becomes more challenging with an increased probability of a break in critical communications (OCHA, 2015).

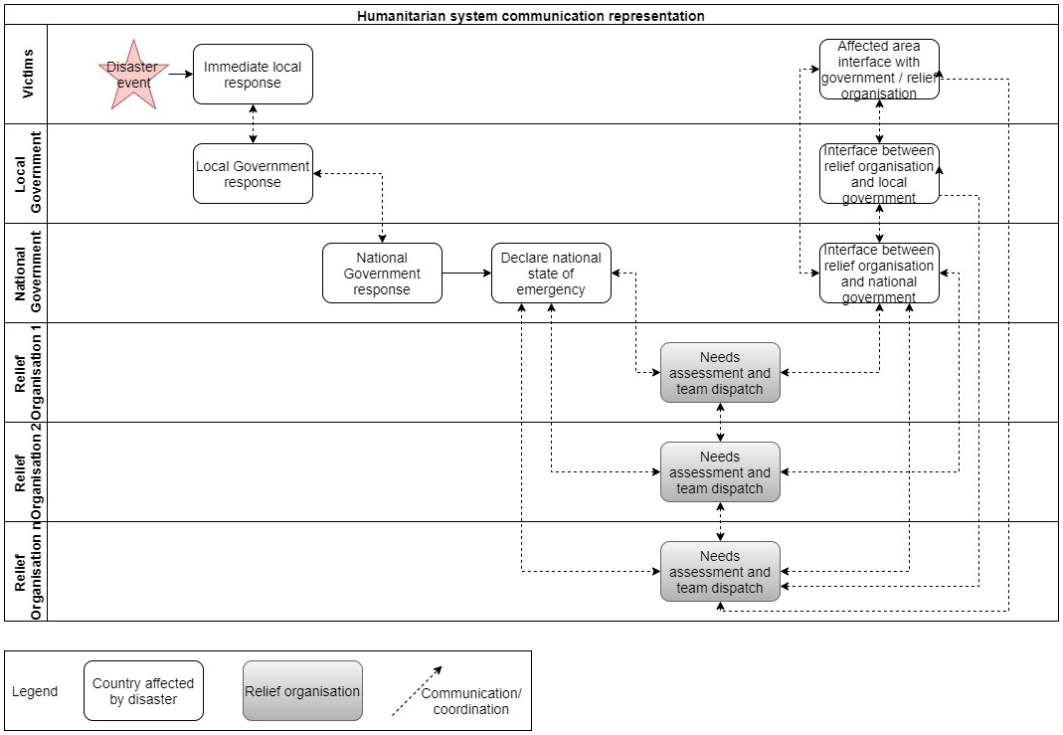


Figure 2.8: Disaster response with multiple stakeholders, inspired by Anaya-arenas et al. (2014)

A search of the OCHA *ReliefWeb* website reveals 2 925 affiliate organizations operating in the humanitarian aid sector alone. It is important to note that this is a list of *affiliate* organizations and is thus, by no means exhaustive. The involvement of such a large number of stakeholders points to a complex system of agencies with varying levels of experience, expertise, and ability to offer effective assistance in a situation where all stakeholders should work together and share

information to achieve the required goal of assisting those in need. To this end, many studies have been conducted and frameworks developed to guide and regulate the humanitarian system.

2.6 Frameworks

The most notable frameworks identified in the literature are: The Sphere project (Birnbaum et al., 2016b; Chou and Chen, 2013; Dunin-Bell, 2018), Hyogo framework (Chou and Chen, 2013; Guadagno, 2016; Yew et al., 2019), Sendai framework (Goniewicz et al., 2019; Guadagno, 2016; Yew et al., 2019) and the WHO Cluster Approach (Broby et al., 2018; Dunin-Bell, 2018; Kovács and Spens, 2009). These frameworks form the foundation of humanitarian response and are discussed for context of the disaster supply chain.

2.6.1 The Sphere Project

The Sphere Project was founded in 1997 by a group of NGOs and the IRCRC (International Red Cross and Red Crescent Movement). The purpose of the project was to create a guideline for *minimum standards and best practices* for humanitarian **response efforts**. These minimum standards translate to each individual's right to water, shelter, food, and health, also referred to as the rights-based approach to humanitarian work. The project yielded a Humanitarian Charter and a set of minimum standards that are published together in what is known as the Sphere Handbook. The handbook was first published in 2000 and revised in 2003 and 2009-2010 (The Sphere Project, 2011).

An evaluation of the Sphere Handbook conducted in 2004 by Dyke and Waldman (2004) noted that the perception amongst humanitarian practitioners was that the Sphere project had exerted an important and positive effect on the practice of humanitarian assistance. This positive effect was, however, not clearly measurable. The report also noted several problems with the project:

- The "rights-based approach" which forms the cornerstone of the Sphere project is not well understood

- Confusion regarding the terminology used in the handbook
- Knowledge of the project is not uniformly distributed in the humanitarian community
- The project covers a limited emergency paradigm
- In some cases, the application of the Sphere standards elevates the living standards of the affected population above that of the surrounding population which causes tension in the overall population of the affected country
- Lack of funds directly impacts the ability of humanitarian practitioners to implement the standards as outlined in the Sphere Handbook

These problems may have been addresses in subsequent years. Documentation could however not be sourced to verify which of these challenges, if any, have been addressed.

2.6.2 Yokohama, Hyogo and Sendai Frameworks

This set of frameworks focuses on the **prevention of disaster and to lessen the potential impact thereof.** While this research is centred around the response to a disaster, nonetheless these frameworks provide context. These prevention frameworks have been developed since 1994 and are reviewed every decade or so after which a subsequent framework will supersede the previous framework (PreventionWeb, 2020a).

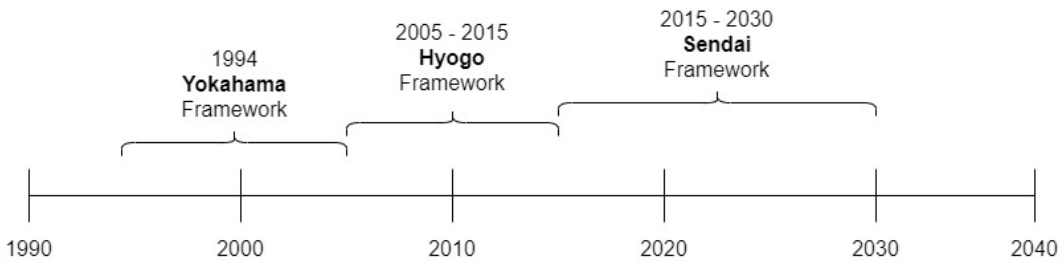


Figure 2.9: Landscape of disaster prevention frameworks

The goal of the current, Sendai framework, is to "Prevent new and reduce existing disaster risk through the implementation of integrated and inclusive economic, structural, legal, social, health, cultural, educational, environmental, technological, political and institutional measures that prevent and reduce hazard exposure and vulnerability to disaster, increase preparedness for response and recovery, and thus strengthen resilience." (PreventionWeb, 2020b). The primary benefit of these frameworks is that stakeholders, who are typically involved in the disaster response effort e.g., governments, relief organizations, and non-government organizations, consider the impact of and response to an event before it occurs. This then potentially reduces the risk of an event occurring or allows preparation for a potential disaster event, ultimately improving the execution of the disaster response should it occur.

2.6.3 WHO cluster approach

The cluster approach forms part of the "The humanitarian reform (2005)" which focuses on three (3) key areas (IASC, 2020):

1. More effective humanitarian financing
2. Strengthened humanitarian coordination system, providing more strategic leadership and coordination
3. Implementation of the cluster approach

The cluster approach is a global coordination system to aid humanitarian and emergency relief. A cluster is a group of humanitarian organizations in each of the main sectors of humanitarian action (OCHA, 2020). Figure 2.10 below depicts the main sectors of humanitarian action as well as the organizations responsible for each.

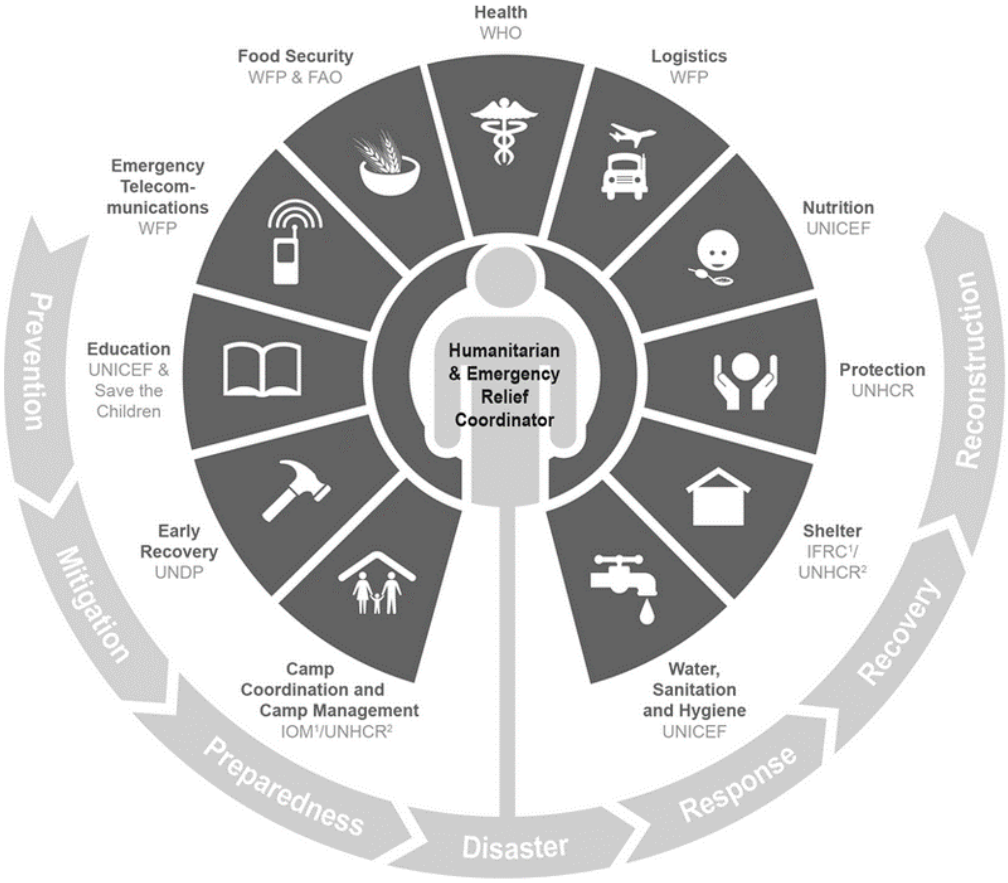


Figure 2.10: Cluster approach (OCHA, 2020)

The cluster approach wins and losses

After the adoption of the cluster approach, several evaluation studies were completed on humanitarian events where the cluster approach was applied (Steets et al., 2012). Findings from these evaluations were that the following operational benefits had been observed in the response events where the cluster approach was followed (Steets et al., 2012):

- Improved coverage of humanitarian needs in some areas
- Gaps better identified and duplication of effort reduced
- Enhanced learning opportunities for practitioners
- More predictable leadership
- Stronger inter-agency partnerships

The following operational challenges and shortcomings were also identified (Steets et al., 2012):

- Alienation of national and local ownership and capacities
- Poor management and facilitation
- Inter-cluster coordination is ineffective with little integration between clusters

Gavidia, (2017) argues that the cluster approach is ineffective due to the limited willingness of humanitarian agencies to share information and the ability of cluster leads to effectively integrate and disseminate provided information. It is also mentioned that politics in the affected governments have a negative impact on an effective response. In opposition, Broby et al. (2018) states the finding that working within existing frameworks, such as the cluster approach, is a critical element to successful medical response during a disaster.

2.6.4 Performance Measures

In large part, the frameworks discussed in section 2.6 *Frameworks* provide structures by which humanitarian efforts can be measured and analyzed. Adivar and Mert, (2010) however argue that measuring the effectiveness of any relief effort is one of the biggest challenges faced by humanitarian organizations, and Kovács and Spens, (2009) state that lack of standards and indicators are some of the biggest challenges which is echoed by Abir et al.(2017), Anjomshoae et al. (2017), İlhan(2011), Seaman(2008). Reasons cited for these challenges are:

- Lack of technical expertise (Seaman, 2008)
- High staff turnover (Seaman, 2008)
- Performance measures are not standardized across organizations causing practitioners to repeat the same mistakes (Abir et al., 2017; Adivar and Mert, 2010)
- The ad hoc nature of relief organizations leads to a lack of performance measurements (İlhan, 2011)

2.7 The humanitarian system a supply network?

(Van Wassenhove, 2006) argues that disaster relief is 80% logistics and that the only way to comply with increased requirements for accountability and transparency is through improved supply chain management.

2.7.1 Supply chain management

The Association for Supply Chain Management (ASCM) defines supply chain management as "the design, planning, execution, control, and monitoring of supply chain activities with the objective of creating net value, building a competitive infrastructure, leveraging worldwide logistics, synchronizing supply with demand, and measuring performance globally" (APICS, 2015). The diagrams below juxtapose the concepts of logistics and supply chain:

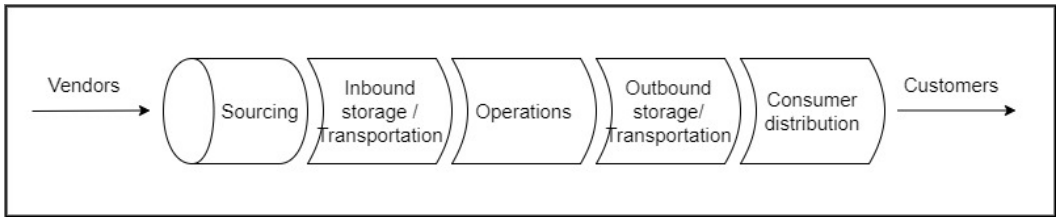


Figure 2.11: Logistics Supply Chain (Coyle et al., 2003)

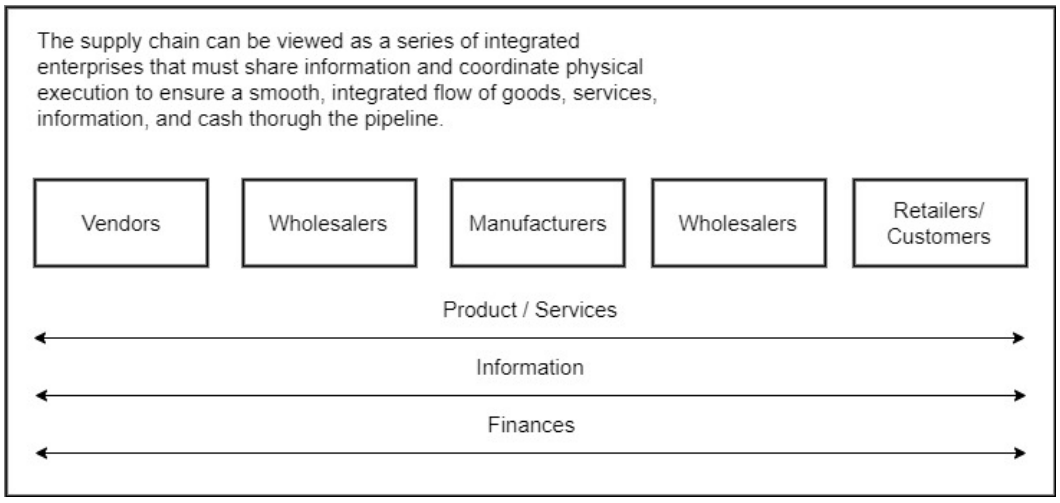


Figure 2.12: Integrated Supply Chain (Coyle et al., 2003)

Considering Figure 2.11*: Logistics Supply Chain (Coyle et al., 2003)* and Figure 2.12: *Integrated Supply Chain (Coyle et al., 2003)* above, *logistics* in this study will be defined as the process surrounding physical goods and physical goods only. Elements considered from the logistics point of view are:

- Source of goods (Vendors, suppliers)
- Type of goods and related transport requirements
- Transport of goods (inbound and outbound) including all elements of transport e.g. vehicles and personnel
- Warehousing
- Inventory

The definition of *supply chain* for this study will include:

- Logistics
- Information
- Coordination
- Communication
- Finances

2.7.2 Supply network

In this section, the concept of the "supply network" will be contrasted to the concept of the "supply chain" as described above in section 2.7.1. Braziotis et al. (2013, p. 648) defines a supply **chain** as "a set of primarily collaborative activities and relationships that link companies in the value-creation process, to provide the final customer with the appropriate value mix of products and/or services" and a supply **network** is defined as "a set of active members within an organisation's SCs, as well as inactive members to which an organisation relates, that can be called upon to actively contribute to an SC if a need arises." The study by (Braziotis et al., 2013) identified 7 key dimensions by which to evaluate the differences between supply chains and supply networks, this comparison is included in Table 2.3 below.

Table 2.3: Differences between supply chains and supply networks (Braziotis et al., 2013, p. 649)

Dimensions	Supply chain	Supply network
Focal concept	Products (and services)	Relationships
Design and configuration	Linear and ongoing, relatively stable structures (due to established power attributes)	Non-linear and dynamic structures (non-established power attributes)
Complexity	Low	High
Operations	Predictable and stable	Unpredictable/un-solidified
Coordination	Management focuses on the coordination of flow (information, products and finance) and on integration	Management focused on the coordination of the web of inter-firm relationships
Integration	Structured	*Ad hoc*/unplanned
Means to enhance competitiveness	Cooperation, collaboration, and coordination among SC members involving competition between these members in some occasions	Cooperation, collaboration, and coordination among members of a web of SCs. At the same time, it involves conflict and competition too

From this comparison, it becomes clear that a supply network is a more dynamic, complex system that focuses on relationships rather than the delivery of products and services. The complexity of the system is depicted in Figure 2.13.

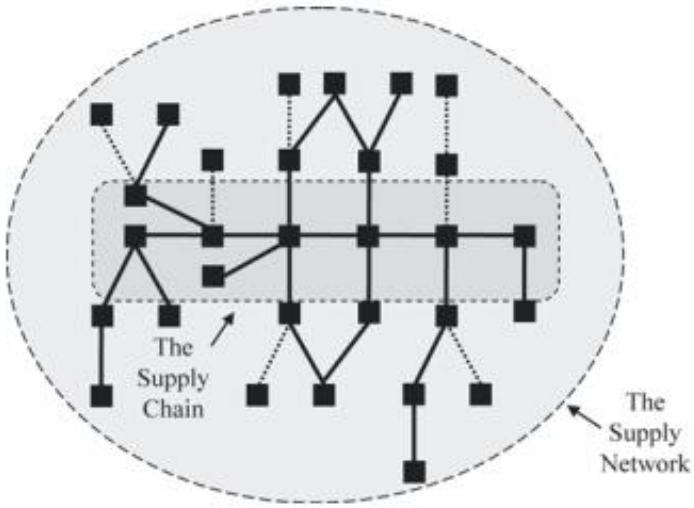


Figure 2.13: Supply chain and supply network: a diagrammatical representation (Braziotis et al., 2013, p. 649)

It can, thus, be concluded that a supply network represents a complex network of supply chains with active and inactive members. This very closely aligns with the humanitarian system as described in section 2.5.

2.7.3 Logistics, supply chain, and supply network in the disaster response context

Bringing together the concepts and requirements of the humanitarian system and disaster response discussed in sections 2.5, 2.4, and 2.8 as well as the above definitions of logistics, supply chain, and supply network the following comparison table can be inferred:

Characteristic (Alphabetical)	Logistics element	Supply chain element	Supply network dimension	Disaster response requirement
Communication		✓	✓	✓
Compexity			✓	✓
Coordination		✓	✓	✓
Funding		✓	✓	✓
Information		✓	✓	✓
Inventory	✓	✓	✓	✓
Non-linear and dynamic structures			✓	✓
Performance measurements		✓	✓	✓
Sourcing	✓	✓	✓	✓
Transport	✓	✓	✓	✓
Unplanned integration			✓	✓
Warehousing	✓	✓	✓	✓

Figure 2.14: Characteristics comparison (Braziotis et al., 2013; Coyle et al., 2003)

Although the above figure is an oversimplified representation, it indicates that the requirements of disaster response appear to align closely with what supply networks require. This notion is examined in more detail in the next sections.

2.8 Requirements and challenges of the Disaster Response

It has become clear that the humanitarian system is a complex organization with many role-players that are loosely connected and working towards a similar goal. If it is considered that the humanitarian disaster situation has the same requirements for success as a typical commercial system, with the added intricacies of a high-pressure disaster situation, these elements should be further investigated. This section explores the following elements from a humanitarian perspective through the lens of supply chain/network:

- Communication and information
- Coordination and
- Challenges

2.8.1 Communication and information

Best practice

(Birnbaum et al., 2016a) consider assessments a foundational element of any disaster intervention, the basis of assessments are data that are gathered and converted into information, which the medical fraternity can act upon. This information should be structured into a predetermined framework of indicators, facilitating the decision-making process. This argument is echoed by Broby et al. (2018) who further elaborate on the theme by noting that international disaster response agencies should only act upon the invitation of the affected country at which time organizations conduct rapid needs assessments in the affected country to determine the response requirements. The fact that needs assessments should be conducted on an ongoing basis and response accordingly adjusted, is an important point highlighted by both Birnbaum et al. (2016a) and Broby et al. (2018). A final noteworthy point raised by Broby et al. (2018) is the requirement for disaster responders to work with the affected nation at national and local levels to avoid wastage of valuable resources. (Polastro, 2014) posits that employing Real-time evaluations (RTEs) can free up operational bottlenecks and provide real-time learning critical to rapid, agile, and effective response during a disaster

situation. Like other evaluation methods, RTEs use qualitative methods to gather data e.g. interviews, peer reviews, and observations.

Challenges

Some of the challenges related to communication are:

- Lack of resources with respect to people and technology (lack of resources is a recurring theme for multiple requirements) (Kovács and Spens, 2009; Lou and Yu, 2014).
- Network disruptions, availability of funds, and use of organizational terminologies (Prutsalis, 2010).
- The unknown of new phenomena with insufficient time for appropriate analysis (İlhan, 2011; Van Wassenhove, 2006)
- Unreliable, incomplete or non-existent supply of information due to lack of Information Technology (IT) infrastructure (İlhan, 2011)
- Incompatible and/or siloed information and information systems

2.8.2 Coordination

Section 2.8.1 *Communication and information* and this section on coordination are very closely related as the one facilitates the other. Coordination between stakeholders is such a critical element of the disaster response and humanitarian effort, that it was cited as a central theme in a number of sources (Adivar and Mert, 2010; Broby et al., 2018; Kovács and Spens, 2009; Naor and Bernardes, 2016; Owusu-Kwateng et al., 2017; Van Wassenhove, 2006)

Best practice

Coordination between stakeholders and effective communication are quite simply lynchpins of effective humanitarian response efforts. Traits of successful coordination would be:

- Working within the existing systems as it: improves communication, minimizes duplication, increases accountability, encourages partnerships, and provides an opportunity for leadership (Broby et al., 2018)
- Increases resource availability through sharing (Naor and Bernardes, 2016)
- Flexible integration and coordination capabilities (Naor and Bernardes, 2016)
- Vertical and horizontal coordination (Owusu-Kwateng et al., 2017)
    - Vertical: upstream and downstream coordination
    - Horizontal: coordination with organizations operating at the same level
- Rapid initial assessment, rapid response time, and collaboration between relief agencies (Owusu-Kwateng et al., 2017)
- Defining, understanding, and implementing three forms of coordination as required (Van Wassenhove, 2006):
    - Coordination by command: central coordination, agreement on responsibilities and territorial areas of responsibility
    - Coordination by consensus: access to compatible or shared communications
    - Coordination by default: routine contact

Challenges

In contrast to effective coordination, many challenges exist with accomplishing satisfactory levels of coordination in the humanitarian context.

Challenges noted in the research are:

- Absence of central authority with sole power and complex coordination issues (Adivar and Mert, 2010)
- Lack of collaboration, knowledge about other organizations, and absence of clear mandates and legislation at a national level (Kovács and Spens, 2009)

- Number of stakeholders: international and local humanitarian organisations, governments, donors, the media, and military each with different structures, capacities, and goals (Naor and Bernardes, 2016; Van Wassenhove, 2006)
- Time pressure that exists with disaster response situations (Owusu-Kwateng et al., 2017)
- Limited inter-agency communication with disparate needs assessments leading to ill-prepared responders placing an additional burden on local resources (Abir et al., 2017)
- The desire to rush aid to victims regardless of poor structure of coordination among stakeholders (İlhan, 2011)
- Only the government of the affected country has the true authority of coordination. Where government is weak or overwhelmed standards cannot be enforced. (Seaman, 2008)

2.8.3 General challenges

Funding and donations

Inconsistent funding is a challenge often lamented by relief organizations and practitioners. Generally speaking, funding is not keeping up with the need (Pal et al., 2019). Lack of funding results in disaster response challenges, as funding is a critical requirement for enablement of the relief work (Birnbaum et al., 2016a, 2016b). It also prevents critical operational tools from being implemented e.g. systems required for communication and information infrastructure as described in section 2.8.1 above cannot be operationalized due to lack of funding (Adivar et al., 2010; Polastro, 2014).

This dynamic of insufficient funds leads to a situation where relief organizations view each other as competition as they are contending for the same pool of available funds – from governments and donors alike. It is also interesting to note that funding and media attention goes hand-in-hand as increased media attention typically leads to increased funding and donations (Kovács and Spens, 2009). Donations can however cause their own challenge in that donations in kind can be

culturally inappropriate and thus rendered unusable, clogging the system and further straining already strained resources (Kovács and Spens, 2009).

Personnel

Several authors note that personnel accounts for some of the biggest challenges in disaster response. Examples of these challenges include that teams in disaster response situations are typically ad hoc groups of individuals with varying degrees of experience and relevant training for the task at hand (Overstreet et al., 2011). In addition, it is noted that even experienced organizations face challenges with retention and high staff turnover of experienced personnel (Birnbaum et al., 2016a; Overstreet et al., 2011; Van Wassenhove, 2006). (Kovács and Spens, 2009) also note a general lack of resources, which includes people.

Training

A recurrent theme in the literature is that practitioners should be well trained – to know what to expect and how to act under extreme circumstances (Chou and Chen, 2013; Naor and Bernardes, 2016). This does however not always seem to be the case as noted by (Kovács and Spens, 2009) who list inadequate training as one of the leading challenges in disaster response.

Culture and language

Awareness and respect for cultural diversity is an element that can greatly influence the success of disaster response. "*The efficacy of responders was inhibited by language and cultural barriers. Translators were identified as a rate-limiting step in relief operations*." (Abir et al., 2017) commenting on the 2010 earthquake in Haiti. (Naor and Bernardes, 2016) further argues that especially healthcare should cater to culturally specific customs e.g. Indian and Arabic traditions.

Politics and corruption

A country affected by disaster ultimately carries the responsibility for reacting upon and managing its own disaster response. It is important to reiterate the point made in section 2.8.1 *Communication and information* that the affected country has to declare a state of disaster and invite relief agencies to respond to the event within its borders. Also mentioned in section 2.6.1 is the important point that responders should work with the affected country to achieve optimal results. The challenge that responders face in this context is that political agendas and corruption cause delays and misappropriation of relief services and supplies. *"Corruption has plagued almost every disaster relief effort in the developed as well as the developing world (Thomas and Fritz, 2006). Human interference in the distribution of aid can come in many forms such as political grand standing and dishonesty among the individuals distributing supplies (McEntire, 1999; McLachlin et al., 2009)."* (Overstreet et al., 2011)

Safety and security

Reports of looting and lawlessness after the advent of a disaster are common (Carroll, 2010; Lee, 2010). Victims are scared and desperate – this could lead to unpredictable and violent behaviour. Disaster responders move into this situation and have to cope with the additional threat to their personal safety and security (Naor and Bernardes, 2016) as well as the potential theft of required supplies (Chou and Chen, 2013).

Time pressure

The humanitarian system, in contrast to the typical commercial system, is an extremely high time pressure environment. Where the cost of delay in the commercial context might be monetary or lack of customer satisfaction, the cost of delay in the humanitarian context could be the difference between life and death for those affected. (Kovács and Spens, 2009; Overstreet et al., 2011; Van Wassenhove, 2006)

Unpredictability

Drawing the comparison between the humanitarian system and the commercial system once more: in a commercial context there is an element of predictability around the location, size, type and timing of demand, and the commercial institution will have some influence and control around where it chooses to supply its service or product. In contrast, when examining a disaster response, humanitarian institutions have no control or influence on where, when or how its resources (services and goods) will be required (Kovács and Spens, 2009). An added element of unpredictability is environmental unpredictability – the Nepal earthquake in 2015 for example had multiple aftershocks affecting relief work and the Japan earthquake and tsunami in 2011 resulted in a nuclear disaster (Naor and Bernardes, 2016). These additional, unpredictable events place the very people who are attempting to save lives, at risk.

Complexity and accessibility

Van Wassenhove (2006) argues that the biggest challenge facing relief efforts is the sheer complexity of operating conditions. Considering the challenges described in this section and adding an environmentally volatile situation with impassible roads, damaged infrastructure and thousands of people in potentially life-threatening situations the challenge seems almost insurmountable.

2.9 Commercial vs disaster supply chain management

The discipline of supply chain in the disaster response context borrows heavily from the commercial discipline of supply chain management (Abidi et al., 2014; Adivar et al., 2010; İlhan, 2011). There are however stark differences between the commercial and disaster supply chains which will be discussed in this section.

2.9.1 Supply chain management

As briefly discussed in section 2.7, a supply chain is an integrated system that involves the management of logistics as well as other business areas such as purchasing, production, warehousing, marketing and information technology with the primary objective of improving the efficiency of the supply chain (Poluha, 2016). An important element that distinguishes supply chain from logistics is the sharing of information and visibility of information across multiple echelons of the supply chain e.g. suppliers, manufacturing and sales (Maghsoudi and Pazirandeh, 2016).

The basic elements of supply chain management are (Poluha, 2016):

- Sourcing/supplier management
- Transport (primary and secondary)
- Warehousing
- Inventory
- Customer demand
- Information
- Coordination

SCOR

The commercial supply chain is typically ultimately concerned with the maximization of profit: minimizing cost and maximizing on-time, in-full deliveries. To this end, commercial supply chains strive to establish highly integrated supply chains. Considering the popular Supply Chain Operations Reference (SCOR) model as an example:

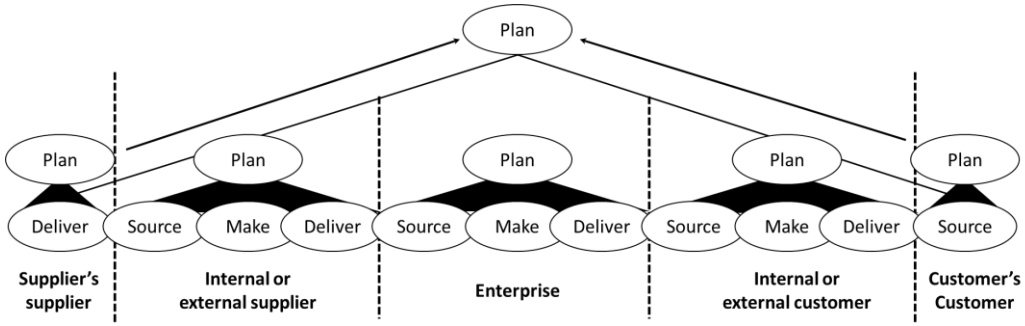


Figure 2.15: Schematic representation of the SCOR model (Poluha, 2016)

Businesses are encouraged to not only consider their single-stage (direct customer and direct supplier) supply chain for their reporting and planning processes but also extend visibility and management to their multi-stage supply chain i.e. the entire product life cycle from raw material to disposal (Poluha, 2016). According to (Poluha, 2016) the complexity and cost of the system increase disproportionately with the inclusion of the multi-stage supply chain and most businesses are thus limited to monitoring only one or two levels of their supply chain.

Balanced scorecard

Another popular supply chain management tool is the balanced scorecard developed by (Kaplan and Norton, 2014). Using this method, companies or organizations define strategic goals which translate to operational measures within several categories namely: Financial, customer, internal process and learning and growth and track progress and improvement accordingly.

Several authors have developed frameworks applying the principles of the balanced scorecard on the humanitarian environment (Abidi et al., 2014; Anjomshoae et al., 2017; D'Haene et al., 2015)

ASUG benchmarking and best practice study

Since 2004 the Americas "SAP Users" Group (ASUG) have been measuring the performance of businesses in supply chain management as part of a larger benchmarking and best practice study. The study considers 10 business processes

for the measurement of supply chains (Poluha, 2016). The diagram below depicts the processes used for benchmarking:

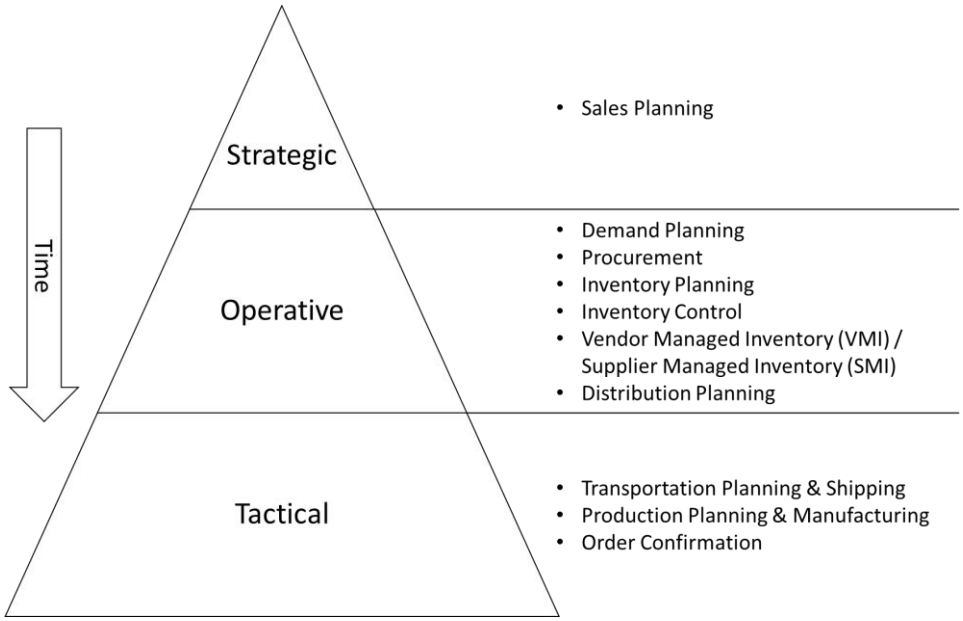


Figure 2.16: ASUG study supply chain processes (Poluha, 2016)

2.9.2 Comparing the commercial and disaster supply chains

To compare the commercial and disaster supply chains the ASUG business processes framework has been applied as a comparison framework. The ASUG framework was selected as it best suited the structure of the disaster supply chain.

Table 2.4: Similarities and differences between commercial and disaster supply chain inspired by (Poluha, 2016; Van Wassenhove, 2006)

Level	Process	Commercial	Disaster	Process definition source
Strategic	Sales Planning	Organisation has control over strategic direction and timing of activities, actions and changes. Data is used to create sales forecasts and plan activities accordingly. Typically sufficient data is available to build these forecasts and strategies.	Organisation has control over some strategic elements e.g. goal to prevent the loss of human life. From a disaster response perspective, the organisation will have control over whether it responds to a disaster event or not but will not have control over the timing of such an event i.e. when the disaster strikes. Data to develop forecasts and strategies will also not necessarily be available. Although many studies have been conducted to improve	(Tutorialspoint, 2020)

Level	Process	Commercial	Disaster	Process definition source
			forecasting, forecasts are dependent on data and will only be as good as the available data. Given the number of stakeholders and typically voluntary nature of participation making data available for forecasting will likely not be prioritised.	
Operational	Demand Planning	Demand planning aims to find a balance between sufficient supply and minimised inventory. Planning is based on forecasts using historic data to project future demand. In the commercial context, demand planning is done through the implementation of ERP systems.	Due to the short timeframe associated with disaster response, ERP systems and demand planning in its typical form is not applicable. Disaster response organisations (DRO) typically do not have the resources available to	(MSU, 2016)

Level	Process	Commercial	Disaster	Process definition source
		Typically, ERP systems are data-hungry and expensive.	implement and operate an ERP system.	
	Procurement	Opportunity for a long-term mutually beneficial relationship with suppliers. The organisation owns the relationship with the supplier.	Short 'once off' type of interactions with suppliers are characteristic. The DRO does not own the relationship with the supplier. E.g. a donor country procures and delivers aid to the affected country.	(Procurement Cloud, 2020)
	Inventory Planning	The organisation has a long-term view and control over inventory – impacts on cost and customer satisfaction through right-sizing inventory.	Due to the unpredictable demand, lack of ownership of inventory across the span of the supply chain and short lead times of disaster response, inventory planning in its *typical* form cannot be applied,	(Logistics Bureau, n.d.; van Wyk and Yadavalli, n.d.)

Level	Process	Commercial	Disaster	Process definition source
			thus specialised inventory management for the pre-positioning of inventory is employed.	
	Inventory Control	Organisation controls inventory through operational controls such as barcodes, reorder points and detailed inventory lists and counts. Organisation has control over and ownership of data and systems.	If the DRO chooses to use software such as Eden developed by Sahana, which is free disaster management software, some elements of Inventory control can be implemented during disaster response. Implementation of such software is however likely not standardised and would be dependent on at least basic power and network infrastructure.	(Sahana Eden, 2020; TradeGecko, n.d.) (Sahana Eden, 2020)

Level	Process	Commercial	Disaster	Process definition source
	Vendor Managed Inventory	Business model where the organisation buys a product from a vendor, but the vendor remains responsible for the management of the inventory, generally at the customer site.	Given that supplies are needed on-demand at very short lead times, at minimum cost, this model could potentially be applied to the disaster response environment.	(Business et al., n.d.)
	Supplier Managed Inventory	Supplier managed inventory for a manufacturer.	Not applicable as the DRO is not concerned with manufacturing.	(SAP, 2010)
	Distribution Planning	The process of planning to deliver goods efficiently, taking into account forecasting elements such as seasonality.	Distribution planning applies to DRO. Timelines of the planning might be on a different scale to commercial counterparts. (Anaya-arenas et al., 2014)	(MBA School, 2016; PlanetTogether, n.d.)
Tactical	Transportation planning and shipping	Daily planning and execution of transport and shipping to customers.	Disaster response will have a requirement for transportation	(Inbound Logistics, 2020)

Level	Process	Commercial	Disaster	Process definition source
		Typically facilitated through the use of a Transport Management System (TMS). A TMS will provide the company with visibility of loads, shipments and costs.	planning from both an inbound and outbound point of view. The process might be executed informally i.e. not using systems. This could cause challenges as coordination and availability of information is crucial to the disaster response effort. (Anaya-arenas et al., 2014)	
	Production planning and manufacturing	Detailed production plans – owned by the organisation – taking into account demand forecasts, orders, dependencies, material availability to optimise production from a cost, time and inventory perspective.	Not applicable in the DRO space.	(Inbound Logistics, 2020)

Level	Process	Commercial	Disaster	Process definition source
	Order confirmation	Acknowledgement of the receipt of the order. Activates the order fulfilment process.	In many cases, the DRO is on the receiving end of donations and the Order confirmation process will be taking place outside of its locus of control.	(Billomat, 2019)

From this comparison, it becomes clear that there are several similarities and differences between the commercial and disaster response supply chain.

Differences (Poluha, 2016; Van Wassenhove, 2006):

- Lack of control over the timing of disasters and unpredictability of disaster events.
- Short lead times and urgency of delivery.
- Lack of data availability.
- Lack of resources for example ERP systems and funding (Falagara Sigala et al., 2020).
- "Once off" nature of disaster events.
- Disaster response organisation (DRO) is not the owner of the supply chain relationship for example the supplier relationship.
- Challenging environment for inventory planning due to unpredictability.
- Varying levels of implementation and use of inventory control systems.
- Supplier management is not applicable.
- No formal transport management system (TMS).
- No requirement for production planning and manufacturing although resource planning is applicable.
- Ordering and order confirmation is often done by donor agencies and not the DRO itself.

Similarities (Poluha, 2016; Van Wassenhove, 2006)

- The vendor managed inventory model could potentially be applied, with consideration for the unique requirements of inventory pre-positioning related to disaster events.
- Distribution planning is critical to DRO operations (Anaya-arenas et al., 2014).
- Requirement for transportation planning and shipping.
- Requirement for resource planning (Gavidia, 2017).

From this comparison, it is clear that there are significant differences between commercial and disaster supply chains. Commercial supply chains tend to be linear, predictable and controlled whereas disaster supply chains are less structured and unpredictable – reinforcing the conclusion in section 2.7.2 that the disaster supply chain is better classified as a supply network.

2.9.3 Converting the supply chain process to a supply network process

Considering the disaster supply chain as a supply network, it could be argued that the ASUG process as depicted in Figure 2.16 should be re-organised for effective application to disaster response. Where strategy forms the spearhead of the traditional supply chain it could be argued that this principle should be inverted for disaster response as follows:

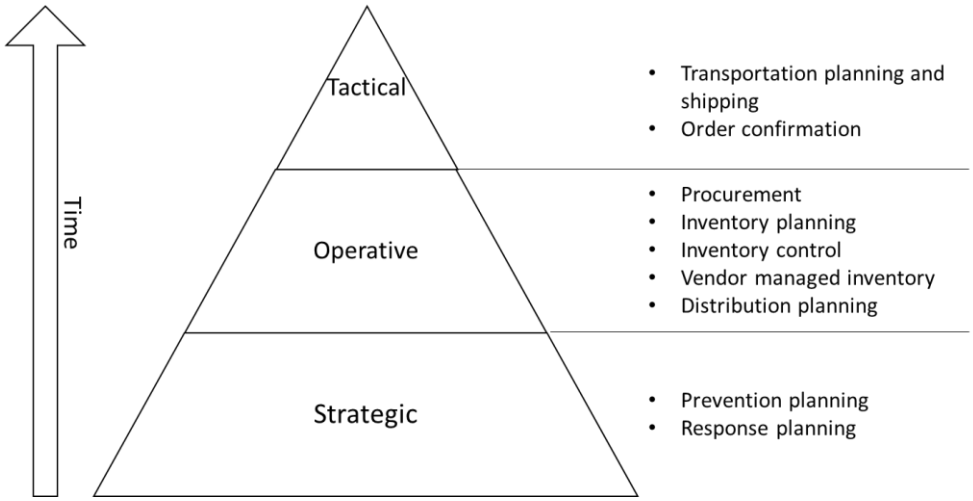


Figure 2.17: Supply chain process for disaster response (developed by author)

In the above model, the bulk of time and effort is applied to planning and preparing for effective response and ensuring that sufficient supplies and resources are available for dispatch at any given time to anywhere in the world. Bearing in mind the supply chain versus supply network comparison presented in Table 2.3, and considering that the supply network focusses on relationships

rather than products, with dynamic structures, high complexity, unpredictable operations, fluid relationships and ad-hoc integration it is concluded that the inverted ASUG model as depicted above in Figure 2.17 would be better suited to any supply network application.

2.10 Conclusions

From the literature, it is clear that disaster response is a highly complex system with many role players and many challenges. Multiple organizations have been formed and frameworks developed in an attempt to formalize and improve upon humanitarian response – of which disaster response is a subset. The biggest challenges in disaster response identified in this review are:

- The number of stakeholders involved
- No single point of responsibility and accountability.
- Voluntary participation in knowledge sharing
- Lack of standardized systems and processes
- Lack of funding to implement standardized systems

The concepts of logistics, supply chain and supply network were reviewed, and it was concluded that the supply network best reflects the disaster supply chain.

Similarities and differences between the typical commercial supply chain and disaster response supply chains were explored and the standard supply chain process was adjusted to fit the disaster response requirements, highlighting that disaster response follows the supply network model and resulting in a supply chain process model that would be well suited for application to any supply network.

Given that disaster response activities are mostly related to logistics with the added requirements of communication and information sharing, it can be concluded that disaster response organizations should consider it imperative to apply supply chain management principles to the execution of their duties.

At present, the focus of the literature is primarily considered with disaster response from a medical perspective. The scope of further research should also include disaster response and the broader humanitarian systems from a supply chain perspective, as supply chain principles could be applied to all elements of the response effort: from the distribution of basic provisions such as food, water and tents to the triage of critically injured patients and the distribution of such patients to the most suited medical care facilities.

3 RESEARCH METHOD AND DESIGN

The research design is presented in this chapter.

3.1 Methodological Approach

The methodological approach describes the collection of research strategies or designs i.e. inquiry procedures, together with the techniques, specific methods of data collection, analysis and interpretation that together form a particular research approach (Creswell, 2014; Richards and Morse, 2013). Due to the nature of available data related to the research, the study was designed using a mixed-method approach (Streefkerk, 2019). Quantitative data was available in the form of the EM-DAT database and the ReliefWeb database was used as the primary source of secondary qualitative data. Elements of both qualitative (data expresses in words, used to understand concepts, thoughts and experiences (Streefkerk, 2019)) and quantitative (data expressed in numbers and graphs, used to test or confirm theories and assumptions (Streefkerk, 2019)) methods were used, however, the primary research method follows the case study method as outlined by (Yin, 2009b).

It is argued that the research qualifies for a case study method. The following study method criteria (defined by (Yin, 2009c)) were considered and juxtaposed against the context of this study (Table 3.1: Case study method qualification criteria) it became clear that a case study methodology would be well suited.

Yin (2009) criteria	Context in this study
The investigator has little control over events	The investigator, in this case, has no control or influence over events being studied
Focus on a contemporary phenomenon within a real-life context	The "phenomenon" of disaster response is both contemporary and within a real-life context

Table 3.1: Case study method qualification criteria

3.2 Case study protocol

The five components of case study research as defined by (Yin, 2009a) was used as a framework to develop the study design. These components are (Yin, 2009a)

- The study question.
- The study's propositions.
- Units of analysis used in the study.
- Linking the data to the propositions.
- The interpretation criteria of the findings.

Each research component is discussed in the next section.

3.2.1 The study question

The research question for this study is: How do disaster response supply chain networks compare when considering natural disasters in developing and developed countries? The research question was developed into a set of theoretical questions as shown in Figure 3.1.

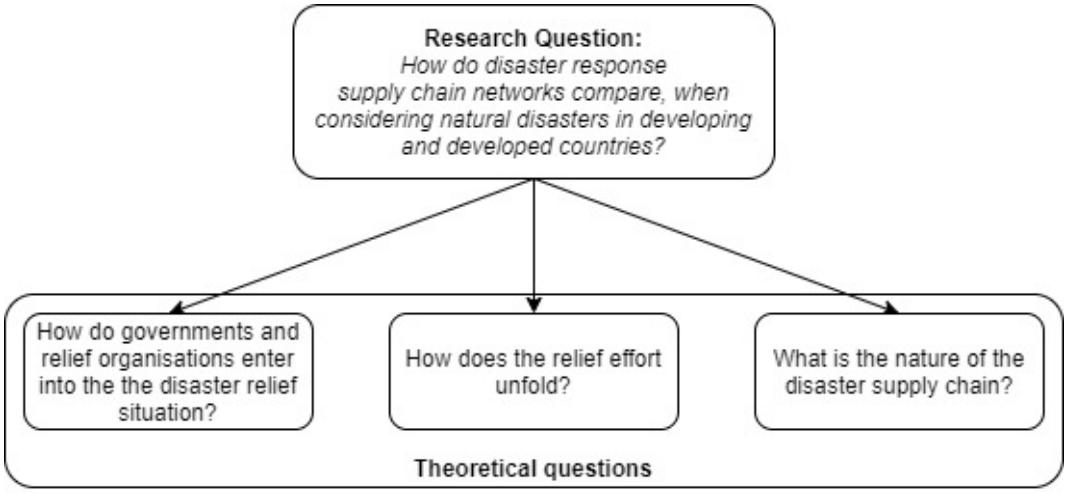


Figure 3.1: Theoretical questions

3.2.2 Propositions

Through assimilation of information from the literature and the framework of the research question and theoretical questions, the below proposition was developed:

Proposition: Sudden-onset natural disaster response supply chain networks are different in developing and developed countries.

Unit of analysis

A unit of analysis or "case" can be described as an event occurring within a bounded context (Baxter and Jack, 2008). The defined unit of analysis (case) for this study is the disaster response effort to a single natural disaster event e.g. a hurricane or earthquake (Baxter and Jack, 2008; Yin, 2009a).

Case study design

Once the primary method of the study – the case study research method - had been identified, the type of case study design was considered and a holistic multi-case study design was chosen. This is because one of the advantages of a multi-case study is the view that the evidence from such a study is more compelling and robust (Yin, 2009a). Four cases were chosen for the study: Two each for

developing and developed countries. To identify these cases, a framework was developed (section 3.5.1) to identify similar cases for analysis, following replication logic rather than sampling logic as described by Yin (2009). Replication logic is analogous to conducting the same experiment multiple times to evaluate whether the same result is obtained. In contrast, sampling logic required the statistical selection of a subset of a population that represents the full population for analysis (Yin, 2009a). The multiple case study design is depicted in Fig 3.2 below.

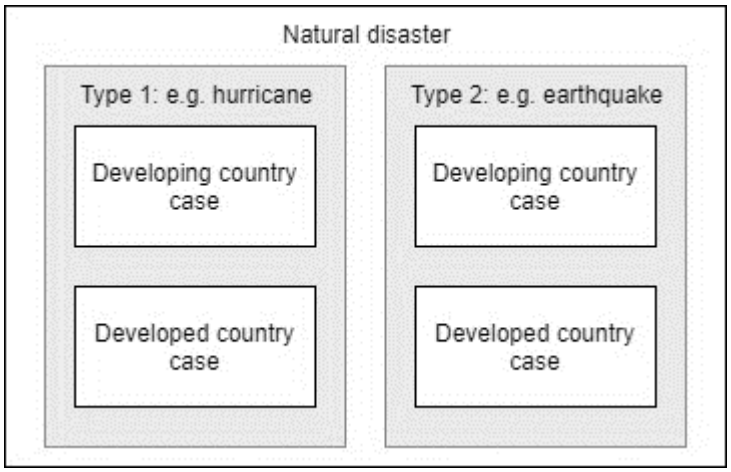


Figure 3.2: Holistic multiple-case study design (Yin, 2009a)

Identification of cases: Quantitative analysis

To identify the cases to be studied, as described in the previous section, a descriptive, quantitative analysis methodology (McCombes, 2019) was chosen due to the availability of a large quantity of data in the form of the EM-DAT database.

"EM-DAT is a global database on natural and technological disasters, containing essential core data on the occurrence and effects of more than 21,000 disasters in the world, from 1900 to the present**.** EM-DAT is maintained by the Centre for Research on the Epidemiology of Disasters (CRED**)** at the School of Public

Health of the Université Catholique de Louvain located in Brussels, Belgium." (EM-DAT, 2020b)

To prevent one of the common pitfalls of case study research which is defined by (Baxter and Jack, 2008) as: *"a tendency for researchers to attempt to answer a question that is too broad or a topic that has too many objectives for one study"* the cases were carefully bound (Baxter and Jack, 2008) by implementing a strict, quantitative analytics framework discussed in section 3.5.1.

3.2.3 Linking data to propositions

The primary method used for linking the data to the propositions as outlined above was pattern matching (Trochim, 2002). This is discussed in detail in section 3.5.2 below.

3.2.4 Criteria for interpreting findings

To conduct the thematic summary, the researcher developed two comparison matrices:

- General theme matrix (APPENDIX B)
- Supply chain theme matrix (APPENDIX C)

Each theme was compared across all cases and a rating was applied to each. Themes were also allocated an influence score related to a weighting across all themes. Supply chain themes were all weighted equally. Each rating represented a score and a score out of 5 was assigned to each case for both general themes and supply chain themes. Below are the rating scales across themes as well as the scoring scale for the cases.

Table 3.2: Theme rating scale (weighting) (developed by author)

Influence	Description	Score
	Not at all influential	1
	Slightly influential	2
	Moderately influential	3
	Very influential	4
	Extremely influential	5

Table 3.3: Case scoring scale (developed by author)

Quality	Description	Score
	Very poor	1
	Poor	2
	Fair	3
	Good	4
	Excellent	5

Some themes were binary in nature and did not contribute to scoring. These were noted separately. For example, some cases had references to livestock, which was indicated with "yes", "no" or none and some had references to sentiments, which was noted as "positive", "negative" or "none".

Due to the risk of bias typically associated with rating scales, the following methods were employed as mitigation (Friedman and Amoo, 1999):

- Equal interval scales: assigning an equal interval to the scale e.g. fair, good, excellent and not very poor, good, excellent

- Balanced rating scales: using an equal number of favourable and unfavourable ratings
- Sufficient number of points: ideally a rating scale of at least 5 points is recommended

3.3 Data collection protocol

(Baxter and Jack, 2008) identify the following potential data sources for case study research:

- Documentation
- Archival records
- Interviews
- Physical artefacts
- Direct observation and
- Participant-observation

These data sources can be divided into primary and secondary data sources (Kabir, 2018). Primary data typically includes: Interviews, physical artefacts, direct observation, and participant observation, whereas secondary data consists of documentation and archival records. Kabir (2018) further elaborates on secondary data and includes books, records, biographies, newspapers, censuses and other published statistical data, internet articles, research articles and databases in addition to archival records. There are several advantages and disadvantages to using either source of data as described above. These advantages and disadvantages are tabled below.

Due to the research design emphasis on the use of the EM-DAT database to identify the cases for study, direct observation and participant observation were not possible as the case events would have to be in the past to be included in the database. The research initially proposed interviewing (primary data) as a preferred method of data gathering however, after contacting dozens of disaster response organizations with no positive responses, that avenue was abandoned. As a result, the method of sourcing published documentation (secondary data)

including but not limited to newspaper articles, social media posts, news reports and film was chosen.

Table 3.4: Primary data versus secondary data (Johnston, 2014; Kabir, 2018)

Primary data	
Advantage	**Disadvantage**
Data specific to the problem under study	Researches must face typical challenges related to data collection e.g. time investment, funding
No doubt about quality of the data (to the researcher)	Ensuring a high standard of collected data e.g. authentic data, data formatting
Possible to obtain additional data during the study period	The cost of obtaining the data is often a major expense
Secondary data	
Advantage	**Disadvantage**
Cost-effective	Potential reliability, accuracy, and relevancy issues
Convenient	Obsolescence of data due to the passage of time
Time-efficient	Questionable authenticity and copyright

To achieve validity and reliability of the study, a systematic data review – similar to the systematic literature review described in Chapter 2 – was followed for the data collection phase of the study (Research Shorts, 2017). The primary data

source used was the ReliefWeb website which is “a humanitarian information service provided by the United Nations Office for the Coordination of Humanitarian Affairs (OCHA). The service is managed by the Digital Services Section of OCHA's Information Management Branch.” (ReliefWeb, 2020a). This repository was selected as it offered a large sample (4000 key sources) of pre-curated and vetted documentation in the form of situation reports, media reports, infographics and more. The name and date of each identified case were entered into the ReliefWeb search engine and data was evaluated using the process below.

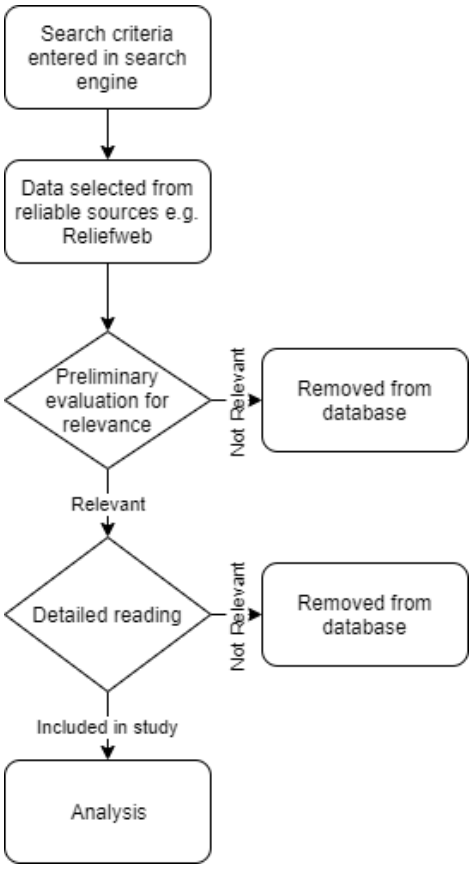


Figure 3.3: Data evaluation process (O’Leary, 2020; Research Shorts, 2017)

Gathered data were entered into a study database using NVIVO qualitative data analysis software for analysis purposes. For sources unavailable in English, text was entered into the Google Translate tool and the translated documents were entered into NVIVO for analysis.

3.4 Case study analysis

As described in section 3.2.2 above, a holistic multi-case study type was selected. To follow the principle of replication logic (Yin, 2009b) the study method depicted in Figure 3.4: Case study method (Yin, 2009b) below was employed. The principle of replication logic is the search for confirmations or disconfirmations of a hypothesis using a set of cases, by examining each case individually and drawing a conclusion for the population (Mills et al., 2010).

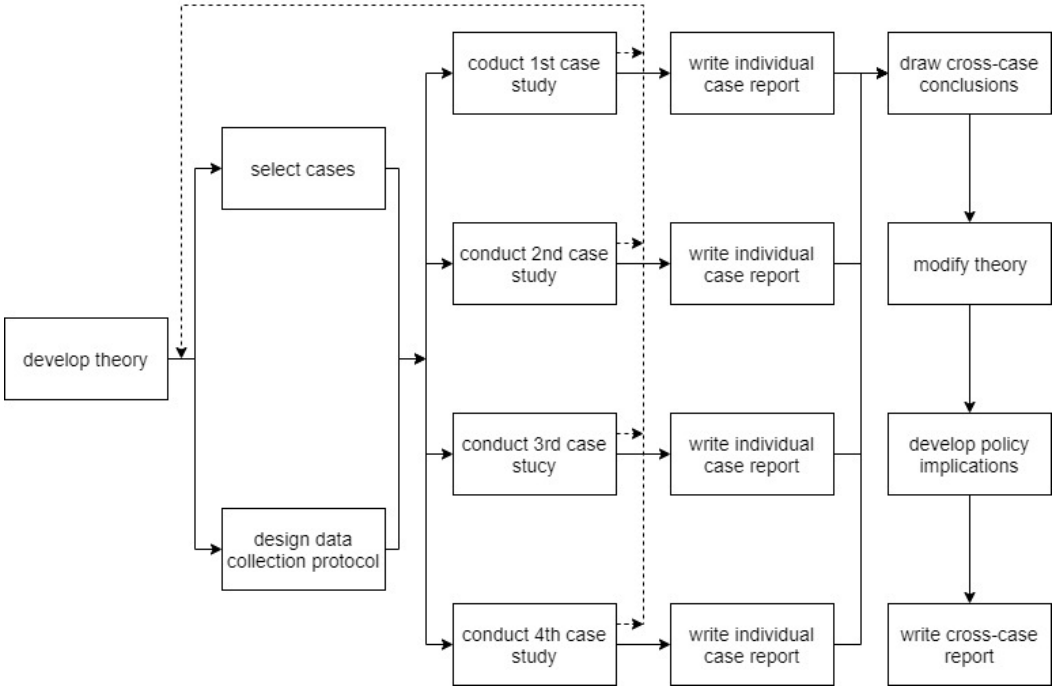


Figure 3.4: Case study method (Yin, 2009b)

Theory development, case selection and data collection protocols have been discussed in sections 3.2 and 3.3 respectively. The case studies were conducted as shown in Figure 3.4: *Case study method (Yin, 2009b)* through first collecting the data and collating it in an NVIVO database. Once the data had been gathered, each case was analyzed individually, and a report was composed. From the insights gathered, preliminary cross-case conclusions were drawn, and theory modifications were made as required. Finally, policy implications were developed and included in the cross-case report.

3.5 Data analysis

The data analysis methodology was constructed considering Yin's case study tactics for internal validity (Yin, 2009b). Given that a mixed-method design was used, data analysis is discussed from a quantitative (case identification) and qualitative (case study) perspective.

3.5.1 Quantitative analysis: Case identification

Quantitative disaster data was sourced from the EM-DAT database (APPENDIX D) and country classification data from the UNCDAT database (APPENDIX E) – together this data represents a picture of worldwide disaster events over the last 10 years related to the economic classification of each country. The quantitative data was used to identify the cases for further analysis.

Data preparation

The data preparation process is described in the below diagram.

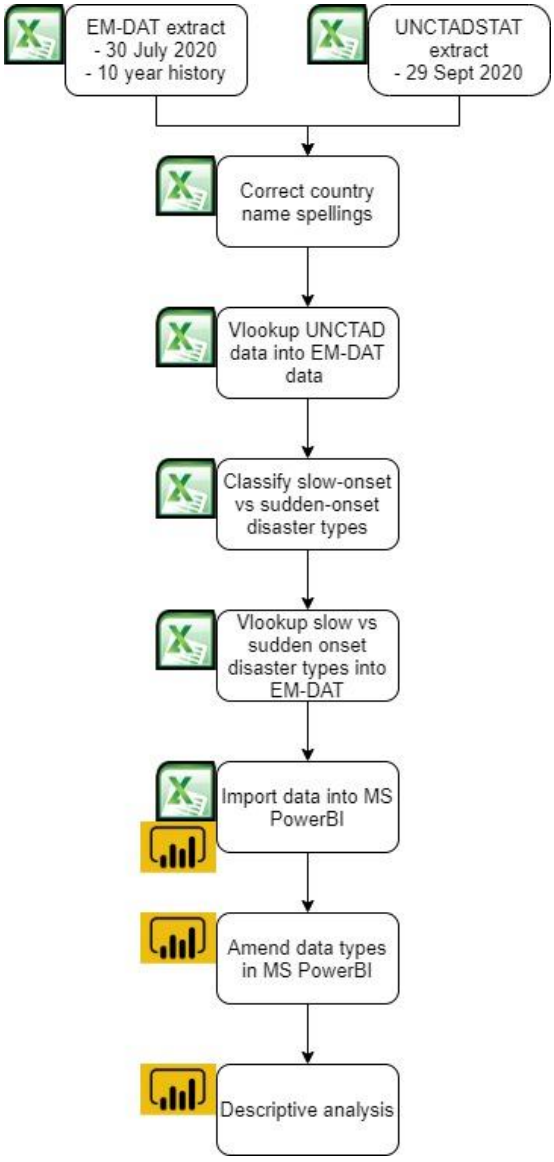


Figure 3.5: Data preparation process (Trochim, 2002)

Data from the EM-DAT database were compared using a rigorous framework: data were analyzed from the EM-DAT database for a period of 10 years (2010 – 2020) and *development status* was cross-referenced into this dataset from the UNCTAD country classification database (EM-DAT, 2020a; UNCTAD, 2020). From this cross-referenced database. the 4 cases were identified; by comparing all disaster events over a 10 year period and selecting the disaster events that presented with the most similar traits when using the pattern matching techniques discussed in section 3.5.2 below.

Baseline analysis for reliability and validity

The database detailed above was also used to test the reliability and validity of the 4 selected cases (Dillon, 2003). A broader baseline analysis was conducted using the full dataset and the 4 cases were compared to this baseline for deeper insight and understanding of the outcome of the 4 cases. The descriptive baseline (overview) analysis compares all data available for the 10-year period under study using MS PowerBI. Results from this analysis are shown in section 4 below.

3.5.2 Qualitative analysis: Holistic multi-case study

This data represents the bulk of the research. Situational reports, press statements, newspaper articles and infographics were analyzed to identify themes and trends in disaster response.

A list of sources has been included in APPENDIX F.

Coding

Coding can simply be described as looking for patterns in qualitative data (Saldaña, 2009).

Saldana (2009) identifies patterns as:

- Similarity: the same phenomenon happening in more than one case.
- Difference: predictably different patterns between cases.
- Frequency: a phenomenon occurs often or seldom between the different cases.
- Sequence: events typically occur in the same order when comparing cases.
- Correspondence: events occur in a certain relation to each other.
- Causation: one phenomenon or event appears to cause another.

This study followed a process of cyclical first and second round coding (Saldaña, 2009). First-round coding techniques employed were a combination of:

- Provisional coding: a list of codes was developed with anticipated categories prior to review of the secondary data sources.

- Hypothesis coding: codes were developed reflecting the research question of the study as outlined in Section 1.3.
- Evaluation coding: codes were added assigning judgement about the success of the relief efforts.

A set of provisional codes were developed from the literature which included the study propositions (hypothesis coding) outlined earlier in this chapter. Some codes were also assigned a positive or negative value, where applicable, to determine general sentiment around disaster relief efforts associated with the selected cases (Saldaña, 2009). This "sentiment" analysis was used to determine the perceived success or failure of each case (relief effort). Provisional codes were developed and documented in NVIVO software with a recorded definition and purpose for each code. The motivation for applying this technique was the intent of the researcher to generate concise and relevant codes as early as possible. The list of codes is included in Table 3.5 below:

Table 3.5: List of codes (developed by author)

Code	Definition	Hypothesis (If applicable)
Affected government	Identify the involvement of the government affected by the disaster.	The affected government plays the primary role in the coordination and management of the relief effort.
Relief provider	Identify relief agencies involved in the relief effort as well as the roles they fulfil.	Relief agencies only engage with the affected country upon invitation in a supporting role, led by the affected government.
Timeline	Aims to construct a timeline of events for the disaster. This timeline is limited to 7 days after the onset of the disaster. The timeline will include engagement/ arrival of relief organisations.	
Infrastructure	Identifies references to damaged infrastructure that has an impact on access to affected populations/distribution of relief supplies i.e. logistics.	
Politics	Notes how politics influence the relief effort.	Politics have a negative impact on relief efforts.

Code	Definition	Hypothesis (If applicable)
Logistics	Identifies the quantity of goods involved in the relief effort e.g. volume/weight of goods donated/moved/distributed.	
Supply chain	The definition of supply chain described in the literature review (Chapter 2) distinguishes between logistics and supply chain. This code aims to identify elements of the relief response that classifies it as a supply chain rather than pure logistics. Supply chain elements are: goods, information, funds.	The relief effort is a Supply Chain.
Sentiment + and -	General sentiment will be tracked to determine whether the relief effort was deemed a success or a failure.	

For the second round of analysis, pattern coding was employed (Saldaña, 2009). Pattern coding is described as a coding method that assimilates large quantities of material to identify emergent themes; creating more meaningful units of data for analysis and explanation (Saldaña, 2009). During this phase of the study, two techniques from the work of (Yin, 2009b) was also applied to support the validity of the study, namely pattern matching (Trochim, 2002; Yin, 2009b) as set out in Figure 3.8 below and timeline analysis (chronological sequencing) as shown in

Figure 5.3. Several rounds of coding were employed to detect in-case patterns as well as cross-case patterns leading to the identification of dependent and independent variables for each case. In an expansion of the pattern matching analysis, time-series analysis in the form of a chronological sequence was used for further pattern identification. It is important to note that pattern matching in this context was applied within each separate case and not across cases. Cross-case pattern matching was employed during the next phase of the study.

A list of sources and number of codes per source is listed in APPENDIX G as well as an example of a source coded in NVIVO.

The diagram below outlines the coding process as described above.

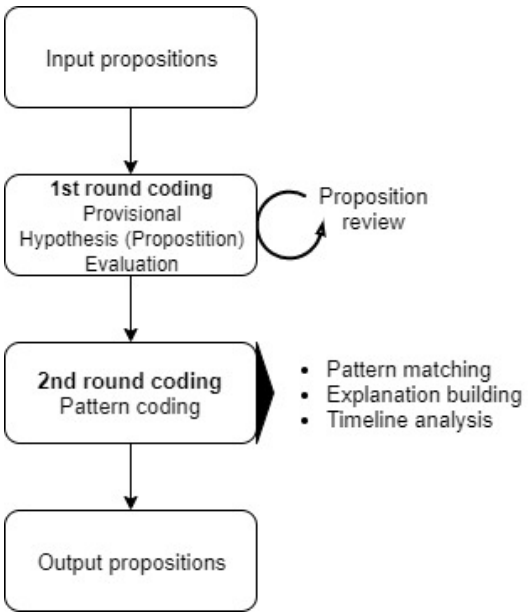


Figure 3.6: Coding process (Saldaña, 2009; Yin, 2009b)

Analysis

The primary technique drawn upon for the qualitative analysis was the pattern matching technique mentioned previously (Trochim, 2002; Yin, 2009b). The diagram below depicts how the technique was utilized during multiple phases of the project as well as the relationship between the phases.

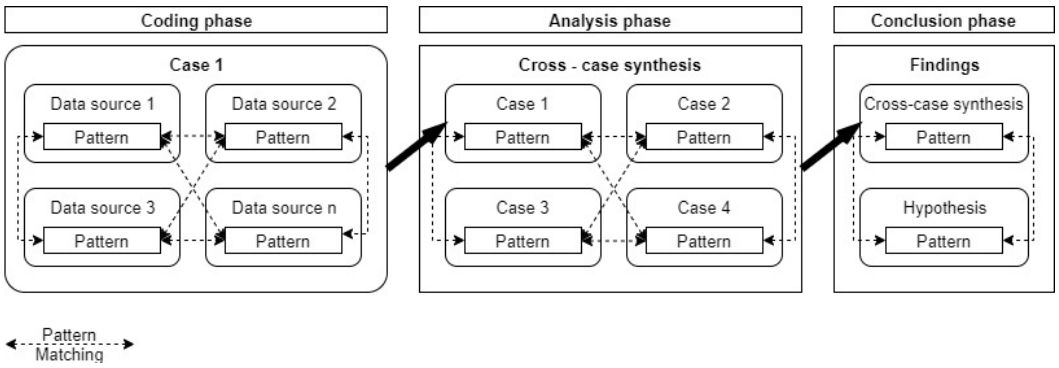


Figure 3.7: Application of pattern matching technique inspired by (Trochim, 2002; Yin, 2009b)

The goal of the application of the pattern matching technique was to draw a relationship between firstly multiple sources of data within a case. Secondly to draw a relationship between the identified cases, resulting in the cross-case synthesis report. And thirdly to draw a relationship between the cross-case synthesis report and the stated hypotheses of the study. Patterns that were compared include but are not limited to:

- Timelines
- Sentiment
- Process and
- Stakeholders

Below is a diagrammatic representation of the pattern matching framework that was followed. It depicts how the pattern matching technique brings the theoretical realm and observational realm together, allowing the researcher to draw conclusions. The study poses a research question (theoretical) which is addressed through the pattern matching approach of observing the identified cases (observational).

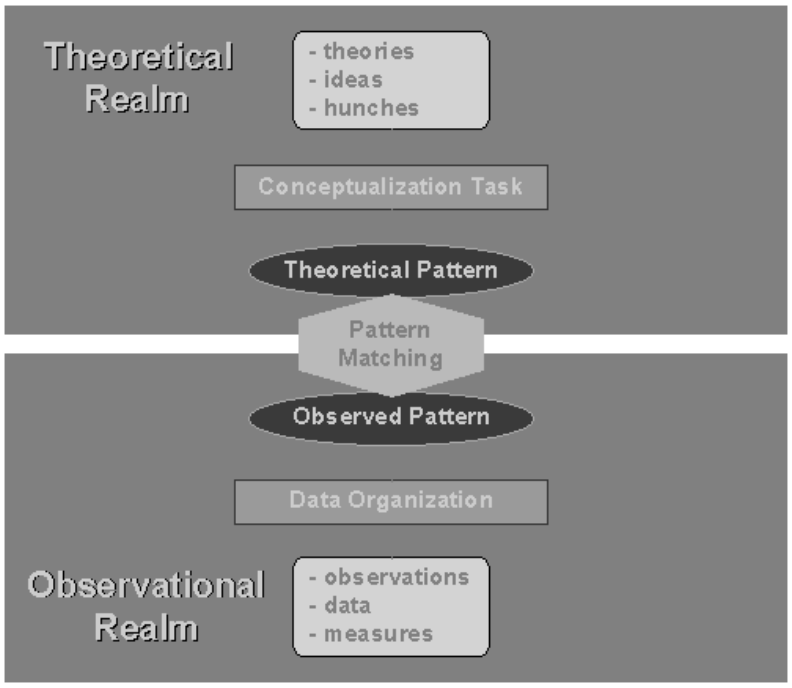


Figure 3.8: Pattern matching framework (Trochim, 2002)

3.6 Case report format

For the individual case analysis, the case report followed the following structure under the headings listed below.

3.6.1 Case overview

The case overview consists of a description of each event, including the location, date, type of event as well as the magnitude of the event.

3.6.2 Timeline analysis

Timeline analysis depicts the occurrence of the event, plotted on a timeline along with response events for the first week after the disaster occurred.

3.6.3 Pattern matching analysis

This section describes general patterns from the data through the identification of emergent themes.

3.6.4 Supply chain insights

Each case is discussed from a general thematic perspective and a supply chain perspective. In this section, emergent supply chain themes are discussed.

3.7 Presented data

Various rounds of coding and analysis were done as outlined in Figure 3.8. For each case, data was collected from the ReliefWeb repository of data (ReliefWeb, 2020b) for a period of seven days after the disaster event occurred. This data was imported into NVIVO software for analysis and coded according to the list of codes noted in Table 3.5.

With the coded data a comprehensive case summary was drafted for each case as presented in Chapter 5. To conduct the timeline analysis a Gantt chart was developed for each case, showing how the disaster and relief effort unfolded, as well as stakeholders that were involved. Where applicable, reports, maps, and infographics from the source material are included to better demonstrate the situation surrounding each case to the reader. Finally, the report elaborates on the supply chain elements of each case, based on the researcher's years of experience as a supply chain consultant.

3.8 Data quality tests

For a robust study design, the validity tests as outlined by (Yin, 2009b) and their application to the study are described in this section.

3.8.1 Construct validity

Construct validity is concerned with establishing the premise from which the research will be conducted (Yin, 2009b). To obtain construct validity for the study, the tactic of obtaining multiple sources of evidence was used (Yin, 2009b). These sources include but are not limited to:

- Credible databases (EM-DAT, ReliefWeb)
- Validated reports (CRED)
- Media coverage
- Relevant published reports (ALNAP)

The premise was to source data representing multiple perspectives of the same event and in so doing, achieving validity of the data.

3.8.2 Internal validity

Since this study was an *exploratory* case study and not a *causal* case study, the issue of internal validity was not of primary concern to the researcher (Yin, 2009b). Nonetheless, techniques for establishing internal validity made up an integral part of the study design through pattern matching, explanation building, and time series analysis (Yin, 2009b) as described in section 3.5.2 above.

3.8.3 External validity

The test of external validity aims to demonstrate that the findings of the study can be extrapolated beyond the study(Yin, 2009b). A common tactic to achieve external validity is to apply replication logic to the study. To this end, a holistic multi-case study design was selected (Yin, 2009b); instead of investigating a single disaster event, multiple disaster events were studied. Replication can be compared to conducting multiple experiments, it enables the researcher to test theories multiple times to support a robust outcome of results (Yin, 2009a).

3.8.4 Reliability

The objective of the reliability test is to ensure repeatability of the findings of the study (Yin, 2009b). Reliability was achieved in this study through the development of a thorough case study protocol as described in sections 3.4 and 3.5 above. Furthermore, a rigorous study database was created and maintained throughout the study using NVIVO software.

3.9 Ethical considerations

"Use of secondary data is in itself, a highly ethical practice: it maximizes the value of any (public) investment in data collection, it reduces the burden on respondents, it ensures replicability of study findings and therefore, greater transparency of research procedures and integrity of research work. But the value of secondary data is only fully realized if these benefits outweigh the risks, notably in terms of re-identification of individuals and disclosure of sensitive information." (Paolatubaro, 2015)

Considering the advantages and disadvantages of secondary research as tabled by Paolatubaro, as well as the nature of the research conducted, it was concluded that ethical exposure of the study was very low. All data sources used were made available for consumption by the general public and/or academia; consent for use was thus implied and all resources consulted during the study were referenced. Furthermore, no personal information of any kind was included in the study.

3.10 Summary

To conclude, in this chapter the study methodology was described. A mixed-method study was constructed using elements of heuristic, quantitative data analysis and a holistic multi-case qualitative methodology. Quantitative analysis was used as a tool to identify the cases to be considered in the qualitative study. For the purpose of the study, a case (or unit) was defined as a single sudden-onset

natural disaster event as entered in the EM-DAT database. 4 cases were selected: 2 cases from a developed country and 2 from a developing country.

Once the cases were identified, secondary data were gathered for all cases and evaluated for relevance. Relevant data were entered into the study database (using NVIVO software) and coded in 2 cycles. Cycle 1 comprised of provisional, hypothesis and evaluation coding and cycle 2 consisted of pattern coding. Coding was followed by data analysis and interpretation.

The chapter also outlined validity tests of the study as well as ethical considerations.

4 CASE SELECTION AND OVERVIEW

This chapter aims to describe the context of sudden-onset natural disasters over the last ten years. The methodology used to source and collate the data is described in section 3.5.1 above.

4.1 Disaster type comparison

Figure 4.1 below compares disaster subgroups (Biological, Climatological, Geophysical, Hydrological and Meteorological) and disaster types e.g., flood, earthquake and storm. From the figure, it becomes clear that Hydrological and Meteorological disasters are by far the most common type of disasters followed by Geophysical and Climatological disasters. Biological and Extra-terrestrial disasters for the period under consideration are negligible in comparison.

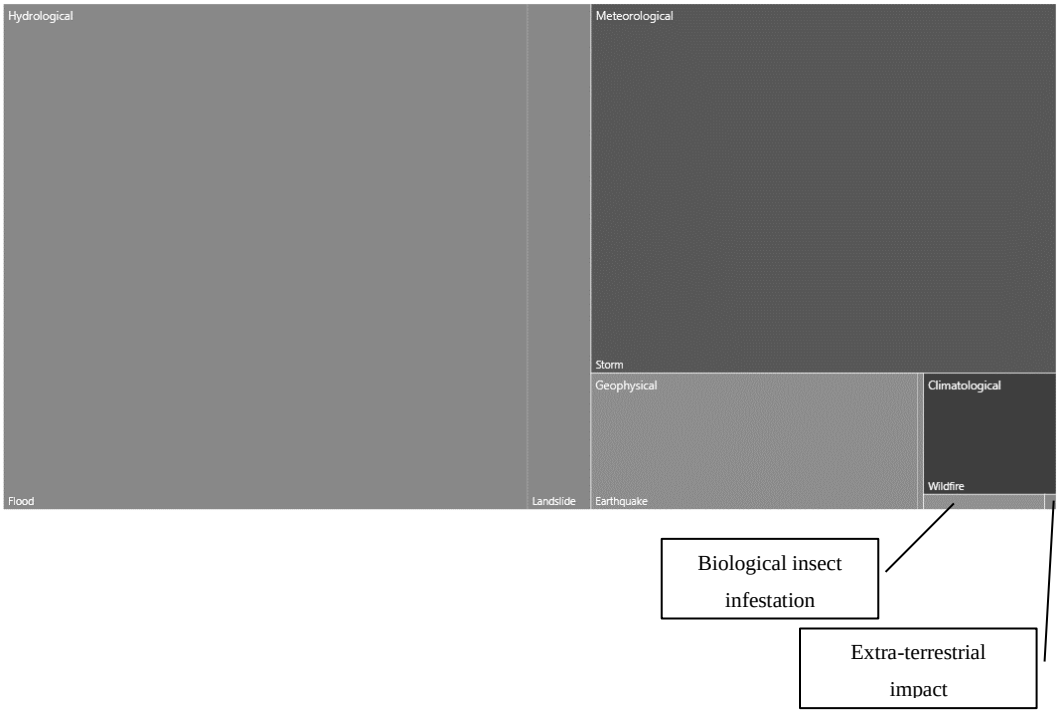


Figure 4.1: Scaled treemap of disaster subgroup and disaster type (EM-DAT, 2020a)

Keeping in mind the relative frequency of each disaster type, the impact of each is explored by considering the total deaths and total damages (measured in '000

US$) over the study period. This analysis is depicted in Figure 4.2 below, clearly showing that although earthquakes are less common, the loss of life and total damages are significant with 74.46% (or 267 738) of deaths attributed to earthquakes as well 23.27% of damages. Statistics for all sudden-onset natural disaster types are shown in Table 4.1 below.

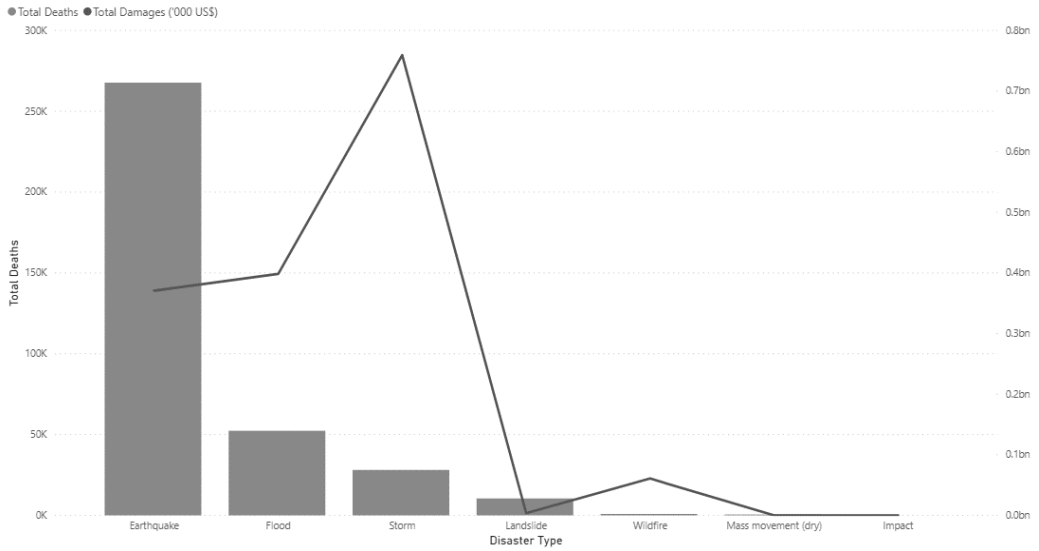
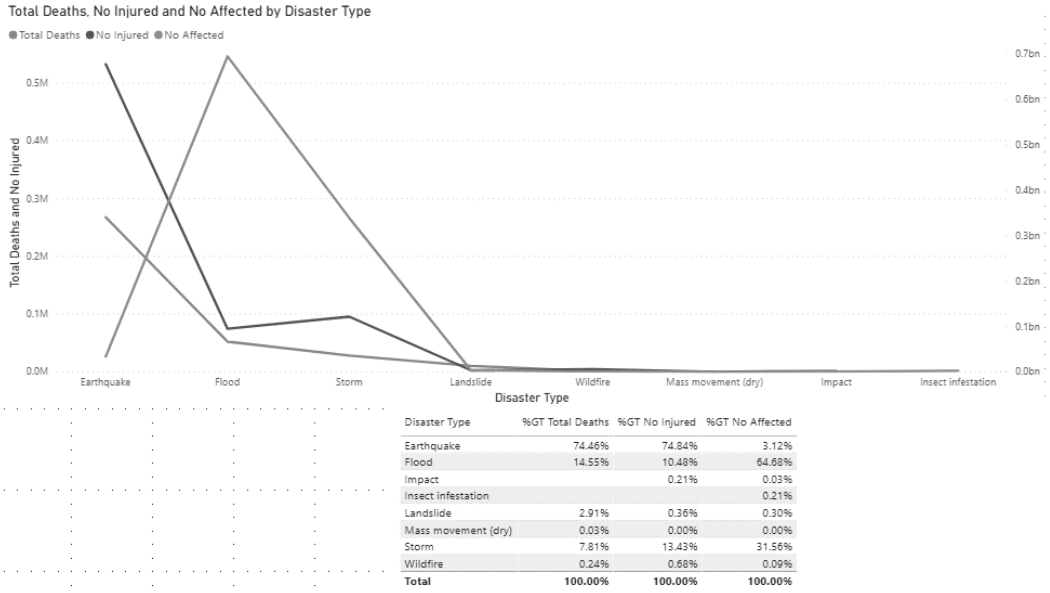


Figure 4.2: Total deaths and damages by sudden-onset natural disasters (SOND) type (EM-DAT, 2020a)

Table 4.1: Death toll and damages by SOND disaster type (EM-DAT, 2020a)

Disaster Type	Total Deaths	%GT Total Deaths	Total Damages ('000 US$)	%GT Total Damages ('000 US$)
Earthquake	267 738.00	74.46%	370 592 631.00	23.27%
Flood	52 328.00	14.55%	398 467 625.00	25.02%
Storm	28 088.00	7.81%	759 342 864.00	47.68%
Landslide	10 455.00	2.91%	3 558 414.00	0.22%
Wildfire	875.00	0.24%	60 722 220.00	3.81%
Mass movement (dry)	100.00	0.03%	8 000.00	0.00%
Impact			33 000.00	0.00%
Total	**359 584.00**	**100.00%**	**1 592 724 754.00**	**100.00%**

The nature of the 3 disaster types with the highest percentage impact was briefly considered with reference to Figure 4.2 and Table 4.1: Death toll and damages by SOND disaster type Table 4.1 above.



Disaster Type	%GT Total Deaths	%GT No Injured	%GT No Affected
Earthquake	74.46%	74.84%	3.12%
Flood	14.55%	10.48%	64.68%
Impact		0.21%	0.03%
Insect infestation			0.21%
Landslide	2.91%	0.36%	0.30%
Mass movement (dry)	0.03%	0.00%	0.00%
Storm	7.81%	13.43%	31.56%
Wildfire	0.24%	0.68%	0.09%
Total	**100.00%**	**100.00%**	**100.00%**

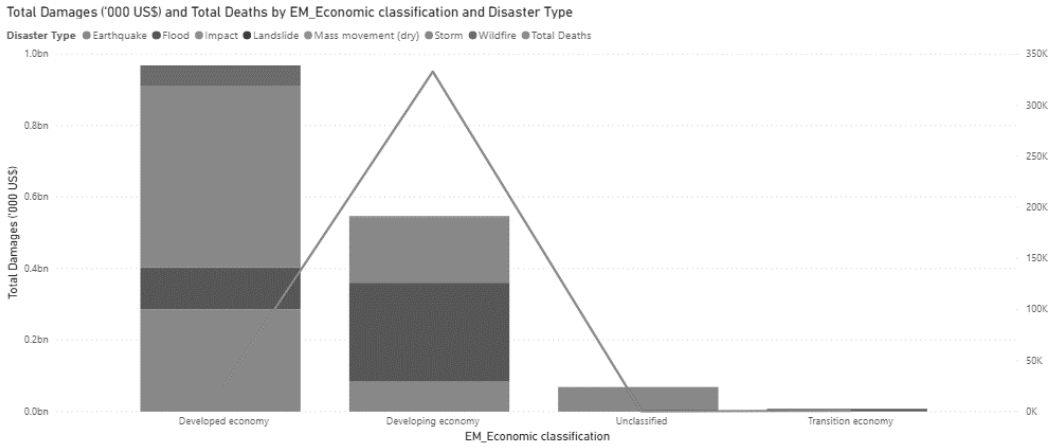
Figure 4.3: Deaths vs injured vs number affected by SOND disasters (EM-DAT, 2020a)

As shown in Figure 4.3, earthquakes rank first concerning death toll with a significant margin over floods of 59.9% and third in terms of total damages with a margin of 24.41% in relation to the disaster type with the highest impact on damages: storms which represent 47.68% of damages. Floods rate second in terms of death toll and damages at 14.55% and 25.02% respectively and storms rank first in damages at 47.68%, as mentioned above, and third in terms of death toll at 7.81%.

Considering the research question for this study, it was considered pertinent to study cases that would place the most pressure on the supply chain to identify the most vulnerable areas in the supply chain. To this end, the disaster type was selected with what was identified as the highest overall impact. Due to the high death rate and injuries of earthquakes relative to other disaster types, as well as the comparatively high damages, the decision was made to focus on earthquakes for this study. It is also hypothesized that the relative infrequency of earthquakes, as described above, has an impact on the efficacy of the response to such an event.

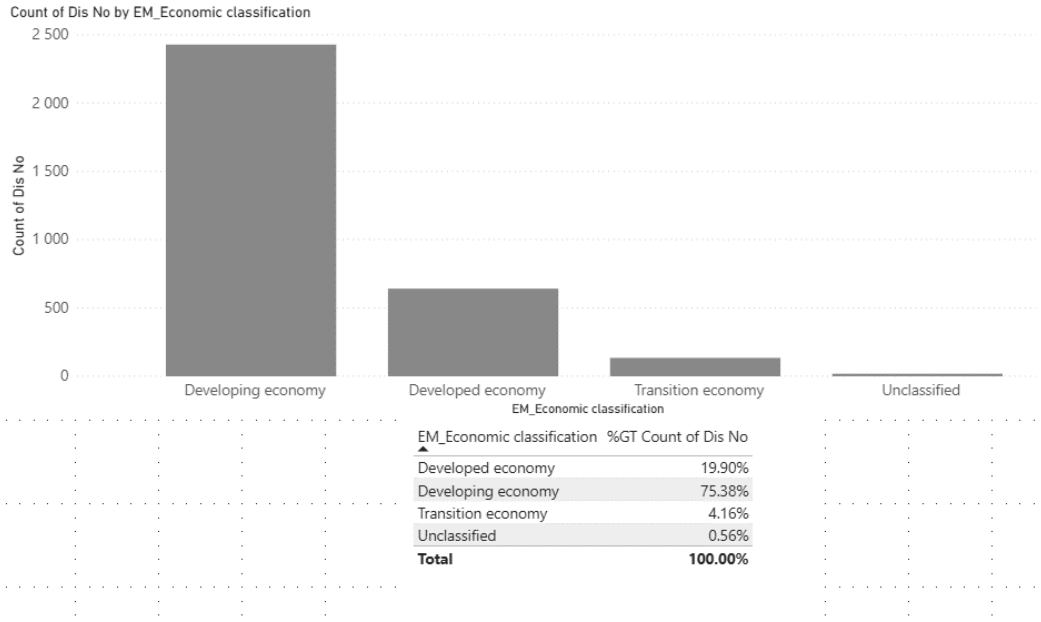
4.2 Economic class comparison

Figure 4.4 and Figure 4.5 below describe the relationship between total damages and death toll (by disaster type) for countries in each economic classification and the number of sudden-onset natural disasters for countries in each economic classification. These figures plainly show that developing countries did not only experience 85.43% more deaths than developed countries during the period under study, but developing countries also experienced 59.48% more SOND disasters than developed countries. In contrast, developed countries experienced 26.49% more damages than developing countries.



EM_Economic classification	%GT Total Deaths	%GT Total Damages ('000 US$)
Developing economy	92.58%	34.33%
Developed economy	7.15%	60.82%
Transition economy	0.24%	0.54%
Unclassified	0.03%	4.32%
Total	**100.00%**	**100.00%**

Figure 4.4: Total damage by SOND disaster type vs total deaths (EM-DAT, 2020a, p.)



EM_Economic classification	%GT Count of Dis No
Developed economy	19.90%
Developing economy	75.38%
Transition economy	4.16%
Unclassified	0.56%
Total	**100.00%**

Figure 4.5: Count of SOND disasters by economic classification (EM-DAT, 2020a)

4.3 Case study selection

The goal in selecting cases for the study was to find the most similar cases for comparative study. A comparison graph was drawn up with all earthquakes registered on the EM-DAT database from Jan 2010 to July 2020. The 2010 Haiti earthquake was removed as an outlier as no other disaster could be compared in terms of death toll and number of injuries. The resultant comparison is shown below in Figure 4.6 below.

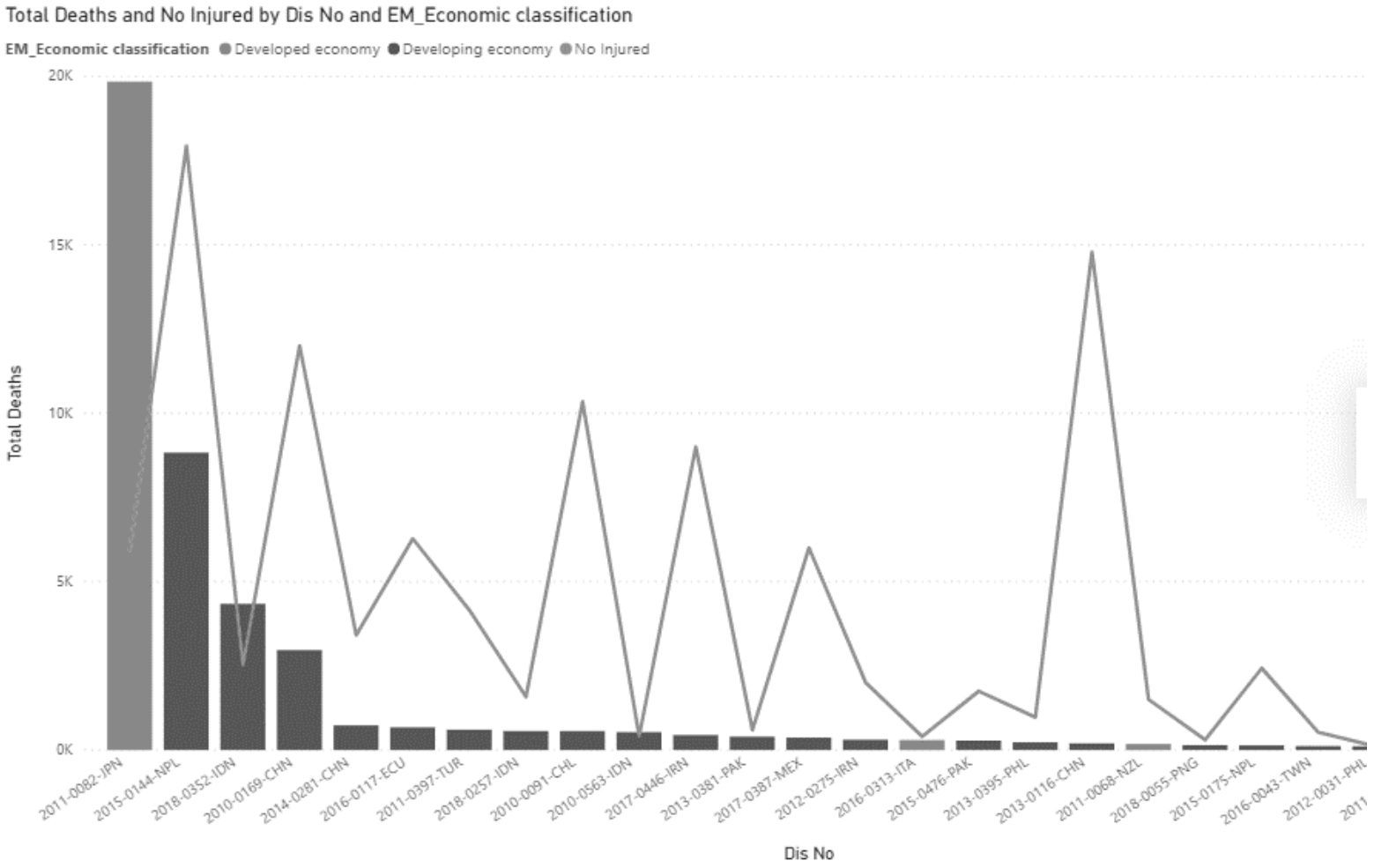


Figure 4.6: Comparison of earthquakes by economic classification, death toll and number of injured (EM-DAT, 2020a)

From the above analysis two comparative cases, from developing and developed countries respectively, had to be identified (4 cases in total) the following clusters of disasters were identified as potential candidates considering the criteria of a similar number of deaths and/or injured for each case.

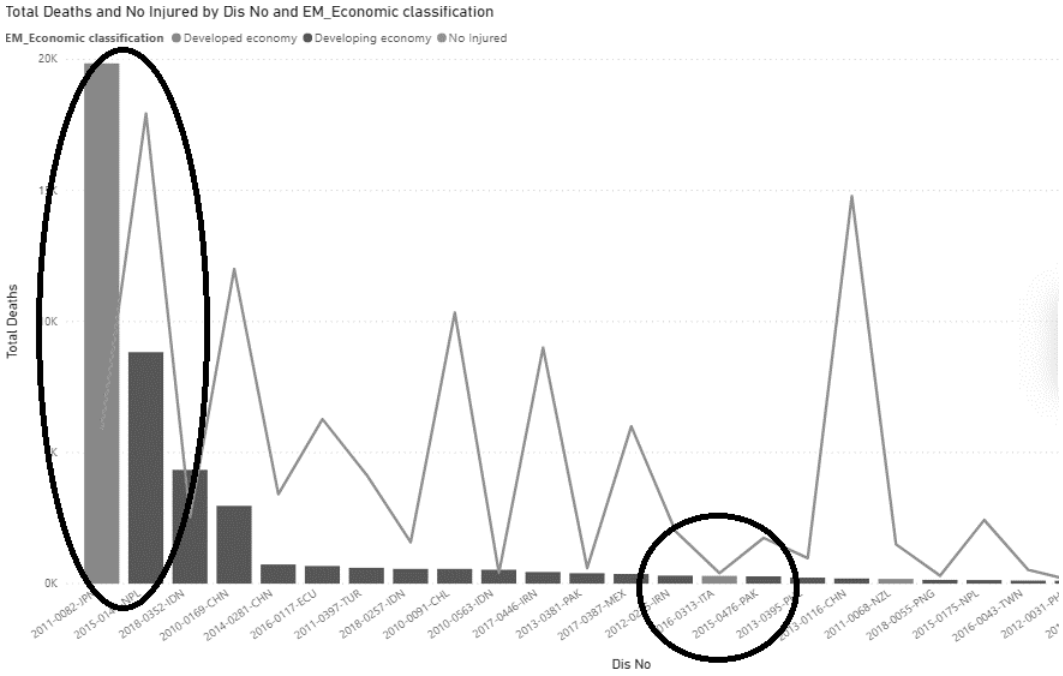


Figure 4.7: Potential cases (developed by Author)

The first cluster presented the following cases:

1. Japan earthquake and tsunami 2011 (Developed economy)
2. Nepal earthquake 2015 (Developing economy)

The second cluster produced a set of 3 cases:

1. Iran earthquake 2012 (Developing economy)
2. Italy earthquake 2016 (Developed economy)
3. Pakistan earthquake 2015 (Developing economy

Only two cases were selected from the second cluster based on the amount of available data for the disasters, selected cases from the second cluster are the Iran earthquake 2012 and the Italy earthquake 2016. The cases selected for this study

are, thus,4 comparable, significant natural disasters that have occurred over the last ten years.

4.4 Overview of selected cases

In the map below, the geographic location of each disaster is shown, as well as the year in which each occurred.

Data were extracted, collated and analyzed from ReliefWeb (ReliefWeb, 2020b) for a period of 7 days from the date of each disaster.

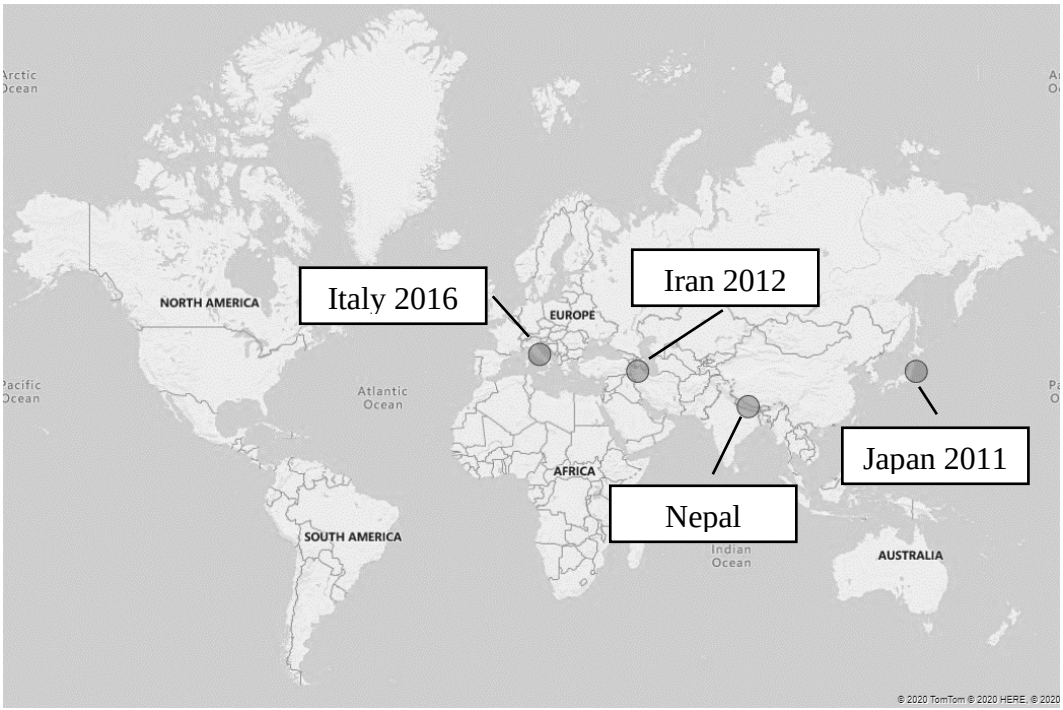


Figure 4.8: Global map of disasters under study.

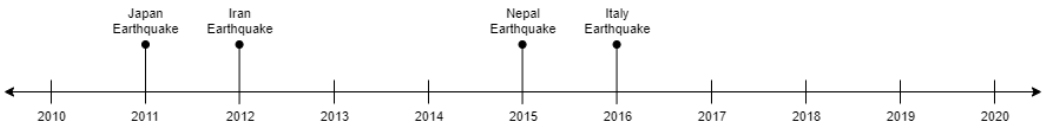


Figure 4.9: Timeline of selected cases

The selected cases are, thus, all located in the Northern hemisphere in Europe, the Middle East and the Far East. There are notably two timeline clusters in the

selected cases, the first in the early part of the decade and the second mid-decade, establishing a solid foundation for comparison.

4.5 Case study context

This section will create some context for the interpretation of the case reports provided in Chapter 5.

4.5.1 Emergent stages in the response process

Upon the first review of the collected data, it became apparent that there were 3 distinct stages in the response process as outlined below.

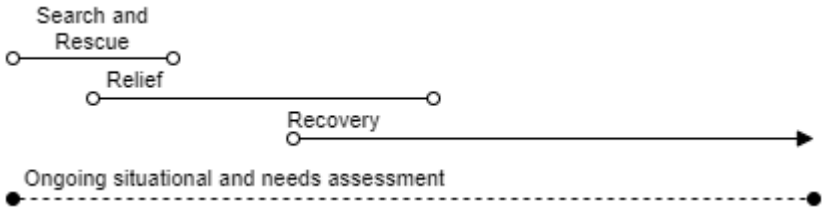


Figure 4.10: Phases of response (developed by author)

Search and Rescue

This is the first and shortest phase of the response effort. The purpose is to save the lives of those who have been injured or trapped by the disaster, this conclusion is drawn from the timeline analysis conducted during the individual case analysis (Chapter 5). These are the images we see in the media of dusty people being pulled out of piles of rubble on stretchers. The reality is that this is the shortest phase of the relief effort and in the cases studied, lasted less than a week for each case before the effort was phased to relief (Figure 5.3, Figure 5.5, Figure 5.11, Figure 5.12 and Figure 5.18).

Relief

In the cases studied there was typically an overlap between the search and rescue phase and the relief phase. The relief phase can be described as looking after the people who have survived the disaster but have lost everything. It covers activities such as medical care, shelter, food, water and basic sanitation. It also includes repair and re-establishing of basic services such as telecommunication and electricity to the affected areas. In all the study cases, this phase covered the clearing and repair of roads and the beginnings of clearing the rubble. This study covers only a part of the relief phase.

Recovery

Recovery is the final phase of the disaster response. This phase covers the long-term recovery of the affected area to a pre-disaster state (or new normal). This phase is not covered by this study as the study focuses on the high-pressure supply chain environment experienced during the first phases of the relief effort.

Ongoing situational needs analysis

This is a critical element of relief through all phases. Governments and organisations need to understand exactly what the affected population requires considering conditions such as: weather, natural elements e.g., wild animals and culture. Using an example from the Japan case study: the event occurred during the winter months in Japan, the affected population thus required winter-proof tents and warm clothing to protect against ice-rain and snow. A donation of mosquito nets would have been unusable. This hypothetical example aims to demonstrate that stakeholders need to be very aware of the requirements on the ground when reacting.

4.5.2 Supply chain perspective

Reflecting on the definition of supply chain versus logistics discussed in Chapter 2 – logistics is broadly defined as the distribution of goods through 3 echelons of a network:

- Supplier
- Distribution centre/warehouse
- Customer

Contrasted to the definition of supply chain, which covers the elements as listed above, but also includes aspects such as the supplier of the supplier, information related to the transport of goods and services, and financial information. This can be summarized as visibility of-, and control over the entire end-to-end network.

This study will not cover the aspect of financial visibility but will focus on the movement of physical goods and the related information flow.

Search and Rescue (SAR)

The search and rescue effort can be described as a very large supply chain activity. Using a simplified description: SAR teams need to know where the victims are and how to get to them. Once victims have been rescued, the next step in the chain is the medical transport, where the medical transportation teams need to know which hospitals/treatment facilities have the capacity for which injuries. Below is a diagram depicting one victim being transported to a hospital. Please note the physical flow and information flow encompassed in this small example.

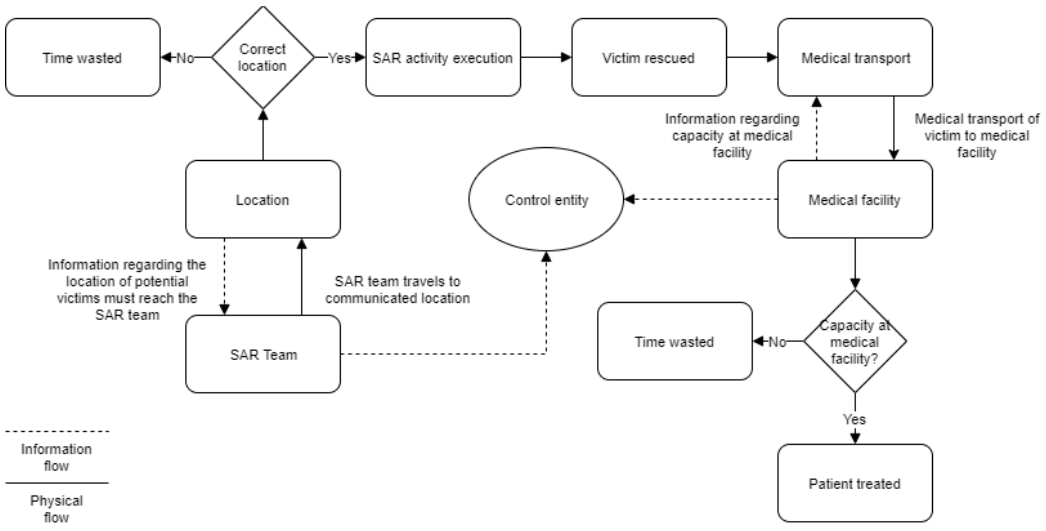


Figure 4.11: Search and Rescue sub-process example (developed by Author)

The diagram shows that there are many critical physical and information touch points required to successfully render the ‘service’ of saving this person’s life. Taking into account the physical flow of goods (the person) the information touch points, and the service delivered we can classify the above process as a supply chain.

Relief

Relief is the process of providing critical supplies to victims of the disaster. These supplies include but are not limited to:

- Food
- Potable water
- Sanitation (washing/bathroom facilities)
- Protection from the elements (heat/cold)
- Shelter (tents)
- Bedding (blankets, mattresses, cots)
- Basic medical care
- Light

Referring to the provided relief detailed in Table 5.1: Iran disaster response snapshot, it becomes apparent that relief supplies account for a significant volume of goods.

As similar information is required for all the activities in the relief chain, as depicted by the cluster approach in 2.6.3, it again becomes evident that a relief effort is a complex supply chain, as concluded in section 2.7.

5 CASE ANALYSIS AND RESULTS

This chapter presents the full case reports for the analytical approach as outlined in Chapter 3 above. The analytical process started with the selection of the four cases to be studied using quantitative methods as described in the previous chapter. Once the cases had been selected, the data collection protocol described in section 3.3 was followed. This approach consisted of searching for relevant data in the ReliefWeb database, evaluating sources for relevance and including relevant sources in a structured database. From the selected data, individual case analysis was conducted through two rounds of coding: The first round of coding identified and categorized relevant information to answer the research question and the second round of coding structured this information into the case report framework detailed in section 3.6 above for pattern analysis.

The case reports will be presented in the following order:

- Iran earthquake 2012 (small event, developing country)
- Italy earthquake 2016 (small event, developed country)
- Nepal earthquake 2015 (large event, developing country)
- Japan earthquake 2011 (large event, developed country)

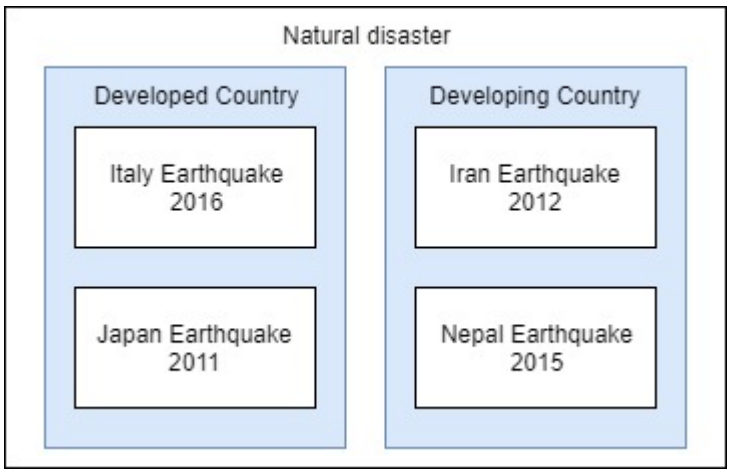


Figure 5.1: Selected cases for holistic multiple-case study (Yin, 2009a)

The chapter concludes with a reflection on the research quality of the within case analytical process through triangulation, highlighting learnings from the case analysis that were carried forward into the subsequent inter-case analyses.

5.1 Iran (2012)

5.1.1 Case overview

A 6.4 magnitude earthquake hit the eastern region of the Azerbaijan province in Iran at 16:54 local time on Saturday 11 August 2012. Eleven minutes later a second, magnitude 6.3 earthquake, hit the same region. Over the next week, the disaster event killed 306 people, injured 3600 and displaced 155 000. (ReliefWeb, 2016a)

Generally, information regarding this event in Iran was hard to come by and a moderate number of sources were available for analysis. These included situation reports from organizations such as the Red Cross and the United nations office for the coordination of humanitarian affairs (OCHA) as well as news reports from agencies such as Al Jazeera.

Figure 5.2 below shows the earthquake that occurred on a map, as well as several aftershocks and when they occurred.

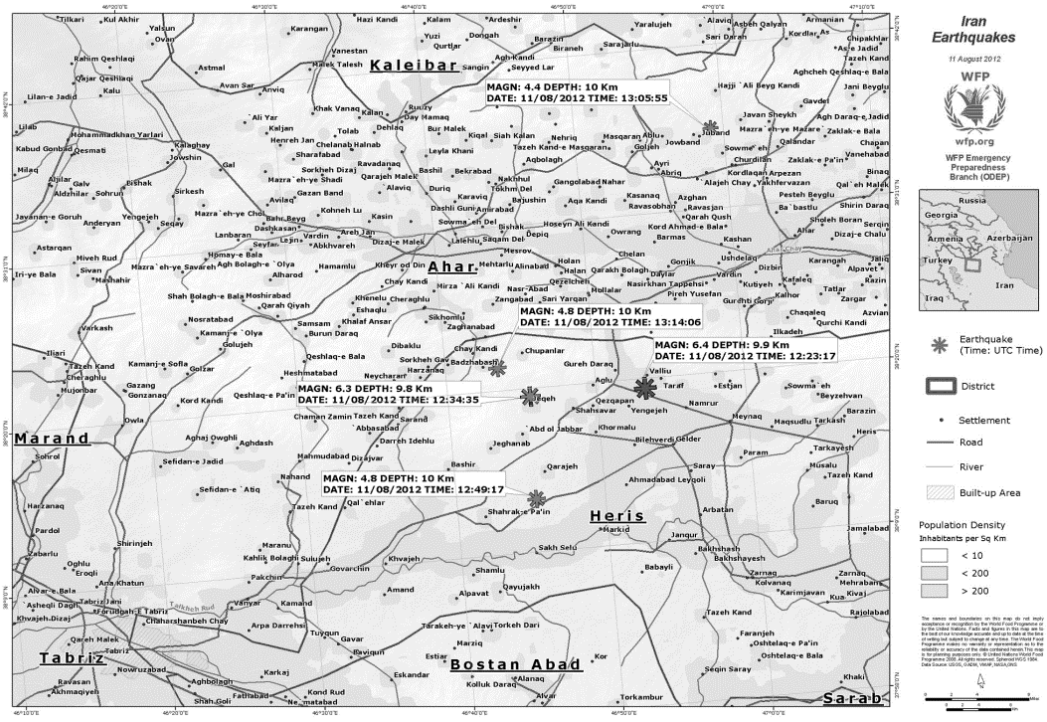


Figure 5.2: Iran earthquake overview

5.1.2 Iran snapshot summary

The following information is primarily drawn from the EM-DAT database and Red Cross and OCHA situation reports (ReliefWeb, 2016a).

Table 5.1: Iran disaster response snapshot

Date of event:	11-Aug-12
Event:	2 earthquakes hit East Azerbaijan
	1) Magnitude 6.4 16:53 (local time)
	2) Magnitude 6.3 17:04 (local time)
Relief effort lead by:	National Disaster Management Organization (NDMO) - Affected government
	Iranian Red Crescent Society (IRCS)
Deaths	306
Injured	3600
Displaced	155000
Relocated	73516
Rescued	3832
Secondary effects / challenges	Snake and scorpion bites
Infrastructure	Hospitals destroyed
	Telephone and electricity cut
Relief challenges	Telephone and electricity cut - cannot get information from affected areas
	Victims in rural areas - hard to reach
	Iranian red crescent society (IRCS)

NGO / IO involved	World health organization (WHO)
	United nations office for the coordination of humanitarian affairs (OCHA)
	Telecoms sans frontiers (TSF)
	Humedica
	International red cross federation (IRCF)
	United Nations (UN)
Total number of NGO/IO	7
Other government involved	Turkey
	Azerbaijan
	Switzerland
	Germany
Total number of governments involved	4
Other military involved	Pakistan
Total number of military involved	1
Total number of personnel	1084

Other equipment	
Ambulances	97
Rescue vehicles	53
Helicopters	5
Bio radar (life detector)	20
K9 (sniffer dogs)	20
Relief goods provided	Swiss Humanitarian Agency (SHA):
	Winter-proof relief for 1000 persons:
	tents
	tent insulation
	heating apparatus
	blankets
	field kitchens
	IRCS:
	18397 family tents
	700 body bags
	21450 relief package
	28000 blankets
	12085 ground sheets

	2520 heating lights
	6204 Coleman water cooler
	4500 lantern
	3830 kitchen sets
	275143 food package
	321733 canned food
	110000 bottles of potable water
	30000 cartons washing powder
	33853 bar of soap
	50000 kg rice
	21850 edible oil
	31000 kg sugar
	300kg tea
	25000 kg cereals
	18000 kg dates

5.1.3 Iran timeline analysis

The following Gantt chart depicts the 7-day period immediately following the disaster.

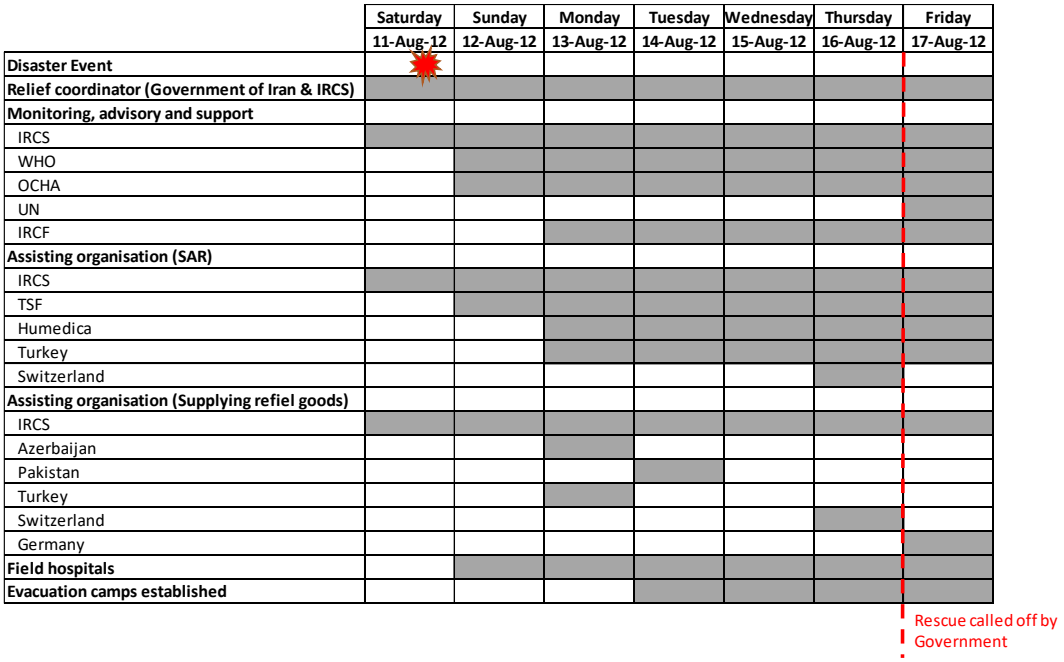


Figure 5.3: Gantt chart of Iran response (developed by author based on ReliefWeb (2016a))

Figure 5.3 shows the disaster event and the arrival and departure (if applicable) of all known aid organizations participating in the relief effort for monitoring search and rescue (SAR) and/or supply of relief aid. Field hospitals were operational one day after the earthquake and evacuation camps were established after 3 days. The announcement by the government that the rescue efforts should cease occurred 6 days after the onset of the disaster. Evacuation camps were still active at the time.

5.1.4 Iran general themes

The following general themes were identified in the available documentation, reports, diagrams, and maps for the earthquake that hit Iran in August 2012 through the process of structured coding using the NVIVO database. Sources for

the analysis, the number of codes per source and an example of coding are available in APPENDIX G.

Themes are separated into two sections: apriori (provisional) codes, stemming from provisional coding, and apostieri (emergent) codes.

General apriori codes

Infrastructure

Various elements of the Iranian infrastructure were affected by the earthquake:

- Telecommunications out (TSF, 2012)
- Electricity out (TSF, 2012)

Politics

In the case of the Iran earthquake, politics seemed to play a significant role. Due to the global sanctions on Iran, relief goods and money could not easily be donated to the country from some countries. The Unites States of America published a number of statements acknowledging the situation and providing controlled vehicles by which to make donations (Gladstone, 2012).

Sentiment

Sentiment analysis for this revealed diverse opinions. Some sources state that the national emergency response by the Iranian government was strong (STL, 2012). Other sources accuse the government of corruption and misappropriation of donations (Erdbrink, 2012). Typically, donations to this crisis were funnelled through the Iranian Red Crescent Society which has very close ties to the government, sparking doubt as to whether the relief aid would reach the intended recipients (Erdbrink, 2012). The level of trust in the government in certain spheres of the population was so low, that a group of Iranians organized a relief convoy themselves driving cross country to the affected area and providing what relief they could from their personal laden vehicles (Erdbrink, 2012). Complaints

of lack of tents to shelter affected communities were also published as well as the sentiment that the disaster was underplayed by the national media. (Reuters, 2012)

General apostieri codes

Access to information

As noted in section 4.4 above, ongoing situational assessment is critical to an effective and efficient relief operation. Typically quality information is hard to come by in a disaster situation, and the same was true for Iran (VOA, 2012). However, information was reported by IFRC (IFRC, 2012a), correlated by OCHA (OCHA, 2012a). In this case, there was a concern that information published by the government of Iran and IFRC was not an accurate representation of what was happening on the ground (Reuters, 2012).

Geography of the affected area

It was reported that some of the worst affected villages were in hard-to-reach places such as high altitude, mountainous areas and that some villages were hard to reach because they were on slopes (STL, 2012).

Need for protection of livestock – animal sheds

An interesting note, in this case, was the specific requirement for animal shelters. Subsistence farmers are dependent on their livestock for survival and income – one source mentioned that the livestock was being killed by wolves and a specific request was mentioned for animal pens. Another source mentioned that the affected area would soon be subject to winter weather and sub-zero temperatures, triggering the request for animal sheds to protect livestock from potentially fatal weather elements and predators (STL, 2012).

Cluster coordination

With reference to the discussion in Section 2.6.3 above regarding the WHO cluster approach, it is specifically mentioned in one of the sources that the cluster approach was not used in this case(STL, 2012).

Permissions and permits

It is important to note that, even in disaster situations, governments typically continue to enforce administrative processes such as border control for people and customs processes for any goods brought across the border. Specific mention is made in some sources of the requirement for specific permits, as well as relief goods being transported to a border post (IRNA, 2012a).

Appeal for assistance

From the available sources, it is not clear whether Iran declared a state of emergency. It was however stated that the country did not launch a formal appeal for external help but was willing to accept assistance if offered (OCHA, 2012b).

5.1.5 Iran supply chain related themes

Considering the definition of supply chain reiterated in Section 4.5.2 and the general thematic insights listed in the previous section, the following information concerning the supply chain of the 2012 earthquake in Iran was extracted:

Supply chain apriori codes

Logistics

As much as supply chain is not equal to logistics, logistics form a large part of the supply chain, so much so, that many use the terms interchangeably. In this case, the biggest challenge to the supply chain was getting goods to the affected areas. High altitudes and rough terrain made affected areas inaccessible(STL, 2012).

Relief

To conceptualize the quantity of goods transported (IFRC, 2012b) a rudimentary calculation was done using a sample of 3 products from the list of distributed goods in Table 5.1: *Iran disaster response snapshot* above. The selected items are all dense, heavy items and will thus hit the weight limit of the vehicle before the volumetric limit.

Supply chain apostieri codes

Information flow

A critical element of the supply chain is the visibility of goods, services and finances across the entire chain (Coyle et al., 2003). This visibility enables tracking and effective decision making in the distribution of goods and the tracking of distributed goods. In the case of the Iran earthquake, there was limited access to information, rendering the supply chain much less effective and creating an accountability gap (STL, 2012; TSF, 2012).

Search and rescue (SAR)

In the Iran case, SAR teams had limited visibility and access to information as well as physical access to affected areas(STL, 2012; TSF, 2012). This caused a situation where teams were not dispatched on time or were unable to reach the victims entirely(STL, 2012).

Table 5.2: Calculated truck loads

	34t truck	**8t truck**
Truck capacity (tons)	34	8
Utilisation (%)	0.8	0.8
Usable load	27.2	6.4

Weight rice (tons)	50	50
Weight sugar (tons)	31	31
Weight dates (tons)	18	18
Total weight (tons)	99	99
Calculated truck loads (rounded up)	**4**	**15**

The above calculation shows that to deliver 3 out of the 20 relief goods distributed in the Iran relief effort, four 34-ton loads, or fifteen 8-ton loads would have been required, which translates into a significant supply chain challenge. Considering the sentiment discussed above, it can only be concluded that this effort was not executed effectively with the Iran disaster.

Iran thematic rating

In this section, the ratings were assigned to emergent themes from the research. Themes are divided into three categories: general themes, binary themes and supply chain themes.

Table 5.3: Iran weighted general theme ratings

Rated themes	Influence rating (Weighting)	Weight	Iran	Score	Motivation for score	Ref	Weighted score
Access to information	Extremely influential	5	Fair	3	Conflicting statements regarding the efficacy of relief efforts casting doubt over the accuracy of reporting. Limited information is available for study.	(Erdbrink, 2012; Reuters, 2012; STL, 2012)	0.375
Geography	Very influential	4	Poor	2	Affected areas located on a steep slope hampering relief.	(STL, 2012)	0.2
Permissions and permits	Very influential	4	Fair	3	No reports of challenges with permissions and permits.	(IRNA, 2012a; Switzerland FDFA, 2012)	0.3
Infrastructure	Very influential	4	Poor	2	Limited information is available. Electricity and phone	(STL, 2012; TSF, 2012)	0.2

Rated themes	Influence rating (Weighting)	Weight	Iran	Score	Motivation for score	Ref	Weighted score
					lines down. Geographically challenging area.		
Politics	Slightly influential	2	Poor	2	Politics played a large role in this disaster due to sanctions.	(Gladstone, 2012)	0.1
Activation of disaster protocol	Extremely influential	5	Fair	3	Iranian red crescent society was very influential in response.	(IFRC, 2012a)	0.375
Camps/ Relief	Very influential	4	Fair	3	A significant amount of well-documented relief aid was sent to the affected area.	(OCHA, 2012b)	0.3
Medical response	Very influential	4	Fair	3	Many medical facilities were destroyed; patients were sent to	(OCHA, 2012c; STL, 2012)	0.3

Rated themes	Influence rating (Weighting)	Weight	Iran	Score	Motivation for score	Ref	Weighted score
					unaffected hospitals. Temporary facilities established.		
Total score							2.15

Table 5.4: Iran binary themes

Binary theme	Rating	Ref
Livestock	Yes	(STL, 2012)
Cluster coordination	No	None
Appeal for assistance	No	(OCHA, 2012c, p. 4)
Coordination with industry	No	None
Sentiment	Negative	(Erdbrink, 2012; Reuters, 2012)

Table 5.5: Iran supply chain themes

Supply chain theme	Rating	Score	Motivation for score	Ref
Logistics	Poor	2	Significant geographical challenges, reports of areas not being reached.	(STL, 2012)
Information flow	Poor	2	Infrastructure challenges: geography, electricity, telecommunications leading to lack of relevant information. Also, the lack of published information and negative sentiment contributes to this rating.	(Erdbrink, 2012; Reuters, 2012; STL, 2012; TSF, 2012)
Search and rescue (SAR)	Poor	2	Limited access to information. Unable to reach certain areas. SAR effort was called off very early by the government.	(STL, 2012; TSF, 2012; VOA, 2012)
Relief	Fair	3	A large amount of relief goods made available to victims. Challenges with the distribution.	(IFRC, 2012c; STL, 2012)
Total score		2.25		

5.1.6 Iran conclusion

There are conflicting opinions as to the success of the rescue and relief efforts in Iran after the 6.4 magnitude earthquake hit the country in 2012. It can be said that

the government and Iranian Red Crescent Society acted quickly, with SAR teams and resources on the ground within hours of the disaster and two field hospitals were operational within a day of the tremor. It does however seem that there were some challenges surrounding the delivery of relief in the relief camps - with reports of insufficient shelter, food, and water.

5.2 Italy (2016)

On Saturday 24 August 2016 at 03:36 a magnitude 6.2 earthquake hit central Italy. Just shy of an hour later, at 04:33 a second magnitude 5.4 earthquake shook the region, killing 292 people, injuring 400 and displacing 2925. (ReliefWeb, 2016b)

Several reports only available in Italian were translated using “Google Translate”. Barring some grammatical errors, the translated information was suitable to use for analysis. A limited amount of information was available describing this event, however, sources were clear and easily identifiable.

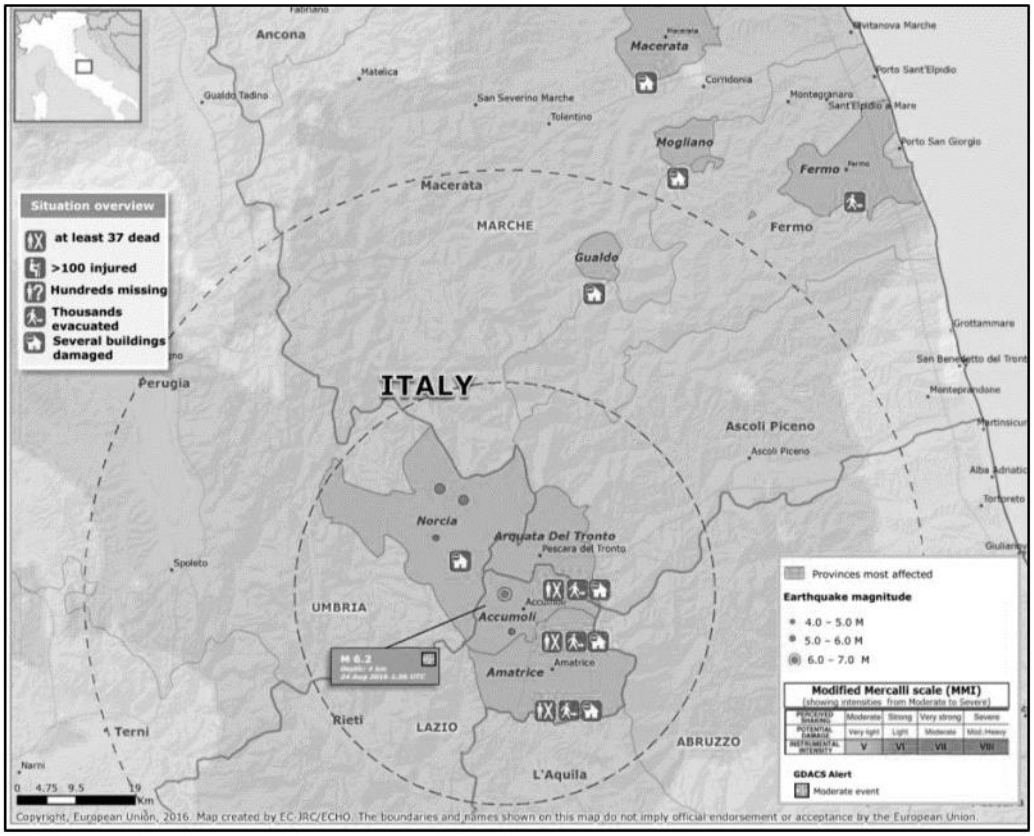


Figure 5.4: Italy earthquake overview (ReliefWeb, 2016b)

5.2.1 Italy snapshot summary

The following information is primarily drawn from the EM-DAT database, Red Cross Information bulletins, Humanity Road situation reports, and reports published by the government of Italy.

Table 5.6: Italy disaster response snapshot

Date of event:	24-Aug-16
Event:	2 earthquakes hit central Italy:
	1) 6.2 magnitude at 03:36 local time
	2) 5.4 magnitude at 04:33 local time
Relief effort lead by:	Italian National Civil Protection Agency (NCPA) - Activated hours after the event
	The hospital disaster response plan activated 30 minutes after the earthquake
Deaths	292
Injured	2925
Displaced	Unknown
Relocated	3554
Rescued	238
Secondary effects / challenges	Strong aftershocks
Infrastructure	Hospitals damaged.
	17 communities cannot be contacted, no phone communication, no damage reported.
	Airports operational.

	Rail services disrupted.
	HAM radio operational.
	Civilians requested to open their Wifi to assist communication.
	Various roads closed due to damage.
	HAM radio operational, police requests assistance of operators.
	Some electricity blackouts.
	Some limitations on use of tap water.
	More roads closed due to aftershocks.
	Some bridges closed.
	Gas supply shut off in Arquata del Tronto and Accumoli.
Relief challenges	Various roads closed due to damage/ landslides, hampering rescue efforts.
NGO / IO involved	Caritas
	Italian Red Cross (IRC)
	European Commission (EC)
	Humanity road
	Shelter Box
	Order of Malta
	Alitalia
	Save the children
Total number of NGO/IO	8

Other government involved	Unknown
Total number of governments involved	Unknown
Other military involved	Unknown
Total number of military involved	Unknown
Total number of personnel	6806
Other equipment	
Ambulances	Unknown
Rescue vehicles	Hundreds
Helicopters	Unknown
Bio radar (life detector)	Unknown
K9 (sniffer dog teams)	70
Relief goods provided	IRC:
	13 regional branches have deployed:
	workers
	vehicles
	tents
	camp beds
	mats
	blankets
	generators

	field toilets

5.2.2 Italy timeline analysis

The following Gantt chart depicts the 7-day period immediately following the disaster.

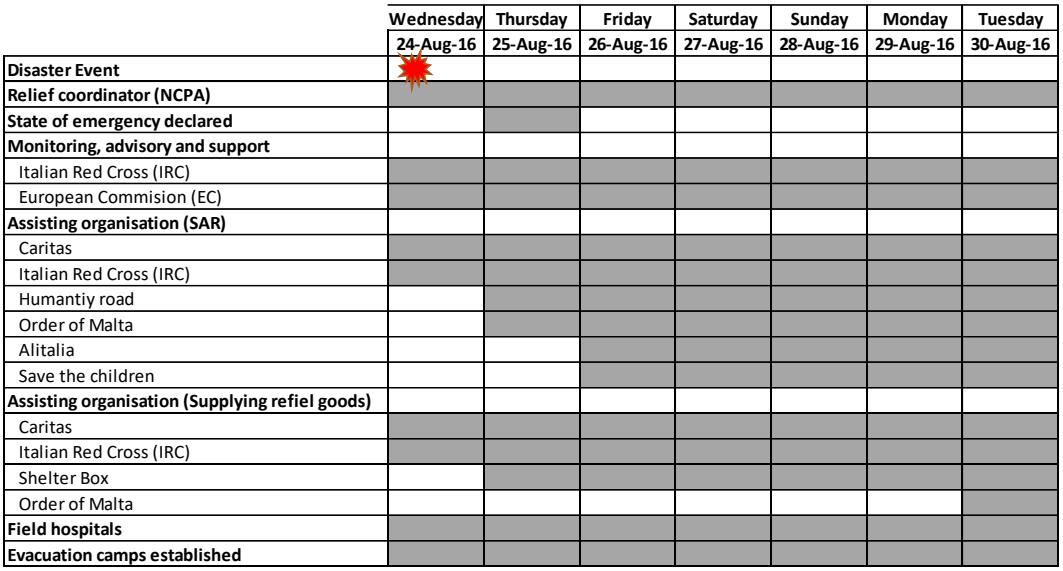


Figure 5.5: Gantt chart of Italy response (developed by author based on ReliefWeb (2016a))

Figure 5.5 shows the disaster event and the arrival and departure (if applicable) of all known aid organizations participating in the relief effort for monitoring search and rescue (SAR) and/or supply of relief aid. Field hospitals were operational immediately after the earthquake and evacuation camps were established on the first day. No announcement was made by the government to cease rescue efforts during the timeframe under study.

5.2.3 Italy general themes

For this case, the researcher felt that there was a strong correlation of information between multiple sources.

The following general themes were identified in the available documentation, reports, diagrams, and maps for the earthquake that hit Italy in August 2016, through the process of structured coding using the NVIVO database.

Themes are separated into two sections: apriori (provisional) codes, stemming from provisional coding, and apostieri (emergent) codes.

General apriori codes

Infrastructure

The following infrastructure was severely damaged by the disaster (Humanity Road, 2016a, 2016b, 2016c):

- Roads,
- Railways,
- Communication,
- Electricity and
- Gas

Essential services personnel played a pivotal role in restoring these services (Government of Italy, 2016a).

With communications down, the relief effort partially relied on Ham (amateur) radio operators for communication, launching an appeal to keep specific frequencies open for this purpose (Humanity Road, 2016b).

Relief: Camps

Evacuation centres were established very soon after the disaster event occurred, with 43 reception areas made available to the victims of the earthquake housing 32 000 people at maximum capacity during the period. These camps were however temporary in nature and with the onset of winter people who were still in the camps were transferred to more robust shelters e.g., hotels and container modules (Humanity Road, 2016a, 2016b, 2016c):

It is also notable that specific mention is made in several sources of psychological support being offered by various providers e.g., the Italian Red Cross and the Order of Malta(IFRC, 2016a, 2016b, 2016c, 2016d; Order of Malta, 2016).

General apostieri codes

Activation of disaster protocol

Various sources reported that the '*Mass casualty action plan'* of Italy was activated within 30 minutes of the occurrence of the first earthquake (Humanity Road, 2016b; WHO, 2016).

Hours after the event the National Civil Protection Service had activated. This body consists of many stakeholders such as national and regional state administrations, essential services and volunteers. At its peak, 6 000 relief personnel were deployed (Government of Italy, 2016a; Humanity Road, 2016b).

Part of this response was making available 43 reception areas and 2 mobile hospitals (WHO, 2016).

Access to information

Once the '*Mass casualty operation plan'* (MCOP) was underway bed and staff capacity of each medical facility was regularly communicated to the front-line responders. As part of the response, a central operation unit was established in charge of directing ambulances to the correct medical facilities. Coordinators were constantly monitoring medical capacity in all provinces for a clear picture of available medical capacity (WHO, 2016).

The Italian Red Cross reported that they were operating from a 24-hour mobile operations centre, in the affected area(IFRC, 2016a).

Multiple reports available from the Italian government regarding the relief effort (Government of Italy, 2016b, 2016a) and information is available on this event with detailed daily updates published by various sources e.g., Humanity Road (Humanity Road, 2016b) and Italian Red Cross(IFRC, 2016a). These information bulletins or situation reports typically contain the following information:

- Contact numbers, websites, and communication links for various services such as connecting separated families
- Overview of the current situational status
- Maps
- Hospital statuses
- Urgent need and relief
- Vulnerable population information
- Update on utility status and so on.

Satellite imagery was also used to determine the extent of the damage and locations in need of assistance.

Cluster coordination

No evidence or mention of the cluster approach (OCHA, 2020) being implemented in any identified sources.

Appeal for assistance

No mention of a formal appeal of assistance from the Italian government.

Other

- The Italian Red Cross made a mobile kitchen available, providing 10 000 meals per day (IFRC, 2016b).

- A child-safe space was made available for activities(Humanity Road, 2016c).

5.2.4 Italy supply chain related themes

Although the term ‘supply chain’ is not explicitly mentioned in the available resources, various supply chain elements (Coyle et al., 2003) were executed well by the government of Italy during the earthquake in 2016.

Supply chain apriori codes

Information flow

As with the impact on Logistics, the impact on information flow, in this case, was caused by the damage to infrastructure. Challenges were experience with communication providers and electricity which caused a lack of information for certain areas. From the available information, it does however seem that the response effort overcame these challenges by implementing communication systems suited to disaster situations as well as involving the community by requesting the removal of passwords from Wifi networks and using the Ham (amateur) radio network (Humanity Road, 2016a, 2016b, 2016c).

Search and rescue (SAR)

Referring to Section 4.5.2 where the premise was stated that SAR is largely a supply chain activity and considering that the 2 elements of supply chain under study are: the physical flow of goods and information flow, resulting in visibility of the supply chain, it can be concluded that SAR efforts, in this case, were executed very well from a supply chain perspective (IFRC, 2016d, 2016c, 2016b, 2016a).

Supply chain apriori codes

Logistics

The challenge for this relief effort was the effect the disaster had on infrastructures such as roads and railways. Some of the affected areas were hard to reach which had an impact on the time it took to reach certain areas (Humanity Road, 2016a, 2016b, 2016c):.

If the available information is considered it becomes clear that various supply chain principles were applied to the transport of victims and patients, considering the elements of the supply chain the study focuses on as discussed in Section 4.5.2. An example of logistics principles applied is 3 Italian red cross warehouses in Italy being made available as hubs to collect donations and distribute to the relevant areas(IFRC, 2016c). More than 20 trucks had been dispatched in the first week post the disaster (IFRC, 2016c).

The medical response was also handled well, applying several supply chain principles – a central control room had a view of all available beds in the province and were directing ambulances to the relevant facilities(WHO, 2016).

Relief

From the considered sources it is concluded that the relief effort was well within the capacity of the affected country and executed sufficiently(IFRC, 2016d).

Italy thematic rating

In this section, the researcher assigns ratings to emergent themes from the research. Themes are divided into three categories: general themes, binary themes and supply chain themes.

Table 5.7: Italy weighted general theme ratings

Rated themes	Influence rating (Weighting)	Weight	Rating	Score	Motivation for score	Ref	Weighted score
Access to information	Extremely influential	5	Good	4	Mass casualties emergency plan activated less than 30 minutes after the event. Relevant information distributed at the time of disaster. Comprehensive situation reports available.	(Humanity Road, 2016c; WHO, 2016)	0.5
Geography	Very influential	4	Fair	3	No mention of geography having a pertinent influence on the response.	(Humanity Road, 2016c)	0.3
Permissions and permits	Very influential	4	Fair	3	No documented challenges around the supply of relief goods.		0.3

Rated themes	Influence rating (Weighting)	Weight	Rating	Score	Motivation for score	Ref	Weighted score
Infrastructure	Very influential	4	Very poor	1	Infrastructure collapse especially roads and bridges had a significant impact on disaster response.	(Humanity Road, 2016c)	0.1
Politics	Slightly influential	2	Fair	3	No documented political challenges.		0.15
Activation of disaster protocol	Extremely influential	5	Excellent	5	Mass casualties emergency plan activated less than 30 minutes after the event.	(WHO, 2016)	0.625
Camps/Relief	Very influential	4	Good	4	Relief shelters were established on the day of the event.	(Humanity Road, 2016b)	0.4

Rated themes	**Influence rating (Weighting)**	**Weight**	**Rating**	**Score**	**Motivation for score**	**Ref**	**Weighted score**
Medical response	Very influential	4	Excellent	5	Mass casualties emergency plan activated less than 30 minutes after the event.	(WHO, 2016)	0.5
Total score							2.875

Table 5.8: Italy binary themes

Binary theme	Rating	Ref
Livestock	No	None
Cluster coordination	No	None
Appeal for assistance	No	None
Coordination with industry	No	None
Sentiment	No	None

Table 5.9: Italy supply chain themes

Supply chain theme	Rating	Score	Motivation for score	Ref
Logistics	Fair	3	Infrastructure challenges hampered relief, but supply chain principles were well-implemented where possible.	(Humanity Road, 2016c; WHO, 2016)
Information flow	Fair	3	Infrastructure challenges impacted information flow negatively. Where possible, information was shared effectively.	(Humanity Road, 2016c; WHO, 2016)
Search and rescue	Good	4	Executed well from a supply chain perspective.	(IFRC, 2016a, 2016c, 2016d, 2016a)
Relief	Good	4	Relief effort within the capacity of the affected country.	(IFRC, 2016d; WHO, 2016)
Total score		3.5		

5.2.5 Italy conclusion

Italy had an emergency response protocol activated within 30 minutes of the 6.2 magnitude quake that hit the country in 2016 with seemingly robust communication processes in place, smoothing the way for rescue and relief activities. Furthermore, no negative sentiments were published in the repository of data studied, indicating that the response to this event can be considered a success. This can be attributed to the fact that the relative size of the disaster, taking into account the preparedness of the Italian government, the population density of the affected area as well as the magnitude of the earthquake, did not exceed the capacity of the affected government.

5.3 Nepal (2015)

Nepal was struck by a severe magnitude 7.8 earthquake on Saturday 25 April 2015 at 11:56 local time, triggering a series of landslides and avalanches as well as various aftershocks. On Sunday 26 April, a magnitude 6.7 aftershock hit the country (ReliefWeb, 2015).

An overwhelming amount of published information is available for this event. The researcher focused on situation reports from reputable sources e.g., OCHA, USAID and CFE-DMHA.

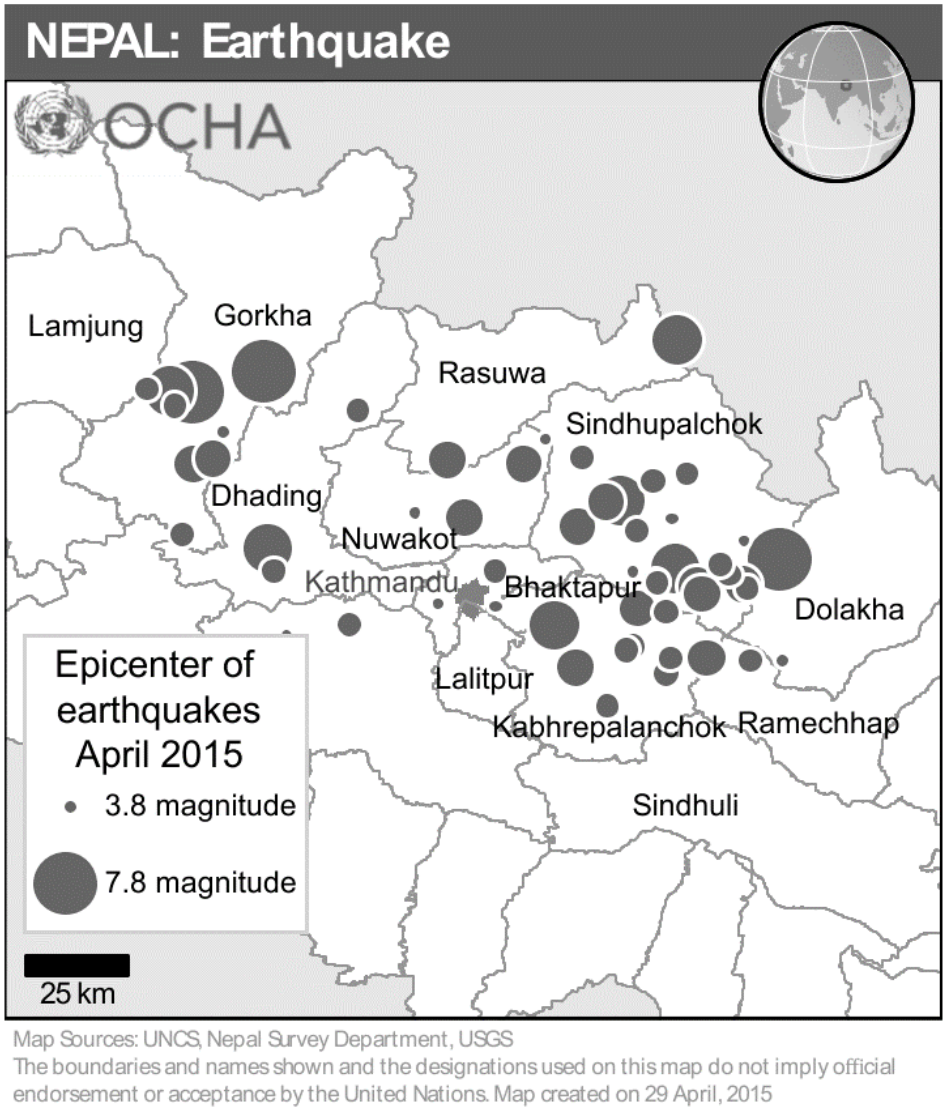


Figure 5.6: Nepal earthquake overview (ReliefWeb, 2015)

5.3.1 Nepal snapshot summary

The following information is primarily drawn from the EM-DAT database, ACAPS briefing notes, Humanity Road and United nations office for the coordination of humanitarian affairs (OCHA) situation reports, United States agency for international development (USAID) fact sheets, Center for Excellence in disaster management and humanitarian assistance (CFE-DMHA) information reports, situation reports published by the World health organization (WHO), WHO logistics cluster and Lutheran world relief and reports published by various governments e.g. Canada, Norway, Nepal and Pakistan among others.

Table 5.10: Nepal earthquake overview (ReliefWeb, 2015)

Date of event:	25-Apr-15
Event:	Magnitude 7.8 earthquake struck central Nepal at 11:56 local time.
	Magnitude 6.7 aftershock struck central Nepal at 12:54 local time.
Relief effort lead by:	National Emergency Operations Centre (NEOC) of Nepal supported by the international humanitarian community.
Deaths	6250
Injured	14357
Displaced	2.8 million
Relocated	24000
Rescued	Unknown
Secondary effects / challenges	The mountainous geography of the country conducive to landslides and avalanches

	Large aftershocks continue to hit the region for several days after the initial quake.
Infrastructure	Hospitals overcrowded, lack of medical supplies to the point of depletion.
	Disease a concern due to exposure. Diarrhoea is an existing problem in Kathmandu and expected to get worse.
	Landlines operational, telecommunications and electricity sporadic.
	Damaged road infrastructure causing extremely limited access to areas outside of Kathmandu. Situation outside Kathmandu unclear.
Relief challenges	Mountainous geography of the country conducive to landslides and avalanches, hampering the relief effort.
	Extremely difficult to reach rural areas affected by the earthquake.
	Limited airport capacity and cumbersome customs clearance required for relief supplies and personnel.
	Bad weather causing some helicopters to turn back.
NGO / IO involved	Agency for technical cooperation and development (ACTED)
	British red cross (BRC)
	Catholic agency for overseas deployment (CAFOD)
	Cooperative for assistance and relief everywhere (CARE)

	Camp coordination and camp management (CCCM) cluster
	Catholic relief services (CRS)
	Disaster assistance response team (DART)
	Doctors worldwide (DWW)
	European Union (EU)
	Field coordination support section (FCCS)
	Global medicine (GM)
	Humanitarian country team (HCT)
	Indian red crescent society (IRCS)
	International Federation of Red Cross and Red Crescent Societies (IFRC)
	International humanitarian partnership (IHP)
	International organisation for migration (IOM)
	Islamic relief
	Japan red cross (JRC)
	Joint humanitarian assessment support team. (JHAST)
	Lutheran world relief (LWR)
	Malteser international
	Mercy Corps (MC)
	Médecins du monde (doctors of the world) (MDM)
	Medair
	Mercy relief

	Mercy Malaysia (MM)
	Médecins Sans Frontieres (MSF)
	Norwegian Refugee Council (NRC)
	Nepal red cross society (NRCS)
	United nations office for the coordination of humanitarian affairs (OCHA)
	The Oxford Committee for famine relief (Oxfam)
	Oxfam India
	Search and rescue in disasters (SARAID)
	Save the children (SC)
	Telecoms sans frontieres (TSF)
	United Nations (UN)
	UN disaster assessment and coordination (UNDAC)
	UN Development Program (UNDP)
	UN Environmental Program (UNEP)
	UN Population Fund (UNFPA)
	UN high commission of refugees (UNHCR)
	UN Children's Fund (UNICEF)
	UN Resident coordinators office (UNRC)
	United States Agency for international development (USAID)/ Office of US foreign disaster assistance (OFDA)
	World Food Program (WFP)

	World Health Organisation (WHO)
	World Vision
Total number of NGO/IO	47
Other government involved Refer to: USAR team snapshot, Foreign medical team snapshot and member state effort figures below.	Australia
	Canada
	China
	Denmark
	Estonia
	European Commission
	Finland
	France
	Germany
	Government of Chine (GOC)
	Government of India (GOI)
	Iceland
	India
	Ireland
	Israel
	Italy
	Japan
	Kuwait
	Morocco

	Myanmar
	New Zealand
	Norway
	Pakistan
	Singapore
	South Korea
	Sri Lanka
	Switzerland
	Thailand
	United Arab Emirates (UAE)
	United Kingdom (UK)
	United States of America (US)
Total number of governments involved	33
Other military involved	India
	Japan
	UK
	US
Total number of military involved	4
Total number of personnel	20833
Other equipment	Refer to: Deployed assets diagram below.

Relief goods provided	ICRC: 400 body bags, 7 sets of dressing modules (medical)
	Oxfam: 5 tons of water and sanitation materials
	World Vision: supplies pre-positioned in Nepal - 1000 tarps, 600 blankets.
	France: 25 tons of aid
	India: has moved >100 tons of material via helo
	UK: 1100 shelter kits
	Medair: 1100 shelter kits, 500 solar lamps.
	Oxfam: 3 trucks - tarps, foam sheets, water containers, chlorine tablets, solar lamps. 2 trucks - water filters, latrine construct materials.
	Australia: 80000 water purification tablets, 750 hygiene kits, 940 tarps, 1200 blankets.
	US military: 45 Tons of cargo

The below infographic shows the number of search and rescue teams deployed in Nepal immediately following the earthquake, it also shows the country each team was from and how many resources were deployed by each country.

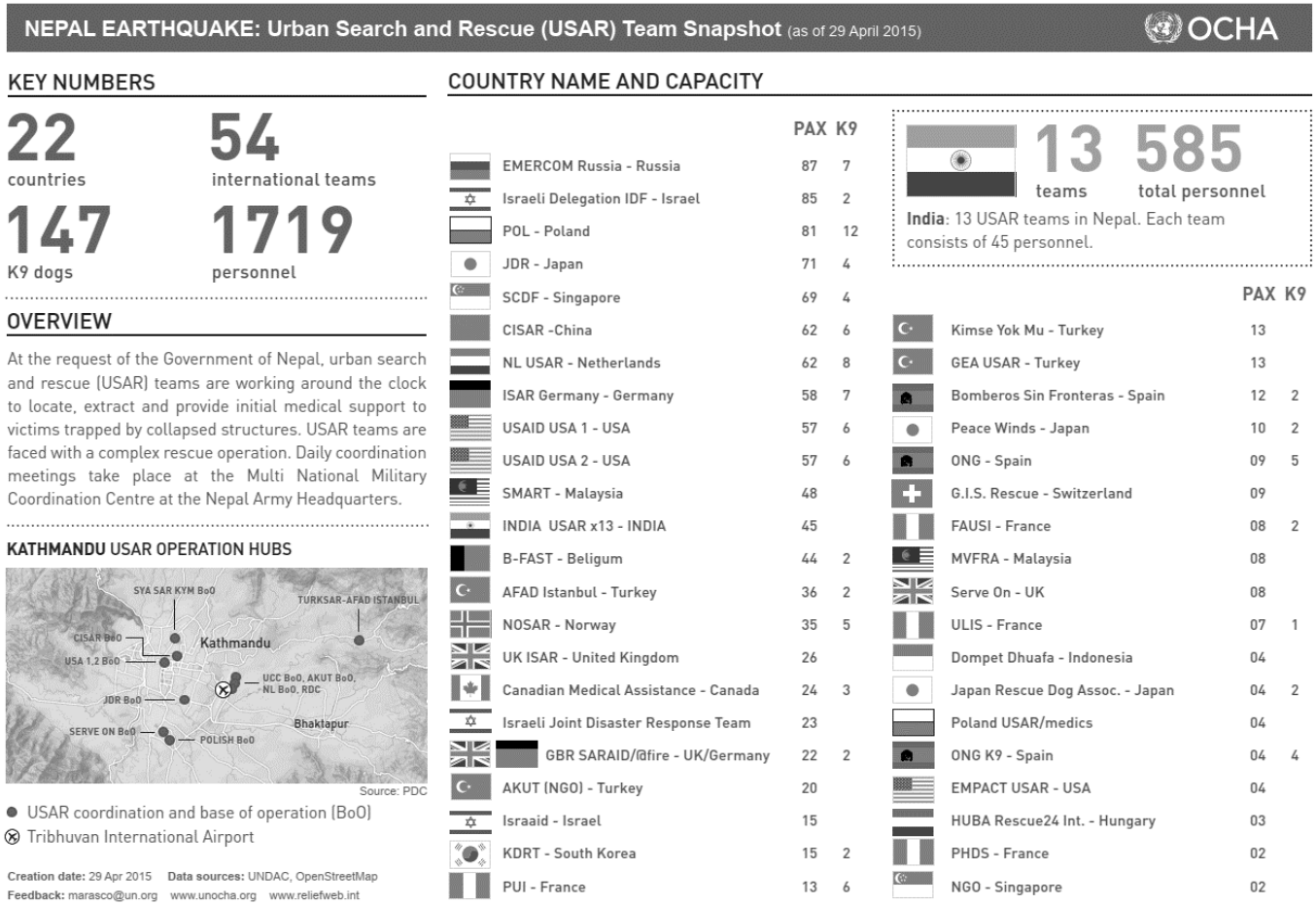


Figure 5.7: Urban search and rescue team snapshot (ReliefWeb, 2015)

The below infographic shows relief aid offered by various countries to the disaster-affected area of Nepal.

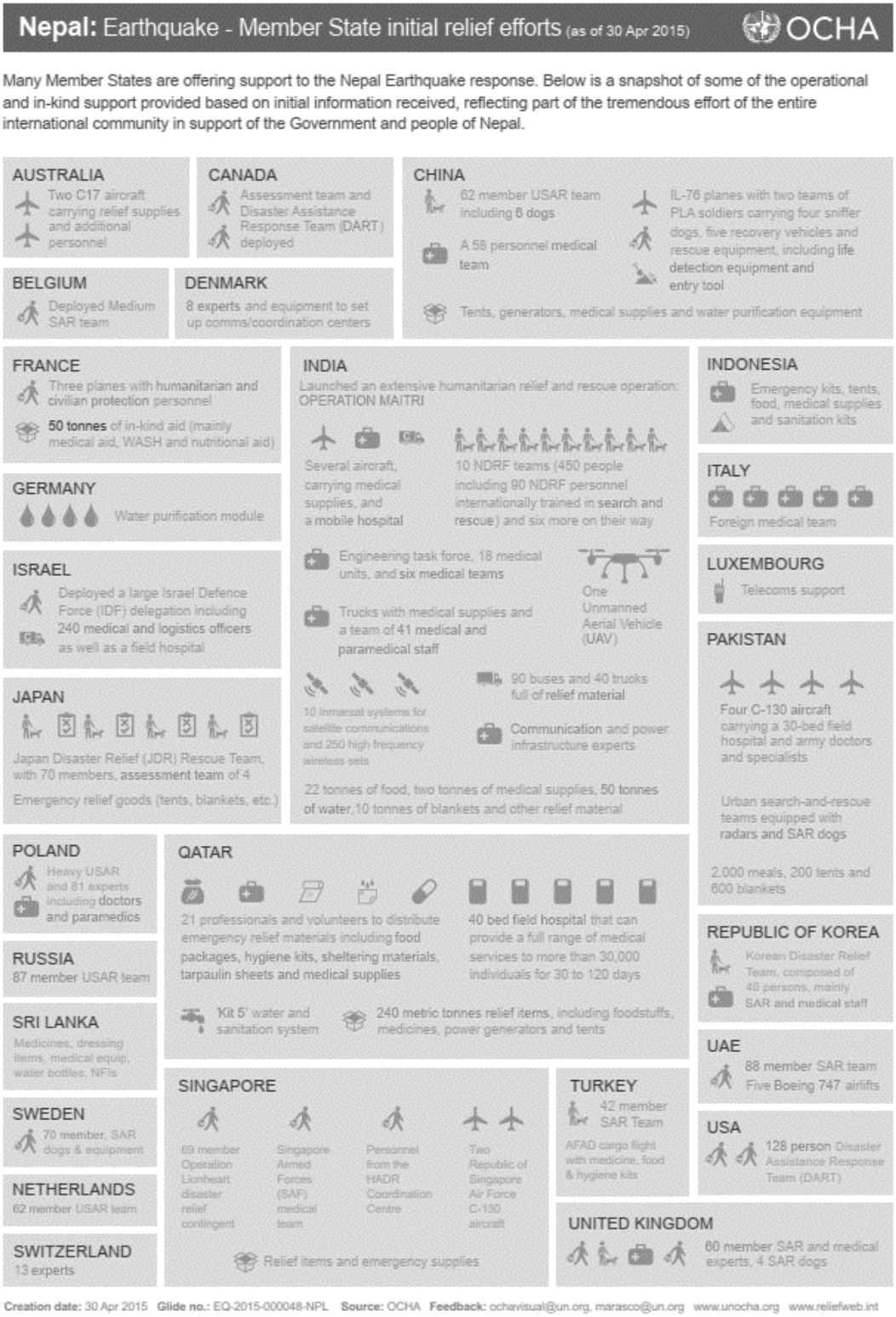


Figure 5.8: Member state initial relief efforts (ReliefWeb, 2015)

The number of foreign medical personnel deployed by various assisting countries is shown in the infographic below:

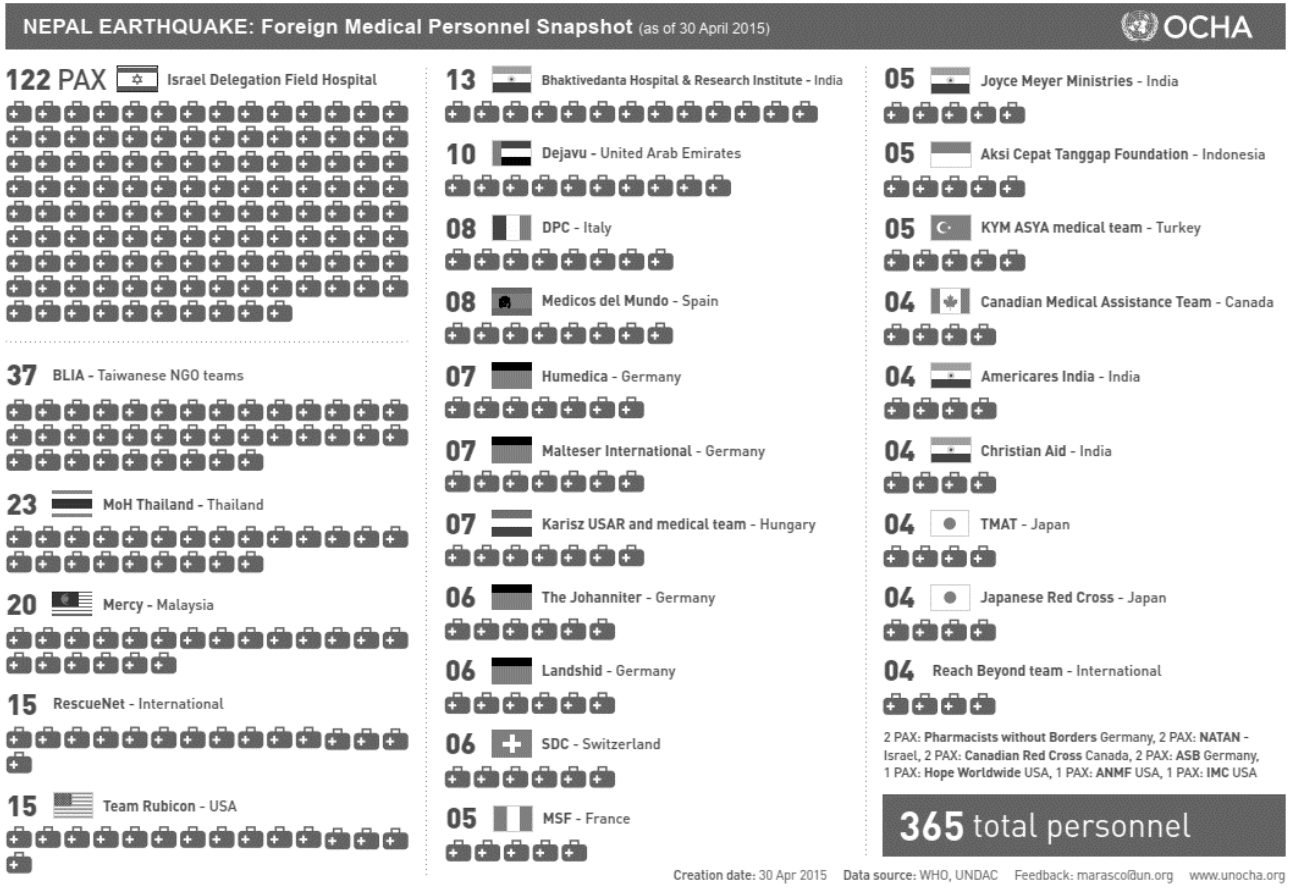


Figure 5.9: Foreign medical personnel snapshot (ReliefWeb, 2015)

Military assets deployed by various assisting nations are shown in the infographic below.

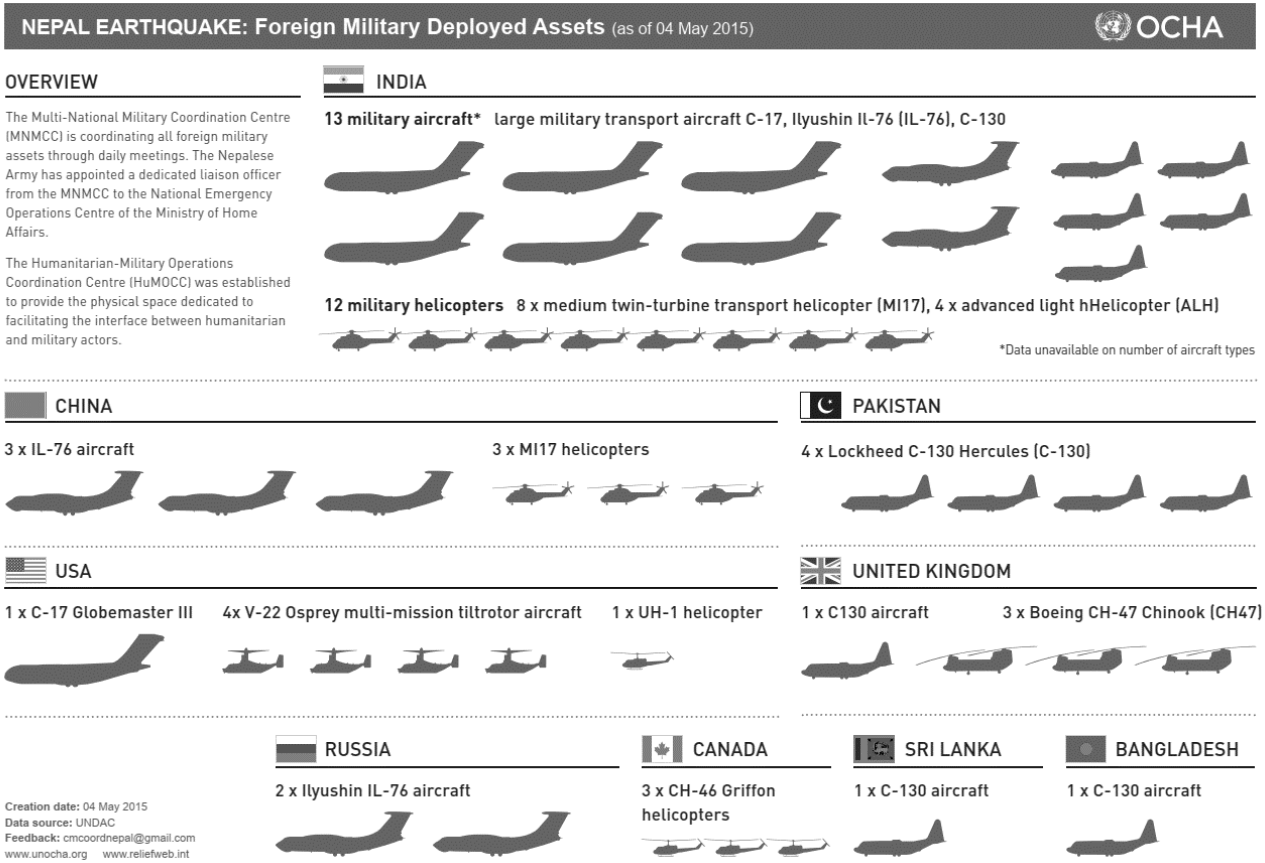


Figure 5.10: Foreign military deployed assets (ReliefWeb, 2015)

5.3.2 Nepal timeline analysis

The following Gantt chart depicts the 7-day period immediately following the disaster.

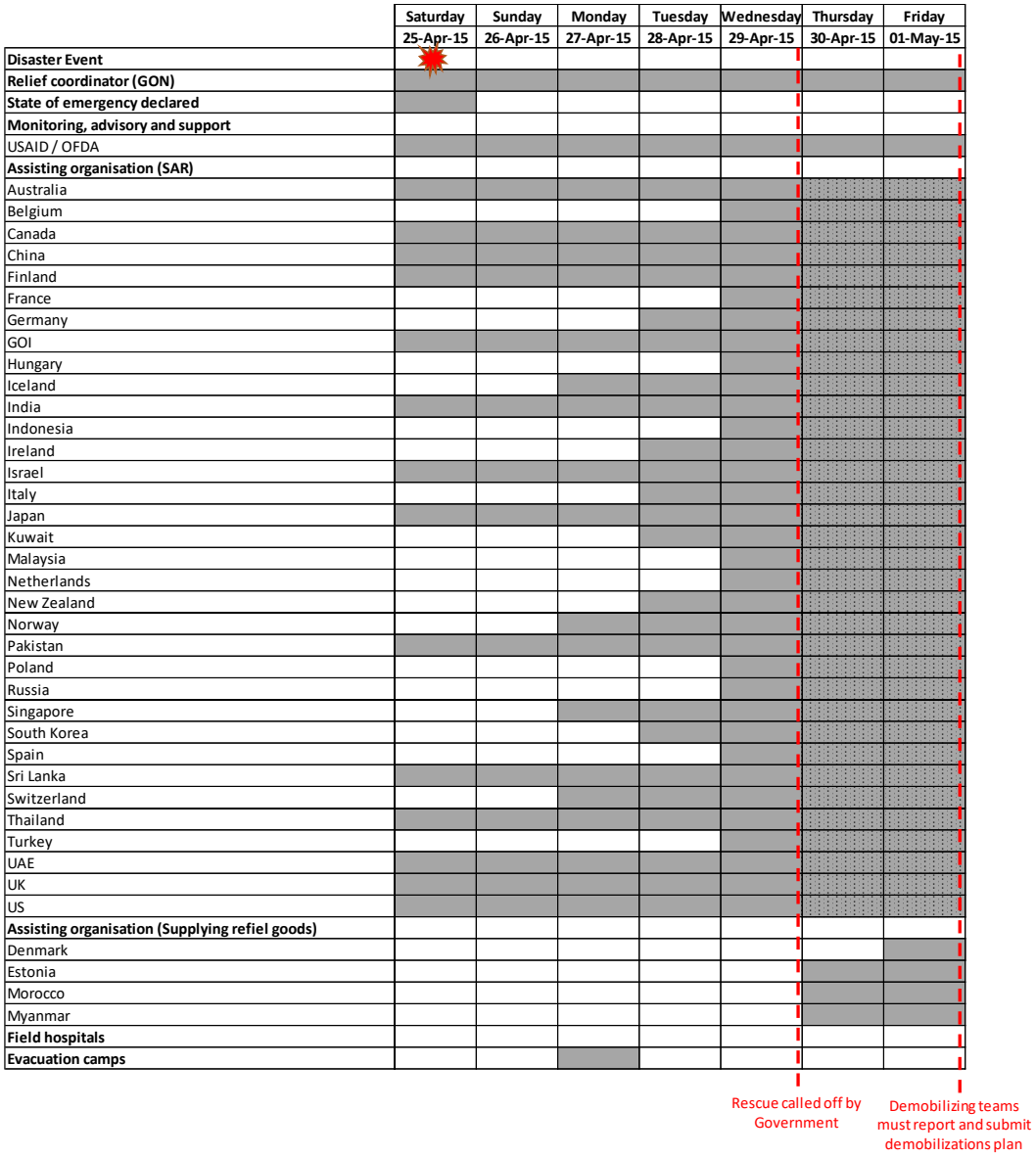


Figure 5.11: Gantt chart of Nepal response from governments and military (developed by author based on ReliefWeb (2015))

Figure 5.11 shows the disaster event, state of emergency declaration and the arrival and departure (if applicable) of all known governments and militaries participating in the relief effort for search and rescue (SAR) and/or supply of relief aid. NGOs involved in the monitoring of the situation are also noted. Field

hospitals provided and operated by teams from Pakistan, Israel and Mercy Malaysia were operational from approximately 3 days after the earthquake and evacuation camps were established at the same time. An announcement was made by the Government of Nepal that the rescue was being called off 5 days after the event and all search and rescue (SAR) teams had to submit demobilizing plans 7 days after the disaster.

	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday
	25-Apr-15	26-Apr-15	27-Apr-15	28-Apr-15	29-Apr-15	30-Apr-15	01-May-15
Disaster Event							
Relief coordinator (GON)							
State of emergency declared							
Monitoring, advisory and support							
USAID / OFDA							
Assisting organisation with in-country footprint							
Care							
MSF							
Nepal Red Cross & IFRC							
Save the children							
UNHCR							
UNICEF							
World Vision							
Other assisting organisations							
ACTED							
British red cross (BRC)							
CAFOD							
CARE							
CCCM cluster							
CRS							
DART							
DWW							
FCCS							
GM							
HCT							
ICRC							
IHP							
IOM							
Islamic relief							
Japan red cross (JRC)							
JHAST							
LWR							
Malteser international							
MC							
MDM							
Medair							
Mercy relief							
MM							
NRC							
OCHA							
Oxfam							
Oxfam india							
SARAID							
TSF							
UNDAC							
UNDP							
UNEP							
UNFPA							
UNHCR							
UNRC							
WFP							
WHO							
World Vision							

Figure 5.12: Gantt chart of Nepal response from NGOs (developed by author based on (ReliefWeb, 2015)

Figure 5.12 depicts the disaster event, state of emergency declaration and the arrival and departure (if applicable) of all known NGOs participating in the relief effort for search and rescue (SAR) and/or supply of relief aid. NGOs involved in the monitoring of the situation are also noted. NGOs with an existing presence in the country are listed separately as they could immediately assist where needed without travel required. It is important to note that the instruction for the demobilization of SAR teams from the Nepalese government, as noted in Figure 5.11, was also applicable to NGOs.

5.3.3 Nepal general themes

After considering gathered data and conducting thematic analysis, as with the other cases, the following themes were identified for the Nepal case, through the process of structured coding using the NVIVO database.

General apriori codes

Infrastructure

Various sources reported damage to infrastructure in the country resulting in extremely limited access to some areas. (CFE-DMHA, 2015a; USAID, 2015a) According to (CFE-DMHA, 2015b) the impact on Kathmandu was less than expected with only moderate impact reported. Access to rural areas was very challenging, aggravated by bad weather. (ACAPS, n.d.)

Kathmandu and Pokhara airports remained open, operating under limited capacity. Mobile networks operated sporadically and landlines seemed to be functional. (CFE-DMHA, 2015b, 2015a)

Relief: Camps

16 shelter locations made available in Kathmandu valley, displaced persons are however also gathering in other places, according to satellite imagery analysis.

(USAID, 2015b). From the collection of sources, it can be inferred that the camps did not offer sufficient infrastructure, with reference to the concern regarding the spread of disease and reports of people sleeping in the open (TNH, 2015a).

One report stated that there was no medical support at the camps and a lack of infrastructure triggering public health concerns due to lack of hygiene and sanitation, affecting an estimated 1.6 million people temporarily displaced by the disaster (TNH, 2015a).

Sentiment

Unconfirmed reports of people protesting the lack of relief or competing for limited resources (CFE-DMHA, 2015c). This is supported by many Nepalese who turned to the media to express anguish and frustration as they continued to await relief supplies more than a week after the disaster struck (Operation USA, 2015).

General apostieri codes

Disjointed response

To create the context for this theme it is important to understand the topography of Nepal: The country's capital, Kathmandu is located in a basin surrounded by the Himalaya mountains, called the Kathmandu valley. Kathmandu also houses the country's largest international airport. To reach the rest of the country extremely difficult terrain must be traversed via mountain passes. Some rural, populated areas are only reachable by donkey or foot during normal conditions. The Kathmandu valley represented approximately 9% of the population of Nepal in 2015 (ACAPS, n.d.; Statista, 2020).

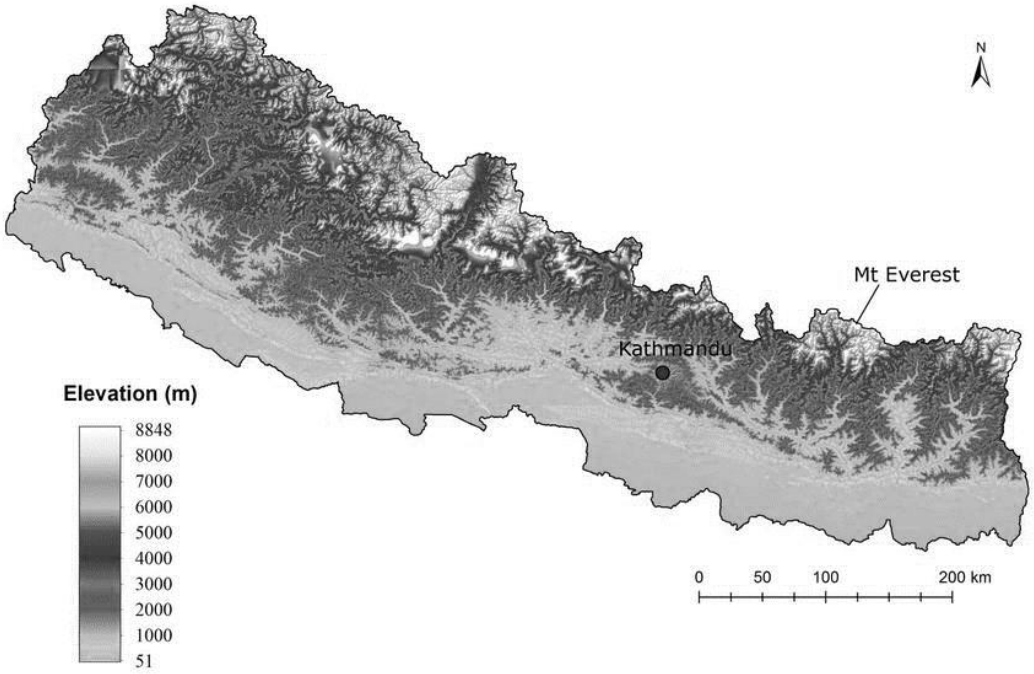


Figure 5.13: Elevation map of Nepal (Research Gate, 2014)

A notable trend in the response to the Nepal earthquake was the disparate response between the Kathmandu valley and the rest of the country. Various sources point to the fact that the Kathmandu SAR response was thorough and well managed, where the left of the country experienced little to no SAR support. Concerning the relief effort, the trends seem to be similar – especially in the first week after the disaster had hit. (CFE-DMHA, 2015a). Another source stated that there was a general perception that much of the initial support was focused on Kathmandu at the expense of rural areas (Helvetas, 2015)

Emergency declaration

The government of Nepal declared a state of emergency and issued a request for international assistance within one day of the earthquake striking their country. (CFE-DMHA, 2015b; USAID, 2015a) with the GON in charge of response coordination (CFE-DMHA, 2015a)

Access to information

As a baseline, mobile network coverage and availability of internet connection in Nepal – especially the mountainous areas – is sporadic (personal experience of the researcher). Various sources reported that getting information from outside the Kathmandu valley was challenging. In an effort to mitigate this challenge, the government of Nepal relied on high-resolution satellite imagery from DigitalGlobe and thousands of global volunteers scouring these images to extract helpful information for the relief effort. (Reuters, 2015).

VSOCC was launched immediately and OSOCC was established approximately three days after the event, which created a communal base for information sharing (CFE-DMHA, 2015b, 2015d).

It should also be noted that a staggering number of entities were involved in the Nepal response as depicted in Figure 5.11 and Figure 5.12 above. Although not stated, this could have caused delays in information sharing and had a significant impact on logistics as will be discussed in Section 5.3.4 below.

Cluster coordination

The cluster approach was implemented (CFE-DMHA, 2015c) in this case with significant contribution from the logistics cluster. (Logistics Cluster, 2015a, 2015b, 2015c, 2015d, 2015e)

- Logistics
- Health
- Telecommunications cluster
- Shelter
- Food security
- WASH
- Protection

Medical capacity

A 24-hour emergency health operations room was set up at the ministry of health, coordinating with NEOC (National Emergency Operations Center), rigorous communication plan in place using the VOSOCC platform, transferring to the physical OSOCC when established (CFE-DMHA, 2015b).

Multiple sources reported that sufficient capacity of medical staff was available, but there was a critical shortage of medical supplies reported countrywide (Health Cluster, 2015; Humanity Road, 2015a)

Various sources also reported a concern regarding the spread of disease due to overflowing hospitals, people sleeping out in the open, lack of access to water and basic sanitation and some areas being unreachable (CFE-DMHA, 2015b; Humanity Road, 2015b; TNH, 2015a).

Livestock

Part of priority relief assistance mentions agricultural inputs e.g., vaccines for livestock. (USAID, 2015c) Keeping animals healthy and productive supports a vital and continuous food source for vulnerable families. (FAO, 2015)

5.3.4 Nepal supply chain related themes

Supply chain apriori codes

Logistics

Logistics proved the biggest obstacle to the response effort in Nepal. Upon the request for help from the international community, there was a deluge of resources flooding into the airport at Kathmandu, which did not have the capacity to handle the influx.

Delays were caused by limited space for aircraft on the apron of the airport, weight restrictions on aircraft, cumbersome customs clearance processes and

permit paperwork and limited available personnel (air traffic controllers and ground staff). Furthermore, airport authorities were having difficulty in decided which aircraft to prioritize for landing, resulting in significant delays (USAID, 2015b).

The Logistics Cluster reported that the above constraints at the airport were having a knock-on effect in the parking area and organizations were requested to remove cargo from the apron as soon as possible (Logistics Cluster, 2015f). A weight limit was also enforced on shipments and donators requested to submit information ahead of arrival to facilitate improved turnaround times, service request forms to be completed and submitted (Logistics Cluster, 2015f)

The Humanitarian Staging Area (HAS) connected directly to the apron of the Tribhuvan International Airport (TIA) was operational 5 days after the disaster and receiving relief aid. Between 27 April 2015 and 3 May 2015 3000 cubic meters of humanitarian cargo was handled at the HAS for approximately 30 organizations (Logistics Cluster, 2015g).

More than a week after the disaster, the Logistics Cluster announced that 5 additional logistics hubs would be established in Deurali, Dhulikhel, Bharatpur, Pokhara, and Birganji (Logistics Cluster, 2015g).

A week after the disaster, road transport in the Kathmandu valley was reported to be accessible, however, the status of roads in many of the affected regions was unknown and air assets were contracted to access rural areas (Logistics Cluster, 2015h).

Relief

Reports around relief aid, in this case, are that aid was slow to reach those who needed it most (Humanity Road, 2015b). The Main reported humanitarian needs in this disaster were (UNOCHA, 2015):

- Potable water and sanitation

- Food security, especially given the fact that food security was an ongoing challenge in the country
- Emergency shelter and essential items (primary shelter provided: heavy-duty plastic sheeting and tarps. (USAID, 2015d)

The delay in aid can most likely be attributed to the fact that the situational and requirement status in the outlying areas of the country were still largely unknown more than a week after the earthquake, at this time the Logistics Cluster was still reporting that air assets might be needed to service certain areas and requesting information regarding the road infrastructure. At this same time (2 May 2015) the World Food Program (WFP) had contracted 25 trucks (10 to 15 mt capacity) to distribute relief aid in the country.

Supply chain apostieri codes

Information flow

Much was done to facilitate efficient information flow in the response to the earthquake in Nepal. Impressions from the comparison of various sources do however indicate a situation where some information was not communicated well. This is most likely due to the large number of stakeholders that needed to be kept informed at any given time.

Almost a week after the event, there were still reports of information that was completely missing for certain areas e.g., ACAPS reported on 1 May 2015 that no information regarding affected population, number of displaced, condition of the affected population or needs assessment was available for the villages in the northern part of the country bordering Tibet (ACAPS, 2015).

Search and rescue (SAR)

As mentioned earlier in this section, recorded sentiment states that SAR efforts were conducted in the Kathmandu valley at the cost of the further outlying rural areas. This could also have been a simple case of triage – with SAR teams operating where they could reach(CFE-DMHA, 2015d).

Another factor to note is that SAR teams who had not yet deployed 2 days after the event were asked to stand down as the systems and processes in Nepal could not cope with the number of stakeholders inundating the country (CFE-DMHA, 2015e; TNH, 2015b).

Nepal thematic rating

In this section, the researcher assigns ratings to emergent themes from the research. Themes are divided into three categories: general themes, binary themes and supply chain themes.

Table 5.11: Nepal weighted general theme ratings

Rated themes	Influence rating (Weighting)	Weight	Rating	Score	Motivation for score	Ref	Weighted score
Access to information	Extremely influential	5	Fair	3	VSOCC and OSOCC implemented timeously, infrastructure and geographical challenges.	(CFE-DMHA, 2015b, 2015d).	0.375
Geography	Very influential	4	Very poor	1	Extremely mountainous and difficult terrain at high elevations.	(Research Gate, 2014)	0.1
Permissions and permits	Very influential	4	Very poor	1	Severe challenges with the import of relief goods.	(Logistics Cluster, 2015e)	0.1
Infrastructure	Very influential	4	Poor	2	Damage to infrastructure (road and communication) hampering response efforts.	(ACAPS, n.d.)	0.2

Rated themes	Influence rating (Weighting)	Weight	Rating	Score	Motivation for score	Ref	Weighted score
Politics	Slightly influential	2	Fair	3	No documented political challenges.		0.15
Activation of disaster protocol	Extremely influential	5	Good	4	Rapid declaration of national disaster with request for international help.	(CFE-DMHA, 2015b; USAID, 2015a)	0.5
Camps/Relief	Very influential	4	Poor	2	Lack of infrastructure and medical care. Public health concerns.	(TNH, 2015a)	0.2
Medical response	Very influential	4	Poor	2	Overcrowded hospitals, lack of medical supplies	(USAID, 2015b)	0.2
Total score				1.825			

Table 5.12: Nepal binary themes

Binary theme	Rating	Ref
Livestock	Yes	(OCHA, 2015)
Cluster coordination	Yes	(CFE-DMHA, 2015c)
Appeal for assistance	Yes	(CFE-DMHA, 2015a)
Coordination with industry	No	None
Sentiment	Negative	(Humanity Road, 2015b; TNH, 2015b)

Table 5.13: Nepal supply chain themes

Supply chain theme	Rating	Score	Motivation for score	Ref
Logistics	Poor	2	Extreme challenges getting relief goods into the country via air.	(Logistics Cluster, 2015e)
Information flow	Poor	2	Communication to get goods into the country poor. Communication infrastructure challenges.	(ACAPS, n.d.; Logistics Cluster, 2015e)
Search and rescue	Fair	3	Focussed on more accessible areas around the Kathmandu valley.	(CFE-DMHA, 2015d)

Supply chain theme	Rating	Score	Motivation for score	Ref
Relief	Poor	2	Medical capacity overwhelmed by the large affected population, concern for public health.	(CFE-DMHA, 2015a)
Total score		2.25		

5.3.5 Nepal conclusion

The biggest challenges for the aftermath of the Nepal earthquake on 25 April 2015 were threefold:

- the geography of the country – hard-to-reach mountainous terrain
- too many stakeholders involved causing communication challenges
- logistics bottleneck at the Tribhuvan International Airport chocking required supplies

It is the opinion of this researcher that the above caused the lack of efficient and effective response effort which is supported by a report from Humanity Road, stating that the government of Nepal was struggling to distribute help and provide services 4 days after the earthquake (Humanity Road, 2015b).

5.4 Japan (2011)

A devastating magnitude 9 earthquake hit the North-East of Japan on Friday 11 March 2011 at 14:46 local time. The earthquake triggered a massive 10m tsunami which in turn resulted in a nuclear disaster at the Fukushima nuclear power plant.

Sufficient published information from reputable sources was available in English for this event. The researcher focused on situation reports from reputable sources e.g., OCHA and statements by the Japanese government.

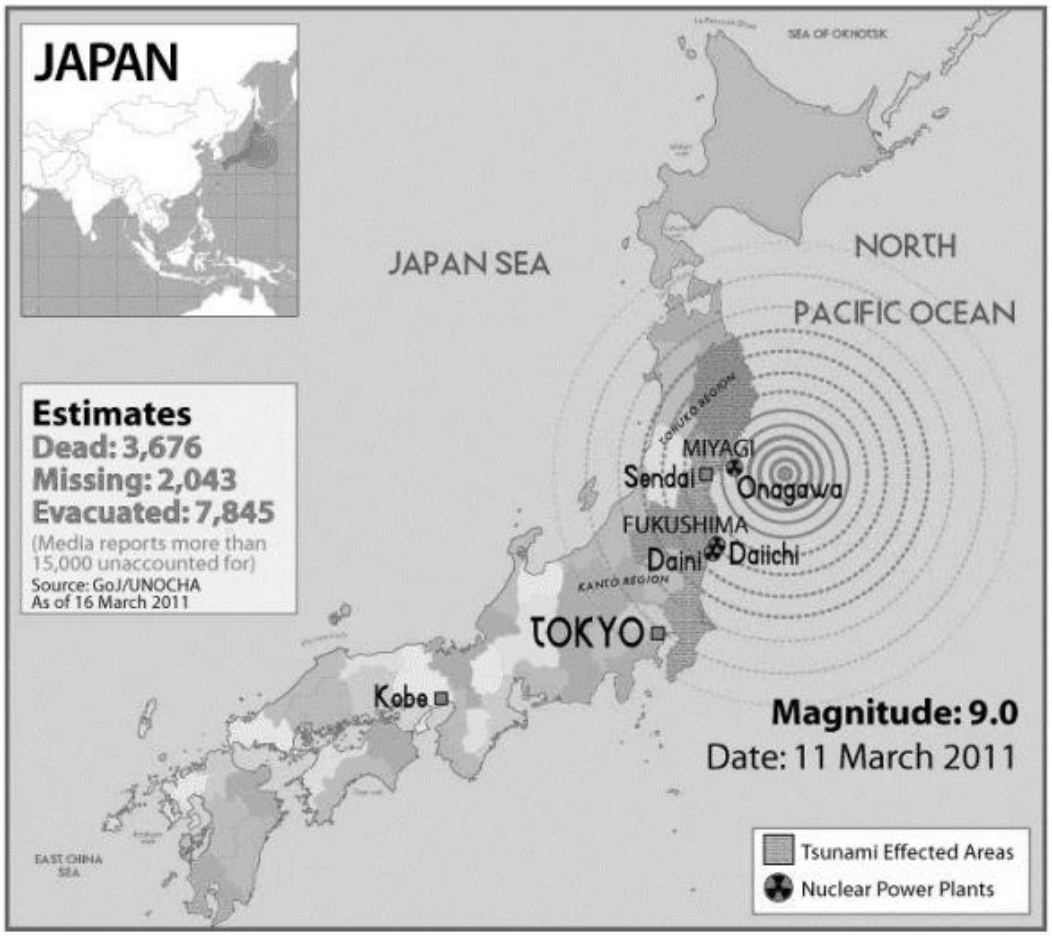


Figure 5.14: Japan earthquake overview (CFE-DMHA, 2011a)

5.4.1 Japan snapshot analysis

The following information is primarily drawn from the EM-DAT database, OCHA situation reports, Red Cross Information bulletins, USAID reports, and

reports published by the government of Japan as well as various other governments.

Table 5.14: Japan earthquake overview (ReliefWeb, 2011a)

Date of event:	11-Mar-11
Event:	Magnitude 8.9 earthquake struck north-east Japan at 14:46 local time, followed by a 10m high tsunami.
	Earthquake upgraded from 8.9 to 9 on the Richter scale.
Relief effort lead by:	Government of Japan (GOJ)
Deaths	6400
Injured	2285
Displaced	Unknown
Relocated	430000 (maximum)
Rescued	26000
Secondary effects / challenges	Explosion at a nuclear plant, followed by 2 more explosions in the following days.
	High nuclear alert.
	Radiation reaches harmful levels in the evacuation zone.
	>100 aftershocks triggering tsunamis with a 70% chance of more aftershocks.
	Fires

Infrastructure	Many areas on the northeast coast remain isolated and unreachable by emergency services.
	Damage:
	827 roads
	7 railways
	47 bridges
	5 embankments washed away
	Fuel supply running low.
	2.6 million households no electricity (maximum level)
	3.2 million households running out of gas (maximum level)
	1.6 million households no access to water (maximum level)
	Hospitals coping with patients. 145 of 170 emergency response hospitals in Japan operational.
Relief challenges	Snow and freezing temperatures hit the most affected areas.
	Relief efforts hampered by aftershocks, tsunami alerts and fires.
	Fires
	Winter in the affected area - temp. dropping to 1 degree Celcius overnight.
	Fuel supply critically low.

	Shortage of supplies at evacuation centres: food, water, medicine, medical staff.
	Interruption to electricity and gas supply
NGO / IO involved	Canadian Medical Assistance Team
	European Union (EU)
	International federations of the red cross and red crescent societies (IFRC)
	International rescue dogs
	Japanese red cross society (JRCS)
	Mercy Corps (MC)
	Médecins Sans Frontieres (MSF)
	Plan international
	Save the children
	Switzerland Humanitarian Aid
	Telecoms sans frontiers (TSF)
	Turkish red crescent
	UN disaster assessment and coordination (UNDAC)
	United Nations Operational Satellite Applications Programme (UNOSAT)
Total number of NGO/IO	14
Other government involved	Australia
	China
	France

	Germany
	India
	Mexico
	New Zealand
	Republic of Korea
	Russian federation
	Singapore
	Switzerland
	Taiwan
	Turkey
	UK
	USA
	USA-Hungary Baptist aid rescue24
Total number of governments involved	15
Other military involved	US
Total number of military involved	1
Total number of personnel	113990
Other equipment	
Helicopters (Japan)	96

Fixed wing aircraft (Japan)	7
Naval vessels (Japan)	58
Helicopters (USA)	2
Ships (USA)	9
Relief goods provided	1.5 million meals (bread, instant noodles, rice balls)
	119000 water bottles
	130 latrines
	403795 Blankets
	207000 Diapers
	920000 Litres fuel

The visual depiction below shows the impact of the disaster on the electrical grid of Japan by picturing visible electrical lights at night. The image to the left has notably more lights than the image on the right.

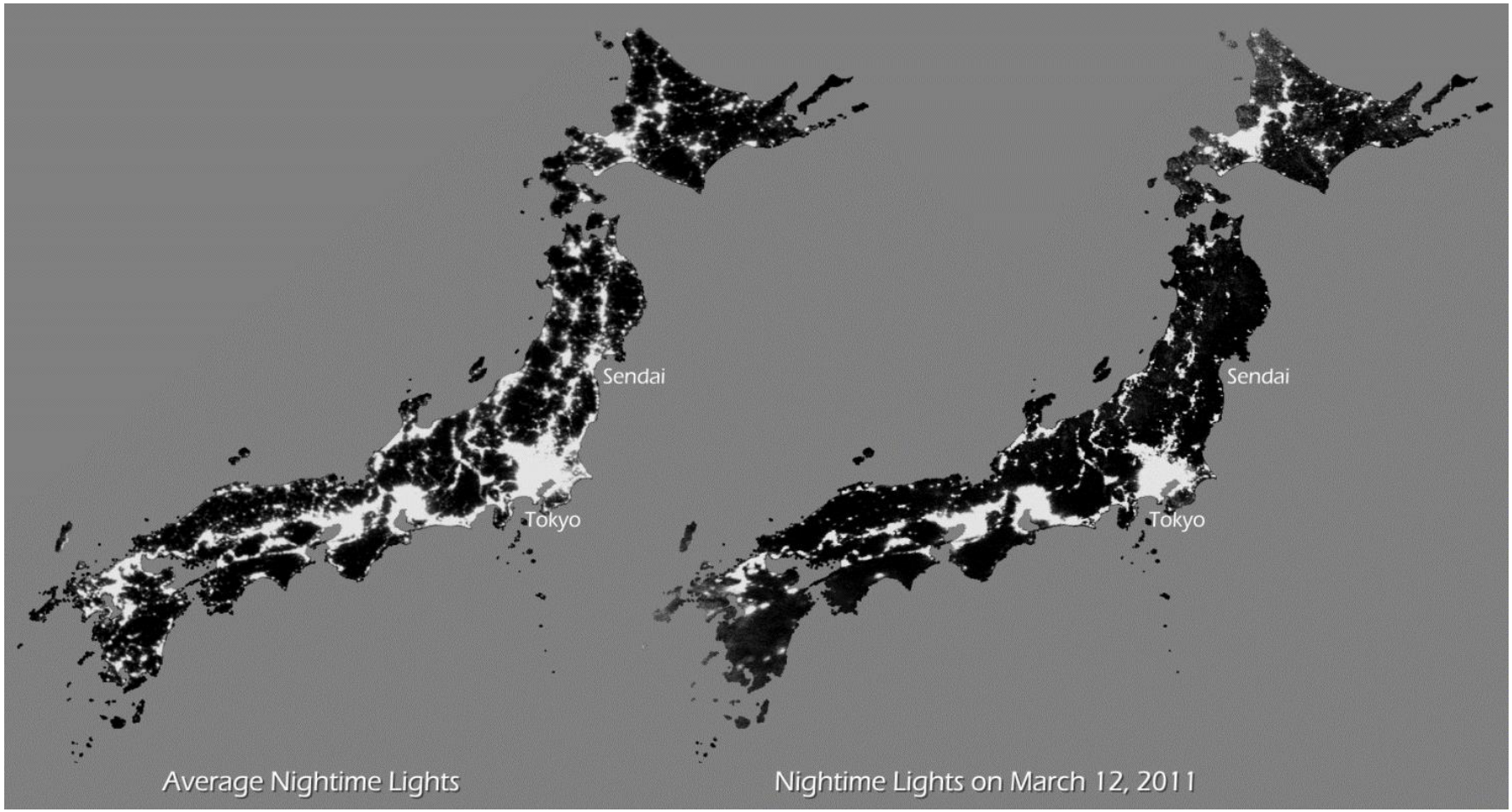


Figure 5.15: Impact of power outages after Japan earthquake 2011: Night-time lights. (ReliefWeb, 2011b)

Figure 5.16 below, depicts the impact of the disaster on Japan, it shows areas inundated by the tsunami as well as areas affected by the nuclear disaster. The intensity of the earthquake in different areas is also shown.

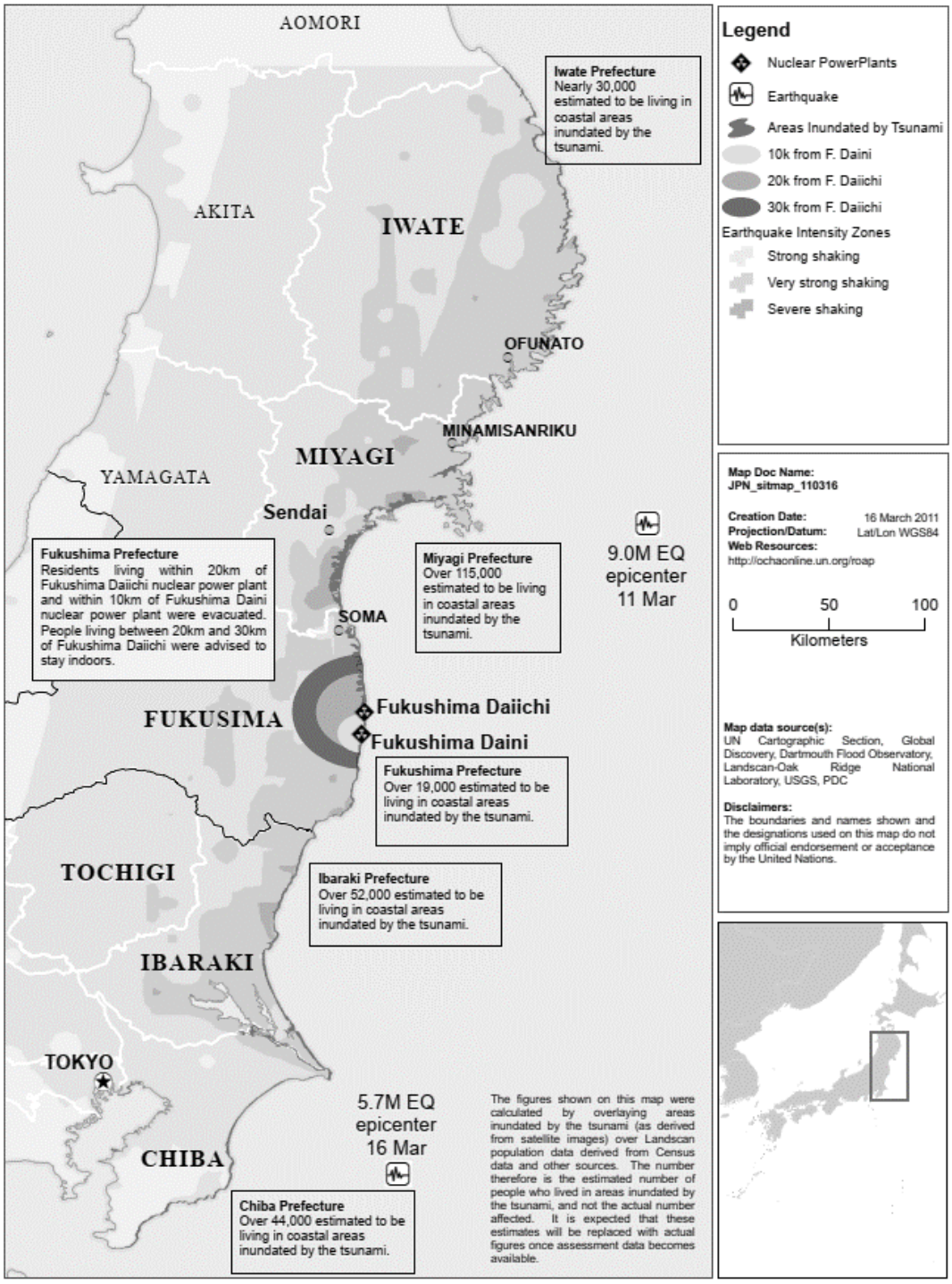


Figure 5.16: Impact of tsunami and nuclear disaster in Japan 2011 (OCHA, 2011b)

The map shown below indicates evacuation centres established in the country as well as population flow in Japan after the disaster.

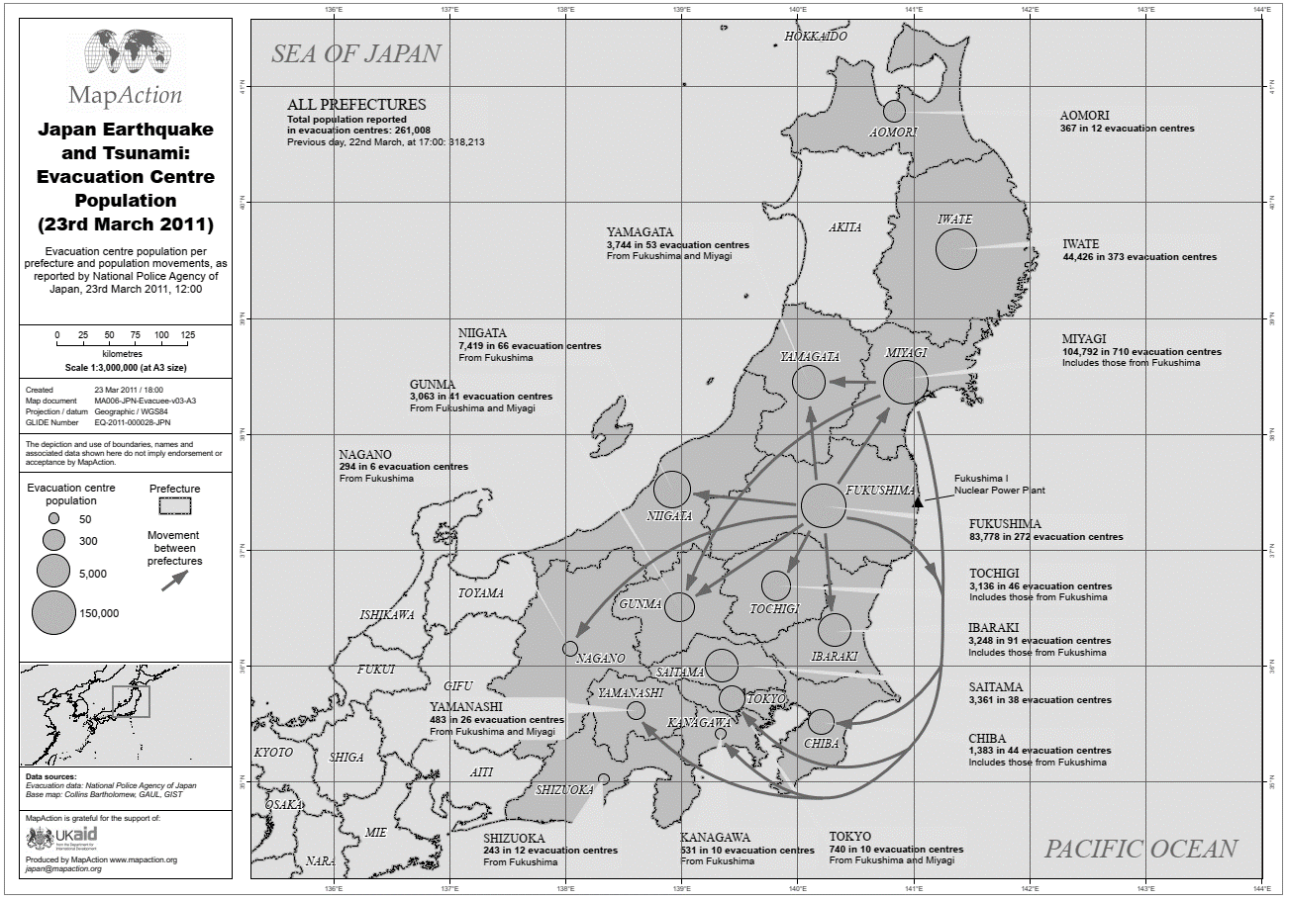


Figure 5.17: Japan evacuation centre flow map (UKAid, 2011)

5.4.2 Japan timeline analysis

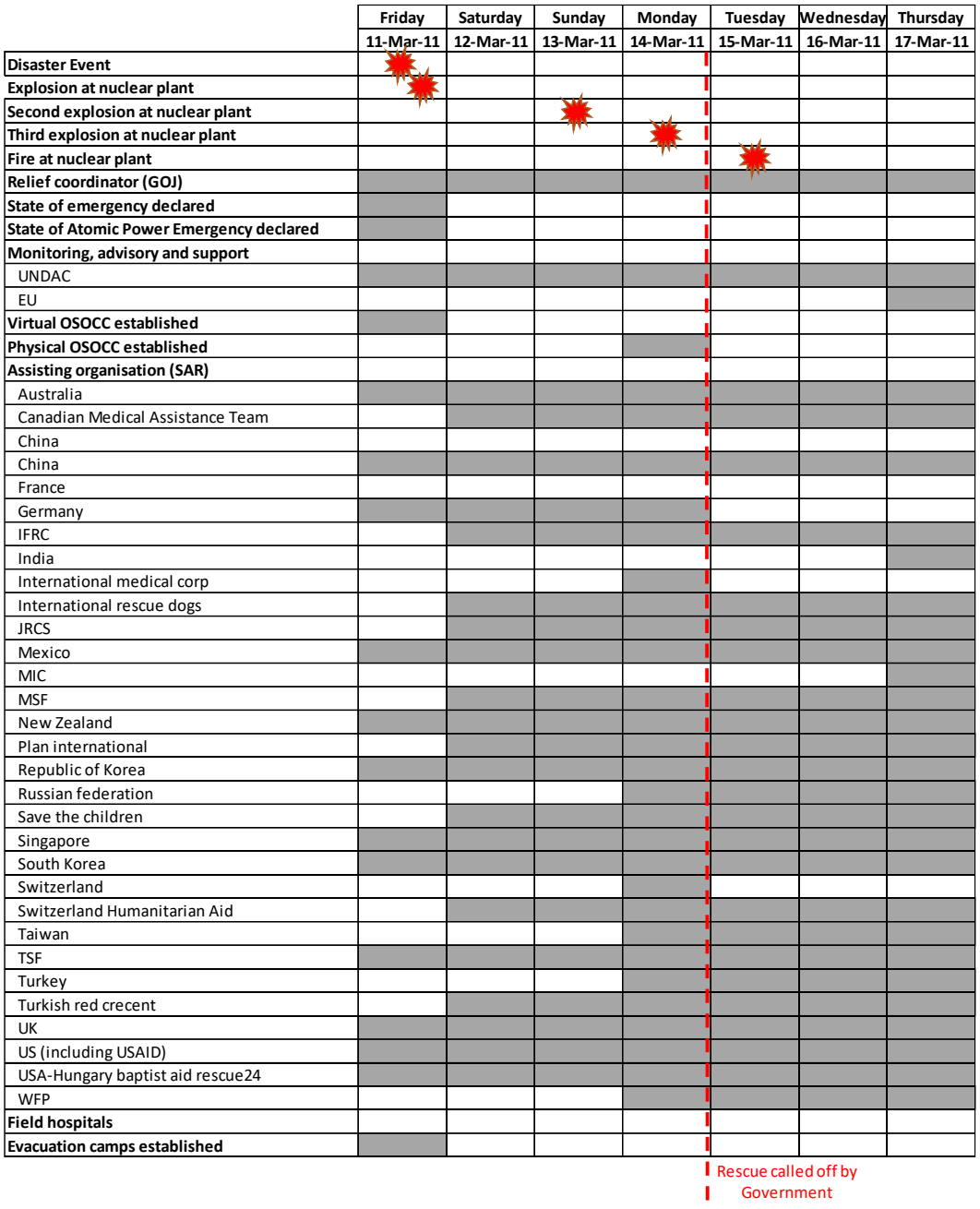


Figure 5.18: Gantt chart of Japan earthquake response (ReliefWeb, 2011a)

Figure 5.18Figure 5.5 shows the initial disaster event as well as subsequent explosions at nuclear power facilities. The involvement of the relief coordinator of the Government of Japan as well as the declaration of a national emergency are depicted along with and the arrival and departure (if applicable) of all known aid

organizations participating in the relief effort for monitoring search and rescue (SAR) and/or supply of relief aid. The establishment of the Virtual On-Site Operations Coordination Centre (VSOCC) and On-Site Operations Coordination Centre (OSOCC) are also noted.

There is no explicit mention of field hospitals in the data and evacuation camps were established the day the disaster took place.

Table 5.15: Example of Japan international assistance schedule (13 March 2011) (ReliefWeb, 2011a)

USAR Team	Personnel	Rescue Dogs	Area of Action
Australia	74	2	Miyagi (Minami-Sanriku-cho)
Germany	41	3	Miyagi (Minami-Sanriku-cho)
France	134	-	Miyagi (Sendai City)
Mexico	9	6	Miyagi
New Zealand	65	-	Miyagi (Minami-Sanriku-cho)
People's Republic of China	15	-	Iwate (Ofunato-cho)
Taiwan Province of China	30	-	Miyagi (Sendai City)
Republic of Korea	105	2	Miyagi (Sendai City)
Russian Federation	54	3 vehicles	Miyagi (Sendai City)
Singapore	5	5	Fukushima (Soma City)
Switzerland	27	9	Miyagi (Minami-Sanriku-cho)
United Kingdom	64	2	Iwate (Ofunato-cho)
USA (2 teams from LA and Fairfax)	148	12	Iwate (Ofunato-cho)
USA-Hungary Baptist Aid Rescue24	4	-	
International Rescue Dogs	12	9	

The map below shows the deployment of various rescue teams in the disaster-affected area.

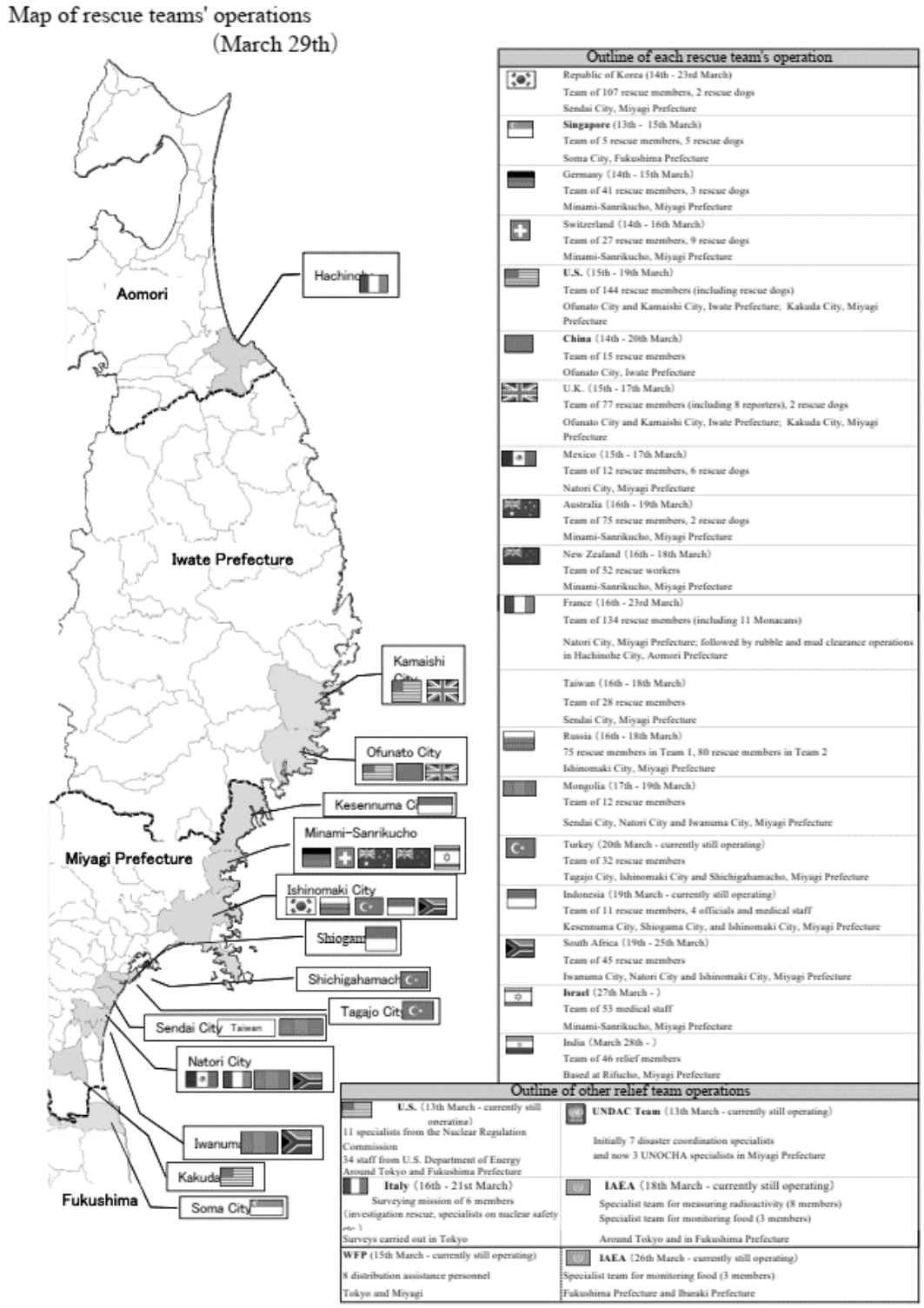


Figure 5.19: Japan rescue team operation map (Govt. Japan, 2011a)

5.4.3 Japan general themes

Considering available publications and analysis, the following themes were emergent in the Japan earthquake case study.

General apriori codes

Infrastructure

Damage to the Japanese infrastructure from the earthquake and the subsequent tsunami and raging fires was severe. Roads, railways, and bridges were severely damaged paralyzing the transportation system. Utility services: electricity, gas and water supply were severely affected leaving upwards of a million households without these basic needs (OCHA, 2011c).

First reports of repaired roads, airports and seaports were made 5 days after the earthquake (CFE-DMHA, 2011a, p. 617).

Relief: Camps

430000 people evacuated to temporary shelters, shelter facilities were reportedly insufficiently equipped and lacked: blankets, water, and food. (CFE-DMHA, 2011a, p. 617, 2011b). Victims were dealing with harsh winter conditions – snow and temperatures below zero degrees Celsius.

Approximately 5 days after the event, a fuel shortage developed in the country further amplifying an already dire situation (OCHA, 2011d). For this reason, available aid could not effectively be distributed to the affected areas, leading to people leaving the evacuation camps.

General apostieri codes

Emergency declaration

According to reports, the government of Japan declared an emergency immediately after the magnitude 9 earthquake through the establishment of an

Emergency Response Team (ERT). A hundred thousand troops were immediately mobilized along with 300 planes and 40 ships (OCHA, 2011e).

Access to information

Along with the ERT, a Virtual OSOCC was immediately implemented, and regular updates were made available. The implementation of the OSOCC and availability of data seemed to be communicated well and stakeholders knew what they needed to do and where to do it (OCHA, 2011e).

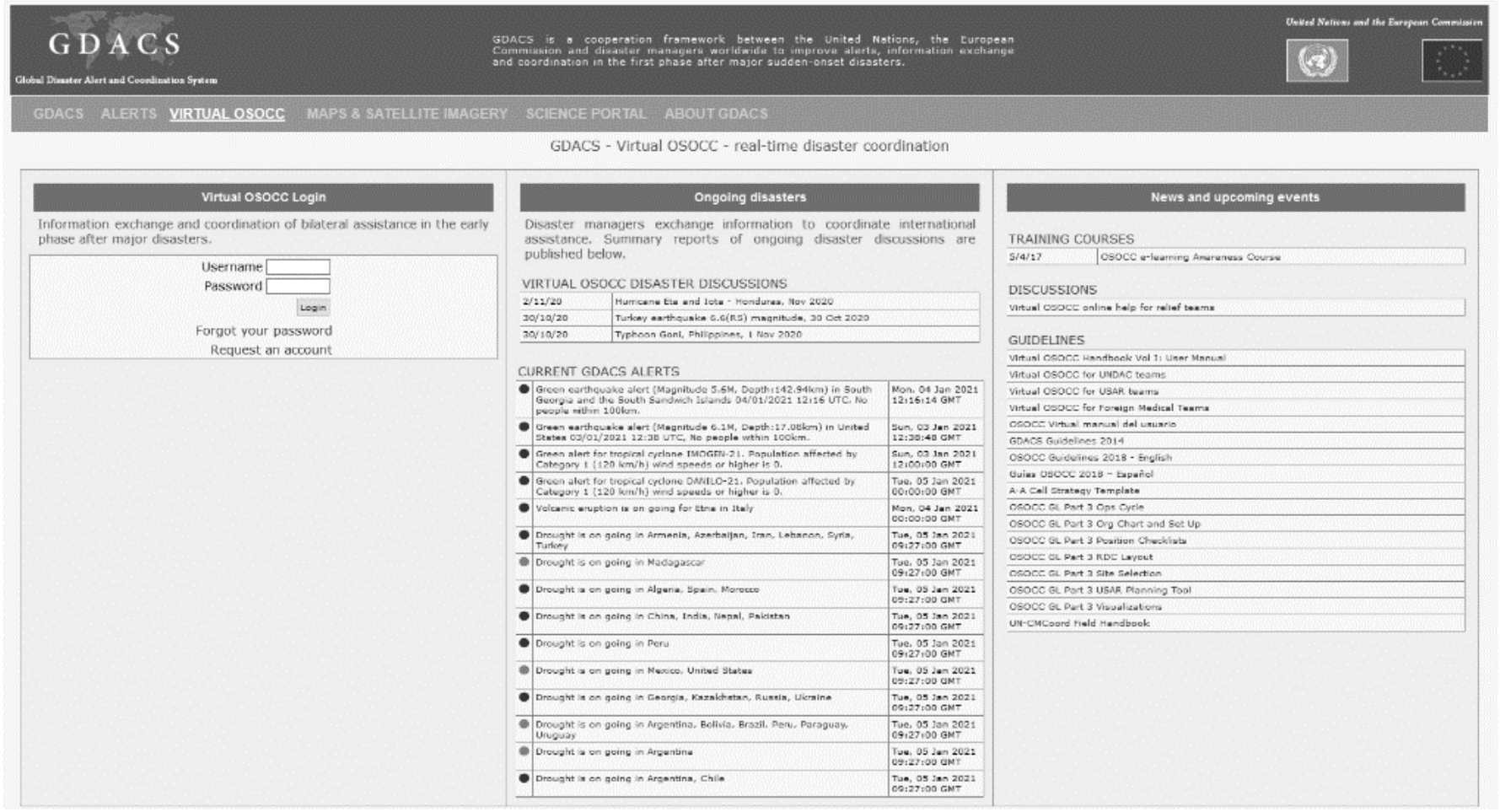


Figure 5.20: Virtual OSOCC landing page

Information regarding access to relief supplies and services were also being broadcast on public and commercial radio (CFE-DMHA, 2011a, p. 617)

Cluster coordination

The cluster approach is not specifically mentioned in the sources used. However, some entities typically associated with the implementation of the cluster approach were active during this response effort:

- UNDAC – to assist the government with information management – with a focus on the international audience
- UNOSAT – reported that the Space Charter was triggered, affording Japan access to satellite imagery for situational assessment.
-

Medical capacity

The affected areas seemed to cope with the number of patients (USAID, 2011). Medical supplies did however start running low in correlation with the fuel shortage, especially in the relief camps, with some reports of insufficient medical support in the camps.

Coordination with industry

The Ministry of Agriculture, Forestry and Fisheries (MAFF) coordinated with the private sector to mobilize food and water rations as well as increased production of relevant food products. (OCHA, 2011b). The MAFF also requested local franchises and supermarkets to remain open to ensure the availability of essential supplies.

5.4.4 Japan supply chain related themes

Supply chain apriori codes

Logistics

Logistics is an expected challenge in an earthquake/tsunami situation. In this case, however, the logistics challenge was significantly increased by the fuel shortage that occurred due to the breakdown of six out of nine oil factories(CFE-DMHA, 2011c). The government announced mitigation plans and offered all possible support to alleviate the situation by redirecting fuel from other parts of the country (Govt. Japan, 2011b).

The result of the fuel shortage and subsequent logistical challenges was that there were delays in distributing relief aid after the disaster.

Figure 5.21 below shows a map published by emergency headquarters depicting the recovery of transportation after the disaster.

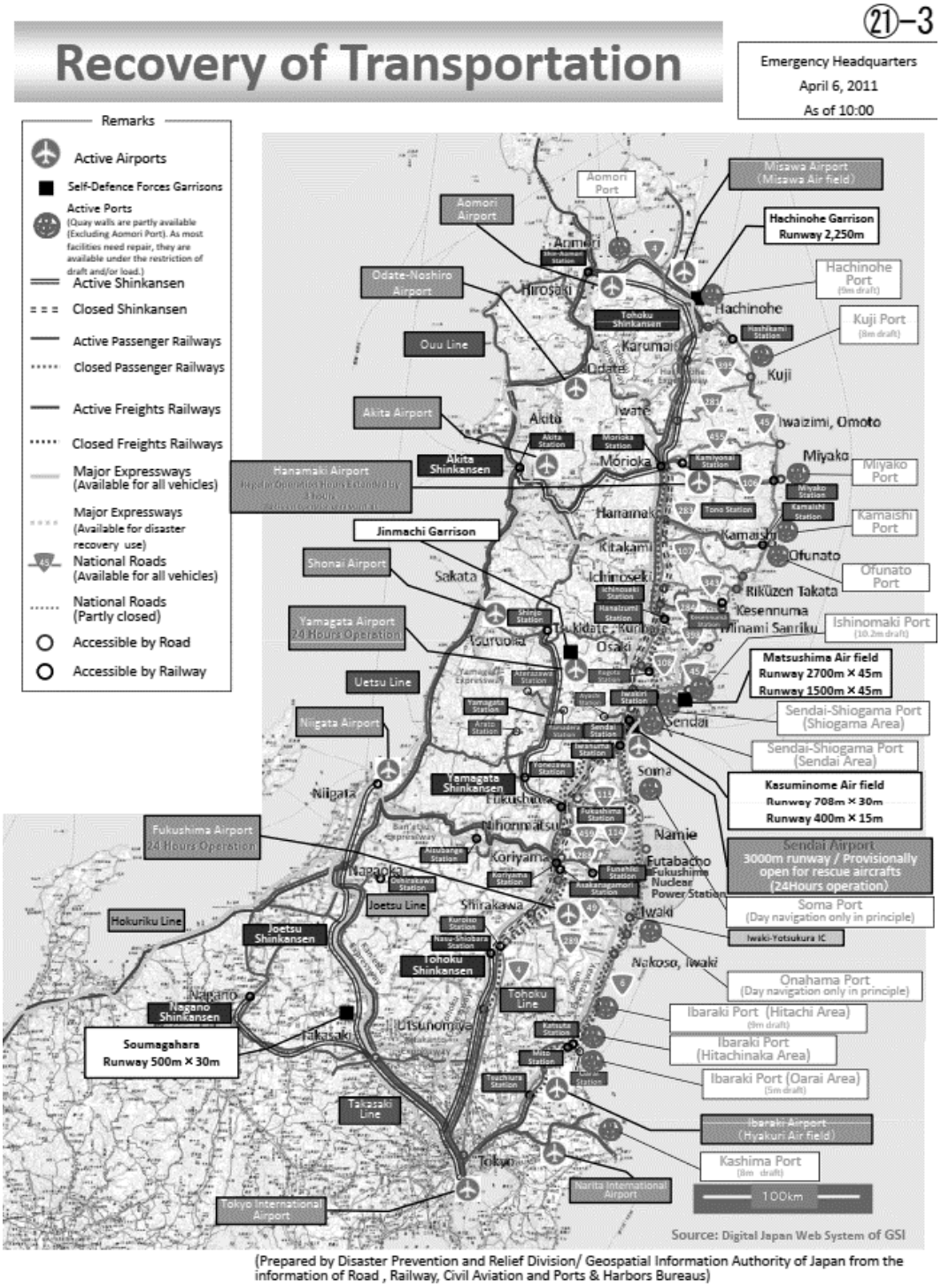


Figure 5.21: Example of transport infrastructure recovery

Relief

As mentioned in the previous section, the relief efforts were continuously hampered by several factors. These factors resulted in significant delays in

getting the necessary relief to vulnerable populations in a reasonable amount of time(CFE-DMHA, 2011c).

Supply chain apostieri codes

Information flow

From available sources, it appears as if a very robust and well-thought-out disaster response was followed in this case(OCHA, 2011c). No reports were found stating a lack of information or ambiguity surrounding responsibilities or actions. The government of Japan were very clear and explicit on the type of international assistance required and which teams were allowed into the country for what type of work. The government also made some very clear statements around relief items and NGOs:

Regarding relief items: "the Government of Japan has received offers for relief goods/material from many countries, international organizations, NGOs and private sector. The Government is identifying the needs and establishing a mechanism for storage and transportation to affected people. Therefore, it is recommended not to send any relief goods without coordination with the Government and local governments"(CFE-DMHA, 2011c).

Regarding NGOs: "Search and Rescue operation phase still continues in the affected areas at this moment and the access to those areas is strictly limited to rescue workers. It is also reported that there is temporary shortage of petrol in the affected area. International/foreign NGOs are recommended to wait until the situation improves so that those NGOs are able to conduct their activities in a self-sustainable way" (CFE-DMHA, 2011c).

Search and rescue (SAR)

A mammoth SAR effort was launched after the earthquake in Japan, although the number of stakeholders was not significant, the manpower was, 100000 Japanese

defence force troops were deployed to participate in the relief effort, this excludes medical personnel, specialized SAR teams and so on (OCHA, 2011f, p. 2). In addition to the above resources, the US government launched operation Tomodachi to assist in the relief effort – committing significant resources to assist the Japanese relief effort (NBR, 2011).

SAR and relief efforts were continuously hampered by ongoing aftershocks and tsunamis on the coast, raging fires caused by the tsunami damage, inclement weather and the fuel shortage(CFE-DMHA, 2011c; OCHA, 2011c).

Japan thematic rating

In this section, the researcher assigns ratings to emergent themes from the research. Themes are divided into three categories: general themes, binary themes and supply chain themes.

Table 5.16: Japan weighted general theme ratings

Rated themes	Influence rating (Weighting)	Weight	Rating	Score	Motivation for score	Ref	Weighted score
Access to information	Extremely influential	5	Excellent	5	Comprehensive information available. Many well organised statements by the Government of Japan.	(CFE-DMHA, 2011a; Govt. Japan, 2011c, 2011b)	0.625
Geography	Very influential	4	Fair	3	No specific mention of geography influencing response.		0.3
Permissions and permits	Very influential	4	Excellent	5	Offers of assistance well managed. No reports of challenges with the import of goods.	(Govt. Japan, 2011c)	0.5

Rated themes	**Influence rating (Weighting)**	**Weight**	**Rating**	**Score**	**Motivation for score**	**Ref**	**Weighted score**
Infrastructure	Very influential	4	Very poor	1	Extreme infrastructure challenges affecting relief efforts. Inclement weather, roads, nuclear disaster.	(CFE-DMHA, 2011b, 2011a)	0.1
Politics	Slightly influential	2	Fair	3	No documented political challenges.		0.15
Activation of disaster protocol	Extremely influential	5	Excellent	5	Disaster protocol activated immediately after the disaster.	(OCHA, 2011e)	0.625
Camps/Relief	Very influential	4	Poor	2	Insufficient infrastructure and supplies at relief camps.	(CFE-DMHA, 2011c)	0.2
Medical response	Very influential	4	Fair	3	Hospitals reportedly had sufficient capacity to treat all patients. Fuel shortages	(CFE-DMHA, 2011a)	0.3

Rated themes	Influence rating (Weighting)	Weight	Rating	Score	Motivation for score	Ref	Weighted score
					posed a challenge as well as the number of deceased.		
Total score							2.8

Table 5.17: Japan binary themes

Binary theme	Rating	Ref
Livestock	No	None
Cluster coordination	No	None
Appeal for assistance	No	None
Coordination with industry	Yes	(OCHA, 2011b)
Sentiment	None	None

Table 5.18: Japan supply chain themes

Supply chain theme	Rating	Score	Motivation for score	Ref
Logistics	Poor	2	Due to fuel shortages and infrastructure damage, affected areas were inaccessible.	(CFE-DMHA, 2011c; OCHA, 2011g)
Information flow	Excellent	5	Information flow well managed by the government of Japan.	(Govt. Japan, 2011b; OCHA, 2011e, 2011f, 2011c, 2011h, 2011i, 2011j, 2011g)
Search and rescue	Good	4	Search and rescue efforts well-coordinated. Challenges due to the magnitude of event and infrastructure damage.	(CFE-DMHA, 2011a, p. 6; OCHA, 2011c, 2011g)

Supply chain theme	Rating	Score	Motivation for score	Ref
			Steps taken to mitigate challenges.	
Relief	Fair	3	Supply challenges caused a lack of food and support at evacuation centres.	(CFE-DMHA, 2011c)
Total score		3.5		

5.4.5 Japan conclusion

The Japan case study was a multi-faceted disaster with one event leading to the next: earthquake, leading to tsunami, leading to fires and nuclear disaster, which in turn led to the displacement of hundreds of thousands of people and finally a significant fuel shortage. In the opinion of this researcher, the government of Japan conducted an exemplary role of preparedness and leadership in a very difficult situation.

6 CROSS-CASE ANALYSIS

Chapter 6 expands on the work conducted in Chapter 5. In this chapter, the researcher applied a number of pattern matching techniques (Saldaña, 2009) to conducts a cross-case synthesis.

6.1 Thematic summary

Thematic results for each analysis: general themes, binary themes and supply chain themes will be discussed in this section.

Several factors contribute to the ratings identified and some factors are not within the country's control. Geography for example is an element that has a significant impact on the disaster response. Another factor that would weigh in on the response – and ultimately the rating that is given – would be the magnitude of the disaster. At some point, systems will fail. This rating system was used as an analytical tool to evaluate the similarities and differences in the cases under study.

6.1.1 General themes

In this section, general themes will be discussed.

Table 6.1: Comparison table of general themes and ratings

			Developing Countries						Developed Countries					
Rated themes	**Influence rating (Weighting)**	**Weight**	**Iran**	**Score**	**Weighted score**	**Nepal**	**Score**	**Weighted score**	**Italy**	**Score**	**Weighted score**	**Japan**	**Score**	**Weighted score**
Access to information	Extremely influential	5	Fair	3	0.375	Fair	3	0.375	Good	4	0.5	Excellent	5	0.625
Geography	Very influential	4	Poor	2	0.2	Very poor	1	0.1	Fair	3	0.3	Fair	3	0.3
Permissions and permits	Very influential	4	Fair	3	0.3	Very poor	1	0.1	Fair	3	0.3	Excellent	5	0.5
Infrastructure	Very influential	4	Poor	2	0.2	Poor	2	0.2	Very poor	1	0.1	Very poor	1	0.1
Politics	Slightly influential	2	Poor	2	0.1	Fair	3	0.15	Fair	3	0.15	Fair	3	0.15
Activation of disaster protocol	Extremely influential	5	Fair	3	0.375	Good	4	0.5	Excellent	5	0.625	Excellent	5	0.625
Camps/Relief	Very influential	4	Fair	3	0.3	Poor	2	0.2	Good	4	0.4	Poor	2	0.2
Medical response	Very influential	4	Fair	3	0.3	Poor	2	0.2	Excellent	5	0.5	Fair	3	0.3
	Total score	40			2.15			1.825			2.875			2.8

Table 6.1 shows a side-by-side comparison of the four compared cases with a weighted score for each emergent general theme to compare the cases. The two developing countries scored notably less overall when compared to the developed countries. Of particular interest is that developing countries seem to score lower when comparing access to information and activation of disaster protocol, as these elements have a significant impact on the rescue effort, especially first response.



Figure 6.1: Radar plot of general themes (weighted scores)

Access to information

When comparing the access to information across all cases, only the Nepal case showed tangible evidence of a lack of information due to the inaccessibility of many affected regions (CFE-DMHA, 2015b, 2015d) which is reflected in the score of 3 out of 5. Iran was also allocated a score of 3, it is however the opinion

of the researcher that access to information in the Iran case might be misrepresented based on reports from some Iranian citizens calling published information regarding the disaster into question (Erdbrink, 2012). Japan had the most robust availability and distribution of information.

Geography

In comparison to the rest of the cases, the geography in Nepal played the largest role in the relief effort reflected in the score of 1 out of 5. Due to the extreme altitudes and harsh terrain, many affected areas were rendered unreachable and bad weather also eliminated air assets as a delivery mechanism (WHO, 2015). Iran scored 2 as some affected villages were located on steep slopes (STL, 2012). The other cases both scored 3 as there was no evidence to suggest that the geography of the country played a major role in the relief effort.

Permissions and permits

Permissions and permits have a significant impact on the disaster relief as it influences the speed by which relief teams and relief items can get into the affected country. From the cases under study, the biggest challenge in this regard was experienced by Nepal, reflected in the score of 1, where significant delays were reported with the receipt of goods and personnel into the country which in turn has a direct impact on the supply chain (Logistics Cluster, 2015e). Iran and Italy both received an average score of 3 and Japan showed the response with the best control over assisting entities with a score of 5.

Infrastructure

In all cases, significant damage was caused by the earthquakes. It is the opinion of this researcher that Japan sustained the most significant damage. It should however also be noted that the developed countries were quicker to commence repair efforts and implement mitigation efforts to re-establish infrastructure.

Politics

The only case with notable political influence was the case of Iran where many countries had sanctions against the affected country (OFAC, 2012), it was thus more cumbersome for donators to assist the country. Given how dependent the humanitarian system is on donations, this potentially had a significant impact on the relief effort in this case.

Activation of disaster protocol

From the research, it can be concluded that developed countries are more prepared for disaster events. In both developed country cases disaster protocols were activated quickly and efficiently. Nepal also had a response prepared which was activated swiftly but in the opinion of this researcher, executed poorly.

Camps/Relief

Very little information is available on the accommodation offered to victims of the Iranian disaster, there are however reports of a significant number of victims being accommodated. Italy seemed to perform the best in this case, and it is the opinion of this researcher that it is as a result of the disaster being within the capacity of the country. In the case of Nepal, it seems that already strained resources were overwhelmed and for Japan, it is the opinion of the researcher that the fuel shortage severely impeded the planned operation of- and supply to the camps.

Medical response

Two cases can be highlighted in this context. The medical capabilities of Nepal were completely overwhelmed by the disaster, insufficient medical personnel and medical supplies were reported. It may be inferred that this is due to Nepal's status as a developing country.

6.1.2 Binary themes

Table 6.2: Binary summary results

	Developing Countries		Developed Countries	
Rated themes	**Iran**	**Nepal**	**Italy**	**Japan**
Livestock	Yes	Yes	No	No
Cluster coordination	No	Yes	No	Yes
Appeal for assistance	No	Yes	No	Yes
Coordination with industry	No	No	No	Yes
Sentiment	Negative	Negative	None	None

Livestock

It is interesting to note that the two cases where the protection of livestock was explicitly stated are the two developing country cases. It is the opinion of this researcher that this is since developing countries are more dependent on subsistence farming for survival and the loss of livestock has a more substantial impact on food security for these countries.

Cluster coordination

There seems to be no relationship between the relative success of a relief effort and the use of the cluster approach.

Appeal for assistance

A formal appeal for assistance was issued in two cases: Nepal and Japan. Appeals for assistance are issued when the affected country cannot cope with their own resources.

Coordination with industry

The only documented case of formal coordination between government and industry in a relief effort is with the Japan case, where industry was requested to

manufacture food for relief distribution as well as assist with the redistribution of fuel to the affected area.

Sentiment

The two cases with published negative sentiment were the developing country cases: Iran and Nepal. It is worth noting that the published negative sentiment could originate as a result of political rivalry.

6.1.3 Supply chain themes

Table 6.3: Thematic summary results – Supply Chain themes

	Developing				Developed			
	Iran	Score	Nepal	Score	Italy	Score	Japan	Score
Logistics	Poor	2	Poor	2	Fair	3	Poor	2
Information flow	Poor	2	Poor	2	Fair	3	Excellent	5
Search and rescue	Poor	2	Fair	3	Good	4	Good	4
Relief	Fair	3	Poor	2	Good	4	Fair	3
Total score (out of 5)		2.25		2.25		3.5		3.5

Table 6.3 shows a side-by-side comparison of the four compared cases with a weighted score for each emergent supply chain theme to compare the cases. The two developing countries scored notably less overall when compared to the developed countries. As with the general themes, the developing countries scored lower in the area of information flow.

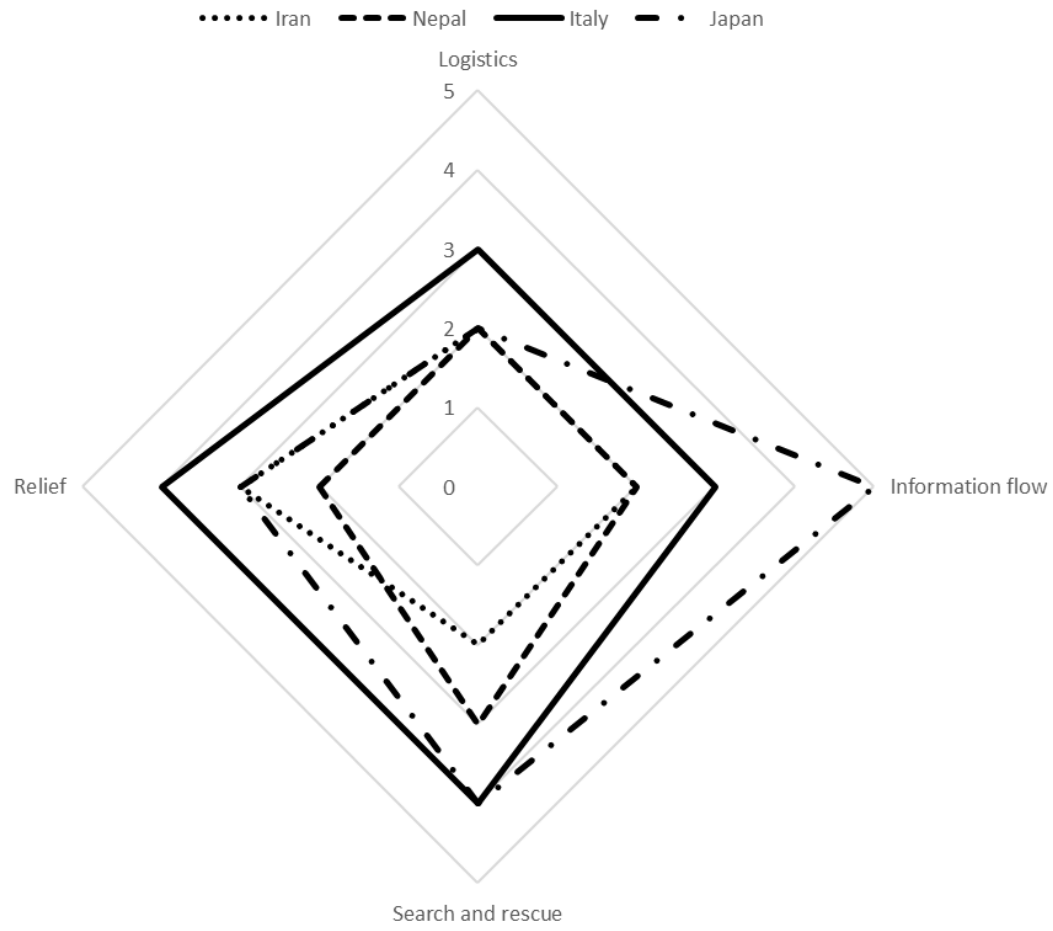


Figure 6.2: Radar plot of supply chain themes

Logistics

In all cases, logistics posed a considerable challenge to the relief effort. The countries that were the worst affected were Nepal and Japan, respectively. In the Nepal case, the systems in the country could simply not cope with the volume of flights that needed to come into the country for various reasons: the size of the international airport in Kathmandu, availability of resources to man the airport and seemingly slow and cumbersome processes that needed to be followed for customs clearance. This led to severe delays in the SAR and relief efforts.

In the Japan case, a fuel shortage caused by the compounded disasters in the country caused a substantial challenge to the relief effort. Sufficient supplies were available in the country but could not be delivered to the victims due to the

lack of fuel. The government did take steps to alleviate the constraint, but many people had already left the evacuation camps by that time.

All cases noted logistical challenges due to damaged infrastructure: roads, bridges and railways. None of the cases reported inoperable airports as a result of the respective disasters.

Information flow

The outlier case for information flow is Japan. Despite the challenges the country experienced, and the relative failure of the relief effort due to the fuel shortage, information flow was managed exceptionally well in the opinion of this researcher. The available documentation is clear and it is apparent that the relief effort was well controlled with information being disseminated as far as possible to all levels of involvement.

Generally, there seems to be a relationship between information flow in developed countries vs developing countries. Developed countries seemed to perform better with information flow. It is the opinion of this researcher that this is due to disaster response preparation for developed countries being better planned – with clear actions and lines of responsibility as well as transparency. This could in turn be because developed countries would have more resources to invest in the development of such plans and preparation.

Search and rescue (SAR)

From the conducted analysis SAR operations for developed countries seem to be executed in a more organised fashion. This is likely due to the superior information flow as reported in the previous section. During the SAR effort, victims need to get to the right hospital as quickly as possible. The available data demonstrates that Italy performed especially well from this perspective. Japan

also received a good score due to the number of resources that were mobilized in a very short time and the coordination with international stakeholders.

Iran and Nepal reported that many people were saved by the respective relief efforts, however, there are also multiple reports that areas could not be reached and in the case of Nepal, that medical infrastructure was overwhelmed.

Relief

The scope of this study covers only the very beginning of the relief effort: supplying basic necessities such as food, water and shelter to victims as soon after the event as possible. In this instance, it once again seems as if there is a disparity between developing and developed countries, with the developed countries performing better with the provision of relief.

6.1.4 Examining the Research Hypothesis

The main differences between developed and developing countries must be understood. Table 6.4 below defines each.

All pattern matching techniques were considered, however similarity matching offered the best fit for this analysis.

Below is the similarity pattern matching analysis:

Table 6.4: Pattern matching analysis

Pattern matching technique	**Similarity (things happen the same way)**	**Reason for Evaluation**
Theme	**Finding**	
Access to information	Similarity	Iran and Nepal both scored 3, where Italy and Japan scored 4 and 5 respectively.
Geography	Similarity	Evidence suggests that developing countries had more challenges in navigating the geography of the respective landscapes. Iran and Nepal scored 1 and 2 respectively, where Italy and Japan both scored 3.
Permissions and permits	No similarity	No relationship between developing and developed countries. Countries with better controls around permits and permissions did however seem to perform better overall. Japan scored 5 with exceptional controls, Nepal scored 1 due to significant challenges and Iran and Italy both scored 3.

Pattern matching technique	**Similarity (things happen the same way)**	**Reason for Evaluation**
Infrastructure	Similarity	All countries experienced significant infrastructure damage with the disasters. Developed countries reported more infrastructure damage than developing countries. Developed countries seemed to conduct repairs and restore services quicker. Italy and Japan both scored 1 and Iran and Nepal scored 2.
Politics	No similarity	Politics only seemed to play a significant role in one case (Iran). Thus, no similarity among cases or developing/developed country definition.
Activation of disaster protocol	Similarity	All cases under study performed relatively well in activating their disaster responses. From available data, developed countries were quicker to act and trigger robust response processes.
Camps / Relief	No similarity	Nepal and Japan both scored 2 for their relief efforts where Italy scored 4 and Iran 3.

Pattern matching technique	**Similarity (things happen the same way)**	**Reason for Evaluation**
Medical response	No similarity	Italy scored the highest with 5 followed by Iran and Japan both scoring 3 and Nepal with 2.
Livestock	Similarity	Livestock was viewed as a priority for developing countries but not mentioned at all in the context of developed countries.
Cluster coordination	No similarity (developing vs developed countries)	It seems that there might be a relationship between the relative size of the disaster and activation of the cluster approach as clusters were activated for Nepal and Japan (larger events) but not Iran and Italy (smaller events).
Appeal for assistance	No similarity (developing vs developed countries)	It seems that there might be a relationship between the relative size of the disaster and the appeal for assistance. Assistance was requested in the cases of Nepal and Japan (larger events) but not Iran and Italy (smaller events).
Coordination with industry	No similarity	Coordination with industry was only noted in one case: Japan.

Pattern matching technique	**Similarity (things happen the same way)**	**Reason for Evaluation**
Sentiment	Similarity	Both developing country cases had documented negative sentiments. No sentiments were recorded for Italy. Positive sentiment was recorded for Japan (Brookings Institute, 2011).
Logistics	No similarity	Iran, Nepal, and Japan scored 2 and Italy 3.
Information flow	Similarity	Developed countries demonstrated superior information flow to their developing counterparts with Japan and Italy scoring 5 and 3, respectively and Iran and Nepal both scoring 2.
SAR	Similarity	It is the opinion of this researcher that SAR is very closely related to the success of information flow in the supply chain. Developed countries performed better in the information flow area and thus also in the SAR domain with Japan and Italy scoring 4 and Iran and Nepal scoring 2 and 3, respectively.

Pattern matching technique	Similarity (things happen the same way)	Reason for Evaluation
Relief	No similarity	The success of the relief effort seems to depend on several factors, most notable of which are the relative size of the disaster and the preparedness of the affected country. For this reason, Italy scored 4, Japan and Iran scored 3 and Nepal 2.

The diagram below shows the percentage similarities and differences between disaster response in developing and developed countries.

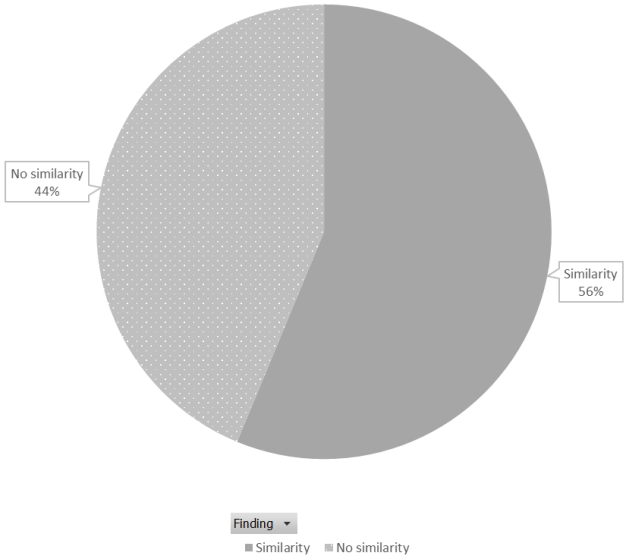


Figure 6.3: Similarity of general themes

The above diagram shows a 56% relationship for compared themes between supply networks for developing and developed countries for general themes.

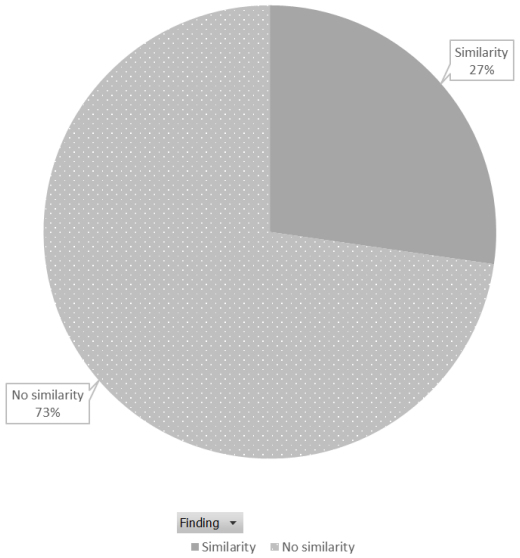


Figure 6.4: Similarity of binary themes

The above diagram shows only a 27% relationship for binary themes.

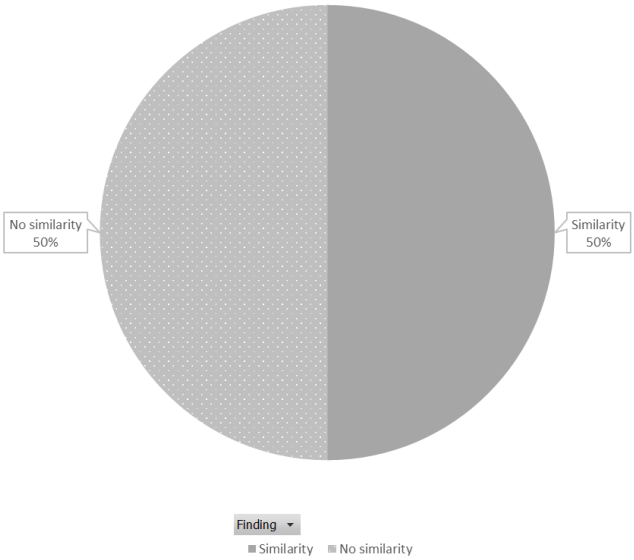


Figure 6.5: Similarity of supply chain themes

The above diagram shows a 50% relationship between supply networks for developing and developed countries for supply chain specific themes.

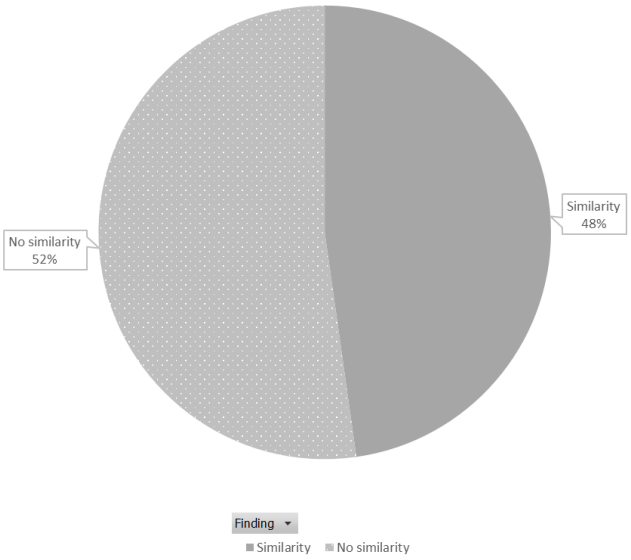


Figure 6.6: Overall relationship between disaster response in developing and developed countries

The diagram above shows a 48% similarity between developing and developed countries overall.

Table 6.5 below shows the overall weighted score of each case.

Table 6.5: Summary of evaluation criteria (developed by author)

	Developing		**Developed**	
Themes	**Iran**	**Nepal**	**Italy**	**Japan**
Total weighted score: general themes	2.15	1.825	2.875	2.8
Total weighted score: supply chain themes	2.25	2.25	3.5	3.5

6.2 Conclusion

In this section, a comparative analysis was conducted of all cases under study through assigning weighted scores to each evaluation theme. The findings from this chapter will further be explored and discussed in Chapter 7.

7 DISCUSSION

The goal of this study was to determine the similarities and differences between disaster supply chains in developing and developed countries, through a holistic multi-case study (Yin, 2009a). Pattern matching techniques were used to identify the similarities and differences between the selected cases (Trochim, 2002; Yin, 2013) through the identification of emergent themes for both in-case and cross-case analysis (Figure 3.7) This chapter aims to critically evaluate the findings pertaining to each theoretical question and the research question posed in Chapter 1. The second section of the chapter is a discussion on general findings and finally limitations of the study are discussed.

7.1 Theoretical Question 1 (TQ1): Governments and relief organizations

TQ1: How do governments and relief organizations enter into the disaster relief situation?

Considering the humanitarian system (Section 2.5) highlights the number of role players involved in humanitarian aid and therefore disaster response, it is a complex system with many stakeholders (Figure 2.7). Several frameworks have been developed to establish a set of minimum standards for relief aid as well as promote best practices. These frameworks are: the Sphere project (The Sphere Project, 2011), Yokohama, Hyogo and Sendai frameworks (Figure 2.9) as well as the WHO cluster approach (OCHA, 2020). Such structures govern how stakeholders interact if disaster response efforts are required. The expected engagement model between governments and relief organizations is as follows: first response is conducted by local government, once the local capacity is overwhelmed an appeal will be made to the national government for assistance. If national capacity is overwhelmed, the government can choose to declare a national state of disaster and appeal for international assistance which can be offered by non-governmental relief organizations or other governments (Anaya-arenas et al., 2014). An observation made in the Nepal (5.3) and Japan (5.4) cases was that the affected governments did not accept all offers of assistance, turning

away a number of relief teams in each case. In the case of Iran (5.1) no appeal for assistance was launched. Furthermore, relief organizations with an existing presence in the affected country are able to offer assistance immediately after a disaster event as in the case of Nepal (World Vision, 2015).

Although the affected government has the authority to grant or deny access within its borders, (Adivar and Mert, 2010) note that the typical lack of a central authority causes challenges with disaster relief as government rules and regulations have to be adhered to, yet relief organizations are not accountable to the affected government but rather their own governing bodies and ultimately their donors.

7.2 Theoretical Question 2 (TQ2): The relief effort

TQ2: How does the relief effort unfold?

The relief effort commences with an appeal for international help from the affected government (TQ 1). In some cases e.g. Iran, a formal appeal will not be made, but the government will announce that they are willing to accept international help if offered (IRNA, 2012b). Once the affected government has expressed the requirement for assistance, the relief organization or assisting government will conduct a needs assessment through on-site evaluation or getting information from agencies who are on-site. Teams and/or relief supplies will then be assembled and deployed to the affected country. It is common for relief to be delayed in reaching the affected areas (Erdbrink, 2012; Humanity Road, 2016c; World Vision, 2015) this could be due to several factors e.g., cumbersome import processes, accessibility of the affected area due to geography or damage, or corruption.

Through the research 3 phases of disaster relief have been identified namely search and rescue (SAR), relief and recovery (Section 4.5.1). SAR is the first part of the relief effort with specialized teams searching for and rescuing survivors.

The timeline for SAR is days to a week from the occurrence of the disaster event, this phase will be called off by the government and SAR teams will be expected to demobilize and exit the country. Relief aims to provide for survivors' most basic and immediate needs e.g., shelter, food, water, sanitation, and medical assistance, the timeline for relief spans weeks to months after the disaster. Recovery includes the rebuilding of communities, infrastructure and livelihoods and is not covered by this study.

7.3 Theoretical Question 3 (TQ3): The disaster response supply chain

TQ3: What is the nature of the disaster response supply chain?

Building on the finding that the humanitarian system is a complex system with many stakeholders (TQ 1) and considering the comparison of the characteristics between logistics, supply chains, supply networks and disaster response requirements (Figure 2.14) it can only be concluded that the disaster response supply chain is, in fact, a supply network. A notably unique trait of the disaster response supply network is that it inverts the expected commercial supply chain process, where the majority of time and effort is spent on operative and tactical operations (Figure 2.16), to a process where the bulk of time and effort is spent on preparation i.e., strategic functions (Figure 2.17). This enables relief organizations to pre-position supplies globally and prepare resources strategically, ready for deployment in the event of a large-scale disaster event. This revised supply chain process also reflects the premise of disaster prevention frameworks e.g., the Sendai framework (PreventionWeb, 2020b).

7.4 Research Question 1 (RQ1): Comparison between developing and developed countries

RQ: How do disaster response supply chain networks compare, when considering natural disasters in developing and developed countries?

The proposition considered in the study closely reflected the research question as follows:

Based on the principle of replication logic, the research concludes that there is strong evidence that disaster response in developed countries is different to disaster response in developing countries, developed countries typically respond better to sudden-onset natural disasters than their developing counterparts. There is however a point where developed countries' capacities are also overwhelmed (6.1.4).

Findings from the research strongly indicate a material difference between disaster supply chains in developing and developed countries.

7.4.1 Key differences

Key differences between disaster response in developed and developing countries included the following: expedited repair of infrastructure and services in developed countries result in earlier restoration of communication and accessibility to certain areas (6.1.1.4). Developed countries have superior disaster response protocols and deployment mechanisms, which typically resulted in superior medical response when compared to developing countries (6.1.1.6 and 6.1.1.8). For developing countries, there was a notable focus on concerns regarding food security and livelihoods, which was not the case with developed countries where the focus was on the restoration of infrastructure (6.1.1.4 and 6.1.2.1). Information flow (which is a critical element for an effective response as well as a critical supply chain identifier) was better executed in the developed country context (6.1.3.2). Generally, superior search and rescue and relief

responses were evident in the developed country context due to better control, management, coordination, and communication (6.1.3.3).

7.4.2 Key similarities

Some key similarities were also identified, namely that geography appeared to play a pivotal role in access to affected areas. Countries with a more challenging geography and rural communities experienced more challenges in conducting SAR and distributing relief (6.1.1.2). Furthermore, the relative size of the disaster was identified as a determining factor in the success of the response effort when reflecting on all cases and finally, the requirement for permissions and permits e.g., customs clearance to access the affected country for both personnel and goods irrespective of whether a developing or developed country needed to be accessed (6.1.1.3).

7.5 General findings

Key findings from investigating the existing body of knowledge include the following:

Limited literature is available that explore the dynamic of disaster response from a supply chain perspective. Available literature stems from varying academic disciplines as described in Figure 2.3. Notably, however, research from the different disciplines display markedly similar themes as shown in Figure 2.4. e.g., communication, coordination, and challenges, with the majority of literature originating in the medical field (Birnbaum et al., 2016a)

Upon investigation of the similarities and differences between logistics (Coyle et al., 2003), supply chain (Coyle et al., 2003) and supply network (Braziotis et al., 2013), it became clear that the requirements of the disaster supply chain closely mirrors that of the supply **network** (Figure 2.14). This finding lays the foundation for further research into the application of supply network principles and best practice in the disaster response field.

Several supply network elements as identified by Braziotis (2013) were also emergent themes from a disaster response perspective, namely information, communication and coordination. Birnbaum et al., 2016a; Broby et al., (2018) noted needs assessments as critical elements to disaster response. These assessments, in turn, are a vital component to the information flow, communication and coordination of disaster response.

Various challenges in disaster response were identified and collated. These challenges include but are not limited to: lack of funding (Pal et al., 2019) which causes competition amongst relief organizations for the same source of funds (Kovács and Spens, 2009). High personnel turnover (Birnbaum et al., 2016a; Overstreet et al., 2011) potentially resulting in training and experience gaps (Kovács and Spens, 2009). The culture and language of the affected nation, which could be foreign to aid workers causing communication challenges (Abir et al., 2017; Naor and Bernardes, 2016). Politics and corruption hampering the relief effort (Overstreet et al., 2011) as demonstrated in the Iran case. Safety and security of relief workers (Carroll, 2010; Lee, 2010). Time pressure due to the unpredictability of disaster events as well as lives being at stake (Kovács and Spens, 2009; Van Wassenhove, 2006) and also the complexity of operating conditions and accessibility of affected areas (Van Wassenhove, 2006)

Finally, the ASUG model was used in the study as a comparison framework for commercial and disaster supply chains Figure 2.16 (Poluha, 2016). In this model, for a commercial supply chain, the bulk of time and effort is invested in the tactical execution of the supply chain e.g., transport planning. It is postulated that inverting the model will render it applicable to the disaster relief environment (Figure 2.17), by investing the bulk of time into strategy, planning and procurement a robust model to address disaster relief can be established. This finding also creates the opportunity for further study.

7.6 General findings: case study

Adivar and Mert (2010) noted that one of the challenges experienced in disaster response is the lack of coordination, due to the lack of a central decision-making

authority. Based on the evaluation scores presented in Table 6.1 and Table 6.3, developed countries scored better overall as shown in Table 6.5 above.

Available evidence suggests that developed countries' governments were better prepared to fulfil the role as decision making authority in their respective disaster situations (Brookings Institute, 2011; WHO, 2016) rendering their response efforts more successful overall. Brining the above into the perspective of the supply network: coordination is noted as an identifying element of the supply network (Braziotis et al., 2013). It is thus argued that more effective coordination is a trait associated with disaster response in developed countries.

General themes evaluated, namely: access to information, geography, permissions and permits, infrastructure, politics, activation of disaster protocol, camps/ relief and medical response, showed a 56% relationship between the responses from developing and developed countries. This indicates that there are notable differences between the responses from developing and developed countries respectively.

Binary themes considered, namely: livestock, cluster coordination, appeal for assistance, coordination with industry and sentiment, had only a 27% relationship which indicates that these themes are specific to each individual case and does not follow trends between developing and developed countries.

Supply chain themes studied, namely: logistics, information flow, search and rescue and relief showed a 50% relationship.

Overall, all studied themes showed a 48% relationship which is less than anticipated. The unexpected results stem from the Japan case as depicted in Figure 6.1 and Figure 6.2, where logistics, relief, camps/ relief and medical response all scored below the expected level of its developed country counterpart. The reason for these scores is that Japan was hit by a multi-faceted disaster (OCHA, 2011e, 2011f, 2011c, 2011h, 2011i, 2011j, 2011g) that also affected the fuel supply in the country – causing significant delays in the distribution of relief supplies (CFE-DMHA, 2011c). The conclusion that can be drawn from this case is that irrespective of the amount of preparation and planning that goes into

disaster response – there is a point at which even the best-prepared country will not be able to cope.

7.7 Impressions

The researcher would also like to share the following impressions from the research: Firstly, where an appeal for funding was made, there was a notable focus on the dramatic aspect of the disaster with a significantly larger quantity of sources published. It was also the impression of the researcher that when the government doesn't play a strong leadership role, the relief effort appears to be disjointed and uncoordinated.

7.8 Limitations and challenges

A notable limitation of the study is the use and availability of historic data sources. Content reviewed is limited to data available from reputable sources, resulting in potential misrepresentation or oversight of some themes. Further challenges experienced in this study are the perceived reliability of the data available for the Iran case. Some resources cast doubt as to the transparency of the available data (Erdbrink, 2012; Reuters, 2012) as well as the lack of information in some cases (Iran and Italy) and an overwhelming amount of information for other cases (Nepal and Japan).

The above-described disparity in the availability of information results in varying levels of detail being available for each case and challenging a reasonable, like for like analysis. This challenge was however mitigated by the robust case study research design based on the work of Yin (2009c), as discussed in chapter 3.

8 CONCLUSION

This chapter will conclude the research by reviewing the objectives and the research question followed by a discussion of the most important findings of the study and conclude with recommendations on future work.

8.1 Objective and research question

The first research objective was to identify key factors, variables, and concepts relevant to disaster relief supply networks. This objective was achieved through a structured literature review of the current body of knowledge pertaining to relevant topics such as the anatomy of a disaster event, how the relief effort unfolds, the humanitarian system, humanitarian frameworks, supply chain concepts, definitions and frameworks and supply networks.

The second research objective sought to investigate each disaster event separately to gain an in-depth understanding of how the disaster unfolded and the resultant relief effort and subsequent supply chain network. This research objective was achieved through a holistic multi-case study, investigating four disaster events that occurred within the last decade. For each case, an overview was presented as well as a timeline analysis of how the event unfolded. Thematic coding (apriori and apostieri) and pattern matching techniques were employed to identify and evaluate themes and populate findings into a scoring matrix.

The third and final research objective aimed to describe the similarities and differences between disaster response supply chain networks in developing and developed countries. This research objective was achieved by completing a cross-case analysis of the four cases identified for the study. Cross case scoring matrices were developed for general themes, binary themes and supply chain themes, enabling the researcher to compare cases and draw conclusions.

The research question enquired how disaster response supply chain networks compare when considering sudden-onset natural disasters in developing and developed countries. The answer to this question is that there are notable differences between the disaster response supply networks when considering

sudden-onset natural disasters in developing and developed countries. Developed countries are better prepared for disaster events and thus more organised in the execution of their response to such events, resulting in more successful response efforts.

8.2 Findings

The most notable findings from this study are threefold. Firstly, the disaster relief effort can be classified as a supply network, secondly, there are three distinct phases in disaster response namely, search and rescue, relief and recovery and finally it can be concluded that disaster response supply chain networks are different in developing and developed countries.

8.3 Future work

Two areas for future work have been identified through this study:

- The application of supply network concepts specific to the medical response field e.g. triage and patient transport and allocation. By applying industrial supply chain models and techniques to the medical field, improvements in response time and efficacy could potentially be identified.
- Through this study, it has become apparent that disaster response is in its essence a supply network. A deeper investigation into how supply network principles can be leveraged in the disaster response and broader humanitarian context.
- Application of an inverted ASUG model to disaster response. This work could further explore the similarities and differences between commercial and disaster supply chains, exploring how existing commercial models could be adjusted and applied to improve disaster supply networks.

REFERENCES

Abidi, H., de Leeuw, S., Klumpp, M., 2014. Humanitarian supply chain performance management: a systematic literature review. Supply Chain Manag. Bradf. 19, 592–608. http://0-dx.doi.org.innopac.wits.ac.za/10.1108/SCM-09-2013-0349

Abir, M., Bell, S.A., Puppala, N., Awad, O., Moore, M., 2017. Setting Foundations for Developing Disaster Response Metrics. Disaster Med. Public Health Prep. Phila. 11, 505–509. http://0-dx.doi.org.innopac.wits.ac.za/10.1017/dmp.2016.173

ACAPS, 2015. d-acaps_district_profile_gorkha_nepal_earthquake_1_may_2015.pdf [WWW Document]. URL https://reliefweb.int/sites/reliefweb.int/files/resources/d-acaps_district_profile_gorkha_nepal_earthquake_1_may_2015.pdf (accessed 12.29.20).

ACAPS, n.d. b-150425_acaps_briefing_note_nepal_earthquake.pdf [WWW Document]. URL https://reliefweb.int/sites/reliefweb.int/files/resources/b-150425_acaps_briefing_note_nepal_earthquake.pdf (accessed 12.29.20).

Adivar, B., Atan, T., Oflaç, B.S., Örten, T., 2010. Improving social welfare chain using optimal planning model. Supply Chain Manag. Bradf. 15, 290–305. http://0-dx.doi.org.innopac.wits.ac.za/10.1108/13598541011054661

Adivar, B., Mert, A., 2010. International disaster relief planning with fuzzy credibility. Fuzzy Optim. Decis. Mak. N. Y. 9, 413–433. http://0-dx.doi.org.innopac.wits.ac.za/10.1007/s10700-010-9088-8

ALNAP, 2020. Why ALNAP? | ALNAP [WWW Document]. URL https://www.alnap.org/why-alnap (accessed 1.10.21).

ALNAP, 2018. State of the Humanitarian System, 2018 Edition.

Anaya-arenas, A.M., Renaud, J., Ruiz, A., 2014. Relief distribution networks: a systematic review. Ann. Oper. Res. N. Y. 223, 53–79. http://0-dx.doi.org.innopac.wits.ac.za/10.1007/s10479-014-1581-y

Anjomshoae, A., Hassan, A., Kunz, N., Wong, K.Y., de Leeuw, S., 2017. Toward a dynamic balanced scorecard model for humanitarian relief organizations' performance management. J. Humanit. Logist. Supply Chain Manag. 7, 194–218. https://doi.org/10.1108/JHLSCM-01-2017-0001

Anyadike, O., 2015. Why Nepal response will be so hard [WWW Document]. New Humanit. URL https://www.thenewhumanitarian.org/analysis/2015/04/27/why-nepal-response-will-be-so-hard (accessed 12.29.20).

APICS, 2015. The Total Scope of Supply Chain Management | APICS Blog [WWW Document]. URL http://www.apics.org/sites/apics-blog/thinking-supply-chain-topic-search-result (accessed 9.24.20).

Baxter, P., Jack, S., 2008. Qualitative Case Study Methodology: Study Design and Implementation for Novice Researchers 18.

Besiou, M., Stapleton, O., Van Wassenhove, L.N., 2011. System dynamics for humanitarian operations. J. Humanit. Logist. Supply Chain Manag. 1, 78–103. https://doi.org/10.1108/20426741111122420
Billomat, 2019. What is an Order Confirmation and How it Works. Billomat. URL https://www.billomat.com/en/magazine/what-is-an-order-confirmation/ (accessed 10.12.20).
Birnbaum, M.L., Daily, E.K., O'Rourke, A.P., 2016a. Research and Evaluations of the Health Aspects of Disasters, Part VII: The Relief/Recovery Framework. Prehospital Disaster Med. Camb. 31, 195–210. http://0-dx.doi.org.innopac.wits.ac.za/10.1017/S1049023X16000029
Birnbaum, M.L., Daily, E.K., O'Rourke, A.P., Loretti, A., 2016b. Research and Evaluations of the Health Aspects of Disasters, Part IX: Risk-Reduction Framework. Prehospital Disaster Med. Camb. 31, 309–325. http://0-dx.doi.org.innopac.wits.ac.za/10.1017/S1049023X16000352
Braziotis, C., Bourlakis, M., Rogers, H., Tannock, J., 2013. Supply chains and supply networks: distinctions and overlaps. Supply Chain Manag. 18, 644–652. http://0-dx.doi.org.innopac.wits.ac.za/10.1108/SCM-07-2012-0260
Broby, N., Lassetter, J.H., Williams, M., Winters, B.A., 2018. Effective International Medical Disaster Relief: A Qualitative Descriptive Study. Prehospital Disaster Med. Camb. 33, 119–126. http://0-dx.doi.org.innopac.wits.ac.za/10.1017/S1049023X18000225
Brookings Institute, 2011. What a Difference a Government Makes: Japan's Earthquake - Japan [WWW Document]. ReliefWeb. URL https://reliefweb.int/report/japan/what-difference-government-makes-japans-earthquake (accessed 12.29.20).
Business, F.B.F.T.M.M. is a former writer for T.B.S., Management, T.A. of E.B. on S.C., Murray, enterprise resource planning R.T.B. editorial policies M., n.d. Small Business Supply Chain: Vendor Managed Inventory (VMI) [WWW Document]. Balance Small Bus. URL https://www.thebalancesmb.com/vendor-managed-inventory-vmi-2221270 (accessed 10.12.20).
Carroll, R., 2010. Haiti looters are shot or lynched as owners comb through house ruins. The Observer.
Center for Evidence Synthesis in Health, 2017. The Steps of a Systematic Review.
CFE-DMHA, 2015a. 150426_U_CDIR_NepalEarthquake.pdf [WWW Document]. URL https://reliefweb.int/sites/reliefweb.int/files/resources/150426_U_CDIR_NepalEarthquake.pdf (accessed 12.29.20).
CFE-DMHA, 2015b. 150425_U_CDIR_NepalEarthquake.pdf [WWW Document]. URL https://reliefweb.int/sites/reliefweb.int/files/resources/150425_U_CDIR_NepalEarthquake.pdf (accessed 12.29.20).
CFE-DMHA, 2015c. 150501_U_CDIR_NepalEarthquake.pdf [WWW Document]. URL https://reliefweb.int/sites/reliefweb.int/files/resources/150501_U_CDIR_NepalEarthquake.pdf (accessed 12.29.20).
CFE-DMHA, 2015d. 150428_U_CDIR_NepalEarthquake.pdf [WWW Document]. URL

https://reliefweb.int/sites/reliefweb.int/files/resources/150428_U_CDIR_NepalEarthquake.pdf (accessed 12.29.20).
CFE-DMHA, 2015e. 150427_U_CDIR_NepalEarthquake.pdf [WWW Document]. URL https://reliefweb.int/sites/reliefweb.int/files/resources/150427_U_CDIR_NepalEarthquake.pdf (accessed 12.29.20).
CFE-DMHA, 2011a. 4BB617625CD251964925785600121D12-Full_Report.pdf [WWW Document]. URL https://reliefweb.int/sites/reliefweb.int/files/resources/4BB617625CD251964925785600121D12-Full_Report.pdf (accessed 12.29.20).
CFE-DMHA, 2011b. 1770F8B2454F8A9AC1257852002F2AA5-Full_Report.pdf [WWW Document]. URL https://reliefweb.int/sites/reliefweb.int/files/resources/1770F8B2454F8A9AC1257852002F2AA5-Full_Report.pdf (accessed 12.29.20).
CFE-DMHA, 2011c. 8AFF4E4A0552080A49257858001DD74F-Full_Report.pdf [WWW Document]. URL https://reliefweb.int/sites/reliefweb.int/files/resources/8AFF4E4A0552080A49257858001DD74F-Full_Report.pdf (accessed 12.29.20).
Chou, S.-Y., Chen, D., 2013. Emergent disaster rescue methods and prevention management. Disaster Prev. Manag. Bradf. 22, 265–277. http://0-dx.doi.org.innopac.wits.ac.za/10.1108/DPM-07-2012-0073
Coyle, J.J., Bardi, E.J., Langley, C.J.J., 2003. The Management of Business Logistics: a supply chain perspective, 7th edition. ed. South-Western, Canada.
CRED, 2009. DisCatClass_264(2).pdf.
D'Haene, C., Verlinde, S., Macharis, C., 2015. Measuring while moving (humanitarian supply chain performance measurement – status of research and current practice). J. Humanit. Logist. Supply Chain Manag. 5, 146–161. https://doi.org/10.1108/JHLSCM-04-2013-0016
Dillon, C., 2003. Understanding Reliability and Validity in Qualitative Research 10.
Dunin-Bell, O., 2018. What do They Know? Guidelines and Knowledge Translation for Foreign Health Sector Workers Following Natural Disasters. Prehospital Disaster Med. Camb. 33, 139–146. http://0-dx.doi.org.innopac.wits.ac.za/10.1017/S1049023X18000146
Dyke, M.V., Waldman, R., 2004. The Sphere Project Evaluation Report 59.
EM-DAT, 2021. EM-DAT Glossary | EM-DAT [WWW Document]. URL https://www.emdat.be/Glossary#letter_d (accessed 1.31.21).
EM-DAT, 2020a. Classification | EM-DAT [WWW Document]. URL https://www.emdat.be/classification (accessed 8.22.20).
EM-DAT, 2020b. Frequently asked questions | EM-DAT [WWW Document]. URL https://www.emdat.be/frequently-asked-questions (accessed 10.19.20).
Erdbrink, T., 2012. Young Iranians Step Up With Their Own Quake Relief - Iran (Islamic Republic of) [WWW Document]. ReliefWeb. URL https://reliefweb.int/report/iran-islamic-republic/young-iranians-step-their-own-quake-relief (accessed 12.19.20).

Falagara Sigala, I., Kettinger, W.J., Wakolbinger, T., 2020. Digitizing the field: designing ERP systems for Triple-A humanitarian supply chains. J. Humanit. Logist. Supply Chain Manag. 10, 231–260. https://doi.org/10.1108/JHLSCM-08-2019-0049

FAO, 2015. FAO Executive Brief _ Nepal Earthquake_30.04.15.pdf [WWW Document]. URL https://reliefweb.int/sites/reliefweb.int/files/resources/FAO%20Executive%20Brief%20_%20Nepal%20Earthquake_30.04.15.pdf (accessed 12.29.20).

FEMA, n.d. PHASES OF EMERGENCY MANAGEMENT.

Friedman, H.H., Amoo, T., 1999. Rating the rating scales. J. Mark. Manag. Vol. 9:3, 114–123.

Gavidia, J.V., 2017. A model for enterprise resource planning in emergency humanitarian logistics. J. Humanit. Logist. Supply Chain Manag. 7, 246–265. https://doi.org/10.1108/JHLSCM-02-2017-0004

Gladstone, R., 2012. Confusion Over How to Aid Iran Quake Victims (Published 2012). N. Y. Times.

Goniewicz, K., Burkle, F.M., Jr, 2019. Challenges in Implementing Sendai Framework for Disaster Risk Reduction in Poland. Int. J. Environ. Res. Public Health Basel 16. http://0-dx.doi.org.innopac.wits.ac.za/10.3390/ijerph16142574

Government of Italy, 2016a. Forze in campo [WWW Document]. Dipartimento Della Prot. Civ. URL http://www.protezionecivile.gov.it/attivita-rischi/rischio-sismico/emergenze/centro-italia-2016/forze-in-campo (accessed 12.26.20).

Government of Italy, 2016b. Donazioni [WWW Document]. Dipartimento Della Prot. Civ. URL http://www.protezionecivile.gov.it/attivita-rischi/rischio-sismico/emergenze/centro-italia-2016/donazioni (accessed 12.26.20).

Govt. Japan, 2011a. FE315EB8AC39590C852578630050F89C-map.pdf [WWW Document]. URL https://reliefweb.int/sites/reliefweb.int/files/resources/FE315EB8AC39590C852578630050F89C-map.pdf (accessed 1.6.21).

Govt. Japan, 2011b. Japan: Extra Press Conference by the Defense Minister (11:24-11:46 A.M. March 16, 2011) - Japan [WWW Document]. ReliefWeb. URL https://reliefweb.int/report/japan/japan-extra-press-conference-defense-minister-1124-1146-am-march-16-2011 (accessed 12.29.20).

Govt. Japan, 2011c. Japan: Offer of assistance from foreign countries and regions (Tohoku Pacific Earthquake) - Japan [WWW Document]. ReliefWeb. URL https://reliefweb.int/report/japan/japan-offer-assistance-foreign-countries-and-regions-tohoku-pacific-earthquake (accessed 12.29.20).

Guadagno, L., 2016. Human Mobility in the Sendai Framework for Disaster Risk Reduction. Int. J. Disaster Risk Sci. Heidelb. 7, 30–40. http://0-dx.doi.org.innopac.wits.ac.za/10.1007/s13753-016-0077-6

Health Cluster, 2015. health-cluster-bulletin_040515.pdf [WWW Document]. URL https://reliefweb.int/sites/reliefweb.int/files/resources/health-cluster-bulletin_040515.pdf (accessed 12.29.20).

Helvetas, 2015. One week on and the earth is still shaking... - Nepal [WWW Document]. ReliefWeb. URL https://reliefweb.int/report/nepal/one-week-and-earth-still-shaking (accessed 12.29.20).
Humanity Road, 2016a. ItalyEarthquake-HRSitrep2-25Aug2016.pdf [WWW Document]. URL https://reliefweb.int/sites/reliefweb.int/files/resources/ItalyEarthquake-HRSitrep2-25Aug2016.pdf (accessed 12.20.20).
Humanity Road, 2016b. Italy Earthquake-HR-Sitrep1, 24Aug2016.pdf [WWW Document]. URL https://reliefweb.int/sites/reliefweb.int/files/resources/Italy%20Earthquake-HR-Sitrep1%2C%2024Aug2016.pdf (accessed 12.20.20).
Humanity Road, 2016c. ItalyEarthquake-HRSitrep3-27Aug2016.pdf [WWW Document]. URL https://reliefweb.int/sites/reliefweb.int/files/resources/ItalyEarthquake-HRSitrep3-27Aug2016.pdf (accessed 12.20.20).
Humanity Road, 2015a. HumanityRoadNepalSitrep7May1summary.pdf [WWW Document]. URL https://reliefweb.int/sites/reliefweb.int/files/resources/HumanityRoadNepalSitrep7May1summary.pdf (accessed 12.29.20).
Humanity Road, 2015b. HumanityRoadNepalSitrep5May3summary.pdf [WWW Document]. URL https://reliefweb.int/sites/reliefweb.int/files/resources/HumanityRoadNepalSitrep5May3summary.pdf (accessed 12.29.20).
IASC, 2020. Inter-Agency Humanitarian Reform [WWW Document]. URL http://www.unicefinemergencies.com/downloads/eresource/Inter-Agency_Humanitarian_Reform.html (accessed 9.10.20).
IFRC, 2016a. IB_Italy_Earthquake_24082016.pdf [WWW Document]. URL https://reliefweb.int/sites/reliefweb.int/files/resources/IB_Italy_Earthquake_24082016.pdf (accessed 12.20.20).
IFRC, 2016b. IB2_Italy_Earthquake_26082016.pdf [WWW Document]. URL https://reliefweb.int/sites/reliefweb.int/files/resources/IB2_Italy_Earthquake_26082016.pdf (accessed 12.20.20).
IFRC, 2016c. IB3_Italy_Earthquake_31082016.pdf [WWW Document]. URL https://reliefweb.int/sites/reliefweb.int/files/resources/IB3_Italy_Earthquake_31082016.pdf (accessed 12.20.20).
IFRC, 2016d. IB4_Italy_Earthquake_09092016.pdf [WWW Document]. URL https://reliefweb.int/sites/reliefweb.int/files/resources/IB4_Italy_Earthquake_09092016.pdf (accessed 12.20.20).
IFRC, 2012a. IFRC IRAN 1 [WWW Document]. URL https://www.ifrc.org/docs/Appeals/12/IB120812IRAN.pdf (accessed 12.19.20).
IFRC, 2012b. IFRC IRAN 5 [WWW Document]. URL https://reliefweb.int/sites/reliefweb.int/files/resources/IB230812Iran.pdf (accessed 12.19.20).
IFRC, 2012c. Full_Report_4331.pdf [WWW Document]. URL https://reliefweb.int/sites/reliefweb.int/files/resources/Full_Report_4331.pdf (accessed 12.19.20).

İlhan, A., 2011. The Humanitarian Relief Chain. South East Eur. J. Econ. Bus. 6, 45–54. https://doi.org/10.2478/v10033-011-0015-x
Inbound Logistics, 2020. Glossary of Transportation, Logistics, Supply Chain, and International Trade Terms - Inbound Logistics [WWW Document]. URL https://www.inboundlogistics.com/cms/logistics-glossary/#T (accessed 10.12.20).
IRNA, 2012a. First Turkish package of emergency supplies at Customs Office - Iran (Islamic Republic of) [WWW Document]. ReliefWeb. URL https://reliefweb.int/report/iran-islamic-republic/first-turkish-package-emergency-supplies-customs-office (accessed 12.19.20).
IRNA, 2012b. IRI Veep: Iran ready for accepting int'l contributions for quake victims - Iran (Islamic Republic of) [WWW Document]. ReliefWeb. URL https://reliefweb.int/report/iran-islamic-republic/iri-veep-iran-ready-accepting-int%E2%80%99l-contributions-quake-victims (accessed 12.19.20).
Johnston, M.P., 2014. Secondary Data Analysis: A Method of which the Time Has Come. Qual. Quant. Methods Libr. 8.
Kabir, S.M.S., 2018. Methods of Data Collection.
Kaplan, R.S., Norton, D.P., 2014. The Explainer: The Balanced Scorecard.
Kovács, G., Spens, K., 2009. Identifying challenges in humanitarian logistics. Int. J. Phys. Distrib. Logist. Manag. Bradf. 39, 506–528. http://0-dx.doi.org.innopac.wits.ac.za/10.1108/09600030910985848
Lee, T., 2010. Rumor to Fact in Tales of Post-Katrina Violence. N. Y. Times.
Logistics Bereau, n.d. Inventory Planning and Why Your Company Should Prioritise It [WWW Document]. URL https://www.logisticsbureau.com/is-your-company-on-top-of-its-inventory-planning-game/ (accessed 10.12.20).
Logistics Cluster, 2015a. logistics_cluster_nepal_conops_150426_0.pdf [WWW Document]. URL https://reliefweb.int/sites/reliefweb.int/files/resources/logistics_cluster_nepal_conops_150426_0.pdf (accessed 12.29.20).
Logistics Cluster, 2015b. logistics_cluster_nepal_conops_150504_final_0.pdf [WWW Document]. URL https://reliefweb.int/sites/reliefweb.int/files/resources/logistics_cluster_nepal_conops_150504_final_0.pdf (accessed 12.29.20).
Logistics Cluster, 2015c. logistics_cluster_nepal_earthquake_situation_update_150426_0-2.pdf [WWW Document]. URL https://reliefweb.int/sites/reliefweb.int/files/resources/logistics_cluster_nepal_earthquake_situation_update_150426_0-2.pdf (accessed 12.29.20).
Logistics Cluster, 2015d. logistics_cluster_nepal_earthquake_situation_update_150427_0.pdf [WWW Document]. URL https://reliefweb.int/sites/reliefweb.int/files/resources/logistics_cluster_nepal_earthquake_situation_update_150427_0.pdf (accessed 12.29.20).
Logistics Cluster, 2015e. logistics_cluster_nepal_earthquake_situation_update_150429_ls.pdf [WWW Document]. URL

https://reliefweb.int/sites/reliefweb.int/files/resources/logistics_cluster_nepal_earthquake_situation_update_150429_ls.pdf (accessed 12.29.20).
Logistics Cluster, 2015f. logistics_cluster_nepal_earthquake_situation_update_150430.pdf [WWW Document]. URL https://reliefweb.int/sites/reliefweb.int/files/resources/logistics_cluster_nepal_earthquake_situation_update_150430.pdf (accessed 12.29.20).
Logistics Cluster, 2015g. logistics_cluster_nepal_earthquake_situation_update_150503_final (1).pdf [WWW Document]. URL https://reliefweb.int/sites/reliefweb.int/files/resources/logistics_cluster_nepal_earthquake_situation_update_150503_final%20%281%29.pdf (accessed 12.29.20).
Logistics Cluster, 2015h. logistics_cluster_nepal_earthquake_situation_update_150501 (1).pdf [WWW Document]. URL https://reliefweb.int/sites/reliefweb.int/files/resources/logistics_cluster_nepal_earthquake_situation_update_150501%20%281%29.pdf (accessed 12.29.20).
Lou, X.C., Yu, X., 2014. Research on Emergency Management Methods of Incident Contingency in City Administration. Appl. Mech. Mater. Zurich 644–650, 5809–5812. http://0-dx.doi.org.innopac.wits.ac.za/10.4028/www.scientific.net/AMM.644-650.5809
Maghsoudi, A., Pazirandeh, A., 2016. Visibility, resource sharing and performance in supply chain relationships: insights from humanitarian practitioners. Supply Chain Manag. Bradf. 21, 125–139. http://0-dx.doi.org.innopac.wits.ac.za/10.1108/SCM-03-2015-0102
MBA School, 2016. Distribution Planning Definition | Operations & Supply Chain Dictionary [WWW Document]. MBA Skool-StudyLearnShare. URL https://www.mbaskool.com/business-concepts/operations-logistics-supply-chain-terms/15951-distribution-planning.html (accessed 10.12.20).
McCombes, S., 2019. Descriptive Research Design | Definition, Methods and Examples [WWW Document]. Scribbr. URL https://www.scribbr.com/methodology/descriptive-research/ (accessed 10.19.20).
Mills, A., Durepos, G., Wiebe, E., 2010. Encyclopedia of Case Study Research. SAGE Publications, Inc., 2455 Teller Road, Thousand Oaks California 91320 United States. https://doi.org/10.4135/9781412957397
MSU, 2016. What is Demand Planning and Why Is It Important? Mich. State Univ. URL https://www.michiganstateuniversityonline.com/resources/supply-chain/how-demand-planning-improves-supply-chain/ (accessed 10.12.20).
Naor, M., Bernardes, E., 2016. Self-Sufficient Healthcare Logistics Systems and Responsiveness: Ten Cases of Foreign Field Hospitals Deployed to Disaster Relief Supply Chains. JOSCM J. Oper. Supply Chain Manag. Sao

Paulo 9, 1–22. http://0-dx.doi.org.innopac.wits.ac.za/10.12660/joscmv9n1p1-22
NBR, 2011. Timeline of Operation Tomodachi. Natl. Bur. Asian Res. NBR. URL https://www.nbr.org/publication/timeline-of-operation-tomodachi/ (accessed 1.1.21).
OCHA, 2020. What is the Cluster Approach? | HumanitarianResponse [WWW Document]. URL https://www.humanitarianresponse.info/en/about-clusters/what-is-the-cluster-approach (accessed 9.10.20).
OCHA, 2015. SitRep 05_28 April 2015_0.pdf [WWW Document]. URL https://reliefweb.int/sites/reliefweb.int/files/resources/SitRep%2005_28%20April%202015_0.pdf (accessed 12.29.20).
OCHA, 2012a. EQ-2012-000136-IRN_0811.pdf [WWW Document]. URL https://reliefweb.int/sites/reliefweb.int/files/resources/EQ-2012-000136-IRN_0811.pdf (accessed 12.19.20).
OCHA, 2012b. 120814 Iran earthquake sitrep 2.pdf [WWW Document]. URL https://reliefweb.int/sites/reliefweb.int/files/resources/120814%20Iran%20earthquake%20sitrep%202.pdf (accessed 12.19.20).
OCHA, 2012c. Humanitarian_Bulletin_en_July_Aug_2012.pdf [WWW Document]. URL https://reliefweb.int/sites/reliefweb.int/files/resources/Humanitarian_Bulletin_en_July_Aug_2012.pdf (accessed 12.19.20).
OCHA, 2011a. OCHA and Slow Onset Emergencies [WWW Document]. URL https://www.unocha.org/sites/unocha/files/OCHA%20and%20Slow%20Onset%20Emergencies.pdf (accessed 8.27.20).
OCHA, 2011b. EB319587637AF7EFC1257855003FD2F4-map.pdf [WWW Document]. URL https://reliefweb.int/sites/reliefweb.int/files/resources/EB319587637AF7EFC1257855003FD2F4-map.pdf (accessed 12.29.20).
OCHA, 2011c. OCHA SITREP 3 [WWW Document]. URL https://reliefweb.int/sites/reliefweb.int/files/resources/DED2C799732D6C53C12578530043E87F-Full_Report.pdf (accessed 12.29.20).
OCHA, 2011d. B695CD6B9CF47956C12578540048D0D6-Full_Report.pdf [WWW Document]. URL https://reliefweb.int/sites/reliefweb.int/files/resources/B695CD6B9CF47956C12578540048D0D6-Full_Report.pdf (accessed 12.29.20).
OCHA, 2011e. OCHA SITREP 1 [WWW Document]. URL https://reliefweb.int/sites/reliefweb.int/files/resources/60C5286F730C9B6449257851004A922B-Full_Report.pdf (accessed 12.29.20).
OCHA, 2011f. OCHA SITREP 2 [WWW Document]. URL https://reliefweb.int/sites/reliefweb.int/files/resources/289B1BF0F9F6B4C7C12578520045004D-Full_Report.pdf (accessed 12.29.20).
OCHA, 2011g. OCHA SITREP 7 [WWW Document]. URL https://reliefweb.int/sites/reliefweb.int/files/resources/C85BCD0DEBF49372C1257857003DE0B5-Full_Report.pdf (accessed 1.4.21).
OCHA, 2011h. OCHA SITREP 4 [WWW Document]. URL https://reliefweb.int/sites/reliefweb.int/files/resources/B695CD6B9CF47956C12578540048D0D6-Full_Report.pdf (accessed 1.4.21).

OCHA, 2011i. OCHA SITREP 5 [WWW Document]. URL https://reliefweb.int/sites/reliefweb.int/files/resources/EB319587637AF7EFC1257855003FD2F4-Full_Report.pdf (accessed 1.4.21).
OCHA, 2011j. OCHA SITREP 6 [WWW Document]. URL https://reliefweb.int/sites/reliefweb.int/files/resources/8353B696BD3AF80CC12578560045B420-Full_Report.pdf (accessed 1.4.21).
OFAC, 2012. iran_guidance_earthquake.pdf [WWW Document]. URL https://reliefweb.int/sites/reliefweb.int/files/resources/iran_guidance_earthquake.pdf (accessed 12.19.20).
O'Leary, Z., 2020. Steps in Secondary Data Analysis | Online Resources [WWW Document]. URL https://study.sagepub.com/oleary3e/student-resources/analysing-data/steps-in-secondary-data-analysis (accessed 10.29.20).
Operation USA, 2015. Situation Report: Nepal | Operation USA. URL http://www.opusa.org/situation-report-nepal/ (accessed 12.29.20).
Order of Malta, 2016. Earthquake Aftermath in Central Italy: Order of Malta's Relief Corps on the Frontline of Rescue Operations. Order Malta. URL https://www.orderofmalta.int/2016/08/31/earthquake-aftermath-in-central-italy-order-of-maltas-relief-corps-on-the-frontline-of-rescue-operations/ (accessed 12.26.20).
Overstreet, R.E., Hall, D., Hanna, J.B., Kelly Rainer, R., 2011. Research in humanitarian logistics. J. Humanit. Logist. Supply Chain Manag. 1, 114–131. https://doi.org/10.1108/20426741111158421
Owusu-Kwateng, K., Hamid, M.A., Debrah, B., 2017. Disaster relief logistics operation: an insight from Ghana. Int. J. Emerg. Serv. Bingley 6, 4–13. http://0-dx.doi.org.innopac.wits.ac.za/10.1108/IJES-10-2016-0022
Pal, N.E., Eckenwiler, L., Hyppolite, S.-R., Pringle, J., Chung, R., Hunt, M., Link to external site, this link will open in a new window, 2019. Ethical considerations for closing humanitarian projects: a scoping review. J. Int. Humanit. Action Heidelb. 4, 1–9. http://0-dx.doi.org.innopac.wits.ac.za/10.1186/s41018-019-0064-9
Paolatubaro, 2015. Research ethics in secondary data: what issues? Data Big Small. URL https://databigandsmall.com/2015/10/18/research-ethics-in-secondary-data-what-issues/ (accessed 10.27.20).
PlanetTogether, n.d. MRP vs DRP in Manufacturing and Production [WWW Document]. URL https://www.planettogether.com/blog/mrp-vs-drp (accessed 10.12.20).
Polastro, R., 2014. Evaluating Humanitarian Action in Real Time: Recent Practices, Challenges, and Innovations. Can. J. Program Eval. Tor. 29, n/a.
Poluha, R.G., 2016. The Quintessence of Supply Chain Management, Quintessence Series. Springer Berlin Heidelberg, Berlin, Heidelberg. https://doi.org/10.1007/978-3-662-48515-6
PreventionWeb, 2020a. Hyogo Framework for Action | PreventionWeb.net [WWW Document]. URL https://www.preventionweb.net/sendai-framework/hyogo/ (accessed 9.10.20).
PreventionWeb, 2020b. Sendai Framework at a Glance | PreventionWeb.net [WWW Document]. URL https://www.preventionweb.net/sendai-framework/sendai-framework-for-drr/at-a-glance (accessed 9.10.20).

Procurement Cloud, 2020. Procurement Process | The 2020 Guide to Procurement Management [WWW Document]. Kissflow. URL https://kissflow.com/procurement-process/ (accessed 10.12.20).
Prutsalis, M., 2010. Developing a Service Industry to Support the Sahana Disaster Management System. Open Source Bus. Resour. Ott. 11–17.
ReliefWeb, 2020a. About ReliefWeb [WWW Document]. ReliefWeb. URL https://reliefweb.int/about (accessed 1.5.21).
ReliefWeb, 2020b. ReliefWeb - Informing humanitarians worldwide [WWW Document]. ReliefWeb. URL https://reliefweb.int/ (accessed 1.5.21).
ReliefWeb, 2016a. ReliefWeb: Iran Earthquake 2012 [WWW Document]. ReliefWeb. URL https://reliefweb.int/search/results (accessed 1.5.21).
ReliefWeb, 2016b. ReliefWeb: Italy Earthquake 2016 [WWW Document]. ReliefWeb. URL https://reliefweb.int/search/results (accessed 1.5.21).
ReliefWeb, 2015. ReliefWeb: Nepal Earthquake 2015 [WWW Document]. ReliefWeb. URL https://reliefweb.int/updates (accessed 1.5.21).
ReliefWeb, 2011a. ReliefWeb: Japan Earthquake 2011 [WWW Document]. ReliefWeb. URL https://reliefweb.int/updates (accessed 1.6.21).
ReliefWeb, 2011b. 3A1D5C98377894048525785E00725932-map.pdf [WWW Document]. URL https://reliefweb.int/sites/reliefweb.int/files/resources/3A1D5C98377894048525785E00725932-map.pdf (accessed 1.6.21).
Research Gate, 2014. Elevation map of Nepal [WWW Document]. ResearchGate. URL https://www.researchgate.net/figure/Elevation-map-of-Nepal_fig1_319183873 (accessed 1.8.21).
Research Shorts, 2017. Conducting a Systematic Literature Review.
Reuters, 2015. Thousands volunteer to scour satellite images of Nepal quake [WWW Document]. news.trust.org. URL https://news.trust.org/item/20150427235955-m7dyx/ (accessed 12.29.20).
Reuters, 2012. Iran government criticised over earthquake response - Iran (Islamic Republic of) [WWW Document]. ReliefWeb. URL https://reliefweb.int/report/iran-islamic-republic/iran-government-criticised-over-earthquake-response (accessed 12.19.20).
Sahana Eden, 2020. BluePrint/Inventory – SahanaEden [WWW Document]. URL http://eden.sahanafoundation.org/wiki/BluePrint/Inventory (accessed 10.12.20).
Saldaña, J., 2009. The coding manual for qualitative researchers. Sage, Los Angeles, Calif.
SAP, 2010. Differ. VMI(Vendor Managed Inventory) and SMI(Supplier Managed Inventory)? - SAP Q&A [WWW Document]. URL https://answers.sap.com/questions/7418573/differ-vmivendor-managed-inventory-and-smisupplier.html (accessed 10.12.20).
Seaman, J., 2008. Learning from emergencies. BMJ Br. Med. J. Online Lond. 337. http://0-dx.doi.org.innopac.wits.ac.za/10.1136/bmj.a2865
Statista, 2020. Nepal - Total population 2015-2025 [WWW Document]. Statista. URL https://www.statista.com/statistics/422462/total-population-of-nepal/ (accessed 1.8.21).

Steets, J., Grünewald, F., Binder, A., de Geoffroy, V., Kauffmann, D., Krüger, S., Meier, C., Sokpoh, B., 2012. Cluster Approach Evaluation 2 Synthesis Report 162.
STL, 2012. 120827 STL SitRep Iran Earthquake (1).pdf [WWW Document]. URL https://reliefweb.int/sites/reliefweb.int/files/resources/120827%20STL%20SitRep%20Iran%20Earthquake%20%281%29.pdf (accessed 12.19.20).
Streefkerk, R., 2019. Qualitative vs. Quantitative Research | Differences & Methods [WWW Document]. Scribbr. URL https://www.scribbr.com/methodology/qualitative-quantitative-research/ (accessed 10.19.20).
Switzerland FDFA, 2012. 40 Tonnes of Relief Supplies sent to Iran [WWW Document]. URL https://www.admin.ch/gov/en/start/dokumentation/medienmitteilungen.msg-id-45625.html (accessed 12.19.20).
Tabaklar, T., Halldórsson, Á., Kovács, G., Spens, K., 2015. Borrowing theories in humanitarian supply chain management. J. Humanit. Logist. Supply Chain Manag. Bingley 5, 281–299. http://0-dx.doi.org.innopac.wits.ac.za/10.1108/JHLSCM-07-2015-0029
ten Ham-Baloyi, W., Jordan, P., 2016. Systematic review as a research method in post-graduate nursing education. Health SA Gesondheid 21, 120–128. https://doi.org/10.1016/j.hsag.2015.08.002
The Sphere Project, 2011. Humanitarian Charter and Minimum Standards in Humanitarian Response: The Sphere Handbook. The Sphere Project, Rugby, Warwickshire, United Kingdom. https://doi.org/10.3362/9781908176202
TNH, 2015a. Health concerns grow in Nepal quake camps [WWW Document]. New Humanit. URL https://www.thenewhumanitarian.org/news/2015/04/28/health-concerns-grow-nepal-quake-camps (accessed 12.29.20).
TNH, 2015b. Aid agencies pour into Nepal – and then what? [WWW Document]. New Humanit. URL https://www.thenewhumanitarian.org/analysis/2015/04/29/aid-agencies-pour-nepal-and-then-what (accessed 12.29.20).
TradeGecko, n.d. Inventory control: Definition, systems, and management [WWW Document]. URL https://www.tradegecko.com/inventory-management/inventory-control (accessed 10.12.20).
Trochim, W.M.K., 2002. Social Research Methods Knowledge Base.
TSF, 2012. Earthquake: TSF offered its support to Iranian rescue effort - Iran (Islamic Republic of) [WWW Document]. ReliefWeb. URL https://reliefweb.int/report/iran-islamic-republic/earthquake-tsf-offered-its-support-iranian-rescue-effort (accessed 12.19.20).
Tutorialspoint, 2020. Sales Planning - Introduction - Tutorialspoint [WWW Document]. URL https://www.tutorialspoint.com/sales_planning/sales_planning_introduction.htm (accessed 10.12.20).
UKAid, 2011. D4C77A44513DA0088525785C00576BA1-map.pdf [WWW Document]. URL

https://reliefweb.int/sites/reliefweb.int/files/resources/D4C77A44513DA0088525785C00576BA1-map.pdf (accessed 1.6.21).
UNCTAD, 2020. UNCTADstat - Classifications [WWW Document]. URL https://unctadstat.unctad.org/en/classifications.html (accessed 9.29.20).
UNOCHA, 2015. nepal_flash_appeal.pdf [WWW Document]. URL https://reliefweb.int/sites/reliefweb.int/files/resources/nepal_flash_appeal.pdf (accessed 12.29.20).
USAID, 2015a. 04.25.15 - USAID-DCHA Nepal Earthquake Fact Sheet #1.pdf [WWW Document]. URL https://reliefweb.int/sites/reliefweb.int/files/resources/04.25.15%20-%20USAID-DCHA%20Nepal%20Earthquake%20Fact%20Sheet%20%231.pdf (accessed 12.29.20).
USAID, 2015b. 04.28.15 - USAID-DCHA Nepal Earthquake Fact Sheet #3.pdf [WWW Document]. URL https://reliefweb.int/sites/reliefweb.int/files/resources/04.28.15%20-%20USAID-DCHA%20Nepal%20Earthquake%20Fact%20Sheet%20%233.pdf (accessed 12.29.20).
USAID, 2015c. 05.04.15 - USAID-DCHA Nepal Earthquake Fact Sheet #8.pdf [WWW Document]. URL https://reliefweb.int/sites/reliefweb.int/files/resources/05.04.15%20-%20USAID-DCHA%20Nepal%20Earthquake%20Fact%20Sheet%20%238.pdf (accessed 12.29.20).
USAID, 2015d. 04.29.15 - USAID-DCHA Nepal Earthquake Fact Sheet #3.pdf [WWW Document]. URL https://reliefweb.int/sites/reliefweb.int/files/resources/04.29.15%20-%20USAID-DCHA%20Nepal%20Earthquake%20Fact%20Sheet%20%233.pdf (accessed 12.29.20).
USAID, 2011. 41DCF023F72BDF4B4925785400007FF5-Full_Report.pdf [WWW Document]. URL https://reliefweb.int/sites/reliefweb.int/files/resources/41DCF023F72BDF4B4925785400007FF5-Full_Report.pdf (accessed 12.29.20).
Van Wassenhove, L.N., 2006. Humanitarian aid logistics: supply chain management in high gear. J. Oper. Res. Soc. 57, 475–489. https://doi.org/10.1057/palgrave.jors.2602125
van Wyk, E., Yadavalli, V.S.S., n.d. Strategic inventory management for disaster relief 10.
VOA, 2012. Iran's quake death toll may rise - Iran (Islamic Republic of) [WWW Document]. ReliefWeb. URL https://reliefweb.int/report/iran-islamic-republic/irans-quake-death-toll-may-rise (accessed 12.19.20).
WHO, 2016. Coordination during disasters saves lives [WWW Document]. URL https://www.euro.who.int/en/countries/italy/news/news/2016/09/coordination-during-disasters-saves-lives (accessed 12.20.20).
WHO, 2015. WHO, health partners striving to treat quake survivors in Nepal's remote regions - Nepal [WWW Document]. ReliefWeb. URL

https://reliefweb.int/report/nepal/who-health-partners-striving-treat-quake-survivors-nepal-s-remote-regions (accessed 12.29.20).
World Vision, 2015. Aid organizations face challenges in rush to help Nepal [WWW Document]. ReliefWeb. URL https://reliefweb.int/report/nepal/aid-organizations-face-challenges-rush-help-nepal-earthquake-survivors-desperately-need (accessed 12.29.20).
Xiao, Y., Watson, M., 2019. Guidance on Conducting a Systematic Literature Review. J. Plan. Educ. Res. 39, 93–112. https://doi.org/10.1177/0739456X17723971
Yeager, K., 2021. LibGuides: Statistical & Qualitative Data Analysis Software: About NVivo [WWW Document]. URL https://libguides.library.kent.edu/statconsulting/NVivo (accessed 3.11.21).
Yew, Y.Y., Delgado, R.C., Heslop, D.J., González, P.A., 2019. The Yew Disaster Severity Index: A New Tool in Disaster Metrics. Prehospital Disaster Med. Camb. 34, 8–19. http://0-dx.doi.org.innopac.wits.ac.za/10.1017/S1049023X18001115
Yin, R.K., 2013. Case study research chapter 5 [WWW Document]. URL https://researchskillsgmm.files.wordpress.com/2014/09/chapter-5-case-study-research-small.pdf (accessed 10.30.20).
Yin, R.K., 2009a. Yin Chapter 2: Case Study Design, in: Case Study Research Fourth Edition. Sage, Unites States of America.
Yin, R.K., 2009b. Case Study Research Design and Methods.
Yin, R.K., 2009c. Yin Chapter 1: Introduction, in: Case Study Research Fourth Edition. Sage, Unites States of America.
Zotero, 2021. Zotero | Your personal research assistant [WWW Document]. URL https://www.zotero.org/ (accessed 3.11.21).

APPENDICES

APPENDIX A: Literature review search criteria

Search criteria for literature is shown below.

Disaster management	
Source	ProQuest Central
Date	08-Mar-20
Settings	Full text
	Peer reviewed
Count	**Search terms**
116257	Disaster management
660	Disaster management AND "sudden onset"
40	Disaster management AND "sudden onset natural"
Anatomy of disaster	
Source	ProQuest Central
Date	08-Mar-20
Settings	Full text
	Peer reviewed
Count	**Search terms**
3747	Natural disaster AND timeline
68	Natural disaster AND timeline and "sudden onset"
20	Natural disaster AND timeline and "sudden onset" plus medical journals excluded
Supply chain evaluation framework	
Source	ProQuest Central
Date	08-Mar-20
Settings	Full text
	Peer reviewed
Count	**Search terms**
57075	supply chain evaluation framework
2015	supply chain evaluation framework AND humanitarian
1054	supply chain evaluation framework AND humanitarian AND disaster
561	"supply chain" evaluation framework AND humanitarian AND disaster
43	"supply chain" evaluation framework AND humanitarian AND disaster and "sudden onset"
Emerald: Journal of HL and SCM	
12	"humanitarian system" - refugee
Grey literature	
See Zotero	
TOTAL	**115**

APPENDIX B: General themes matrix

General theme matrix developed by author.

Importance rating (developed by author)		
Rated themes	**Influence rating (Weighting)**	**Weight**
Access to information	Extremely influential	5
Geography	Very influential	4
Permissions and permits	Very influential	4
Infrastructure	Very influential	4
Politics	Slightly influential	2
Activation of disaster protocol	Extremely influential	5
Camps/Relief	Very influential	4
Medical response	Very influential	4
	Total score	40
Other		
Livestock	Slightly influential	
Cluster coordination	Very influential	
Appeal for assistance	Very influential	
Coordination with industry	Very influential	
Sentiment	Modelrately influential	

APPENDIX C: Supply chain themes matrix

Supply chain themes matrix developed by author.

	Developing				**Developed**			
	Iran	**Score**	**Nepal**	**Score**	**Italy**	**Score**	**Japan**	**Score**
Logistics	Poor	2	Poor	2	Fair	3	Poor	2
Information flow	Poor	2	Poor	2	Fair	3	Excellent	5
Search and rescue	Poor	2	Fair	3	Good	4	Good	4
Relief	Fair	3	Poor	2	Good	4	Fair	3
Total score		2.25		2.25		3.5		3.5

APPENDIX D: EMDAT database data fields

A list of EM-DAT data fields are included below, the full database can be made available on request.

Dis No
Year
Seq
Disaster Group
Disaster Subgroup
Disaster Type
Disaster Subtype
Disaster Subsubtype
Event Name
Entry Criteria
Country
ISO
Region
Continent
Location
Origin
Associated Dis
Associated Dis2

OFDA Response
Appeal
Declaration
Aid Contribution
Dis Mag Value
Dis Mag Scale
Latitude
Longitude
Local Time
River Basin
Start Year
Start Month
Start Day
End Year
End Month
End Day
Total Deaths
No Injured
No Affected
No Homeless
Total Affected
Reconstruction Costs ('000 US$)

Insured Damages ('000 US$)
Total Damages ('000 US$)
CPI

APPENDIX E: UNDAT country classifications

Code	Label	
0000	World	
1200	Developing economies	Developing economy
1210	Developing economies: Africa	Developing economy
012	Algeria	Developing economy
024	Angola	Developing economy
204	Benin	Developing economy
072	Botswana	Developing economy
086	British Indian Ocean Territory	Developing economy
854	Burkina Faso	Developing economy
108	Burundi	Developing economy
132	Cabo Verde	Developing economy
120	Cameroon	Developing economy
140	Central African Republic	Developing economy
148	Chad	Developing economy
174	Comoros (the)	Developing economy
178	Congo (the)	Developing economy
180	Congo (the Democratic Republic of the)	Developing economy
384	Côte d'Ivoire	Developing economy
262	Djibouti	Developing economy
818	Egypt	Developing economy

226	Equatorial Guinea	Developing economy
232	Eritrea	Developing economy
748	Eswatini	Developing economy
231	Ethiopia	Developing economy
230	Ethiopia (...1991)	Developing economy
260	French Southern Territories	Developing economy
266	Gabon	Developing economy
270	Gambia (the)	Developing economy
288	Ghana	Developing economy
324	Guinea	Developing economy
624	Guinea-Bissau	Developing economy
404	Kenya	Developing economy
426	Lesotho	Developing economy
430	Liberia	Developing economy
434	Libya	Developing economy
450	Madagascar	Developing economy
454	Malawi	Developing economy
466	Mali	Developing economy
478	Mauritania	Developing economy
480	Mauritius	Developing economy
504	Morocco	Developing economy
508	Mozambique	Developing economy

516	Namibia	Developing economy
562	Niger (the)	Developing economy
566	Nigeria	Developing economy
646	Rwanda	Developing economy
654	Saint Helena	Developing economy
678	Sao Tome and Principe	Developing economy
686	Senegal	Developing economy
690	Seychelles	Developing economy
694	Sierra Leone	Developing economy
706	Somalia	Developing economy
710	South Africa	Developing economy
728	South Sudan	Developing economy
729	Sudan (the)	Developing economy
736	Sudan (...2011)	Developing economy
834	Tanzania, United Republic of	Developing economy
768	Togo	Developing economy
788	Tunisia	Developing economy
800	Uganda	Developing economy
732	Western Sahara	Developing economy
894	Zambia	Developing economy
716	Zimbabwe	Developing economy
1220	Developing economies: America	Developing economy

660	Anguilla	Developing economy
028	Antigua and Barbuda	Developing economy
032	Argentina	Developing economy
533	Aruba	Developing economy
044	Bahamas (the)	Developing economy
052	Barbados	Developing economy
084	Belize	Developing economy
068	Bolivia (Plurinational State of)	Developing economy
535	Bonaire, Sint Eustatius and Saba	Developing economy
074	Bouvet Island	Developing economy
076	Brazil	Developing economy
092	Virgin Island (British)	Developing economy
136	Cayman Islands	Developing economy
152	Chile	Developing economy
170	Colombia	Developing economy
188	Costa Rica	Developing economy
192	Cuba	Developing economy
531	Curaçao	Developing economy
212	Dominica	Developing economy
214	Dominican Republic (the)	Developing economy
218	Ecuador	Developing economy
222	El Salvador	Developing economy

238	Falkland Islands (Malvinas)	Developing economy
308	Grenada	Developing economy
320	Guatemala	Developing economy
328	Guyana	Developing economy
332	Haiti	Developing economy
340	Honduras	Developing economy
388	Jamaica	Developing economy
484	Mexico	Developing economy
500	Montserrat	Developing economy
530	Netherlands Antilles	Developing economy
558	Nicaragua	Developing economy
591	Panama	Developing economy
592	Panama, Canal Zone	Developing economy
590	Panama, excluding Canal Zone	Developing economy
600	Paraguay	Developing economy
604	Peru	Developing economy
652	Saint Barthélemy	Developing economy
659	Saint Kitts and Nevis	Developing economy
662	Saint Lucia	Developing economy
663	Saint Martin (French part)	Developing economy
670	Saint Vincent and the Grenadines	Developing economy
534	Sint Maarten (Dutch part)	Developing economy

239	South Georgia and South Sandwich Islands	Developing economy
740	Suriname	Developing economy
780	Trinidad and Tobago	Developing economy
796	Turks and Caicos Islands (the)	Developing economy
858	Uruguay	Developing economy
862	Venezuela (Bolivarian Republic of)	Developing economy
1230	Developing economies: Asia	Developing economy
004	Afghanistan	Developing economy
048	Bahrain	Developing economy
050	Bangladesh	Developing economy
064	Bhutan	Developing economy
096	Brunei Darussalam	Developing economy
116	Cambodia	Developing economy
156	China	Developing economy
344	Hong Kong	Developing economy
446	Macao	Developing economy
158	Taiwan (Province of China)	Developing economy
356	India	Developing economy
360	Indonesia	Developing economy
960	Indonesia (...2002)	Developing economy
364	Iran (Islamic Republic of)	Developing economy
368	Iraq	Developing economy

400	Jordan	Developing economy
408	Korea (the Democratic People's Republic of)	Developing economy
410	Korea (the Republic of)	Developing economy
414	Kuwait	Developing economy
418	Lao People's Democratic Republic (the)	Developing economy
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496	Mongolia	Developing economy
104	Myanmar	Developing economy
524	Nepal	Developing economy
512	Oman	Developing economy
586	Pakistan	Developing economy
608	Philippines (the)	Developing economy
634	Qatar	Developing economy
682	Saudi Arabia	Developing economy
702	Singapore	Developing economy
144	Sri Lanka	Developing economy
275	Palestine, State of	Developing economy
760	Syrian Arab Republic	Developing economy
764	Thailand	Developing economy
626	Timor-Leste	Developing economy

792	Turkey	Developing economy
784	United Arab Emirates (the)	Developing economy
704	Viet Nam	Developing economy
887	Yemen	Developing economy
886	Yemen, Arab Republic	Developing economy
720	Yemen, Democratic	Developing economy
1250	Developing economies: Oceania	Developing economy
016	American Samoa	Developing economy
184	Cook Islands (the)	Developing economy
242	Fiji	Developing economy
258	French Polynesia	Developing economy
316	Guam	Developing economy
296	Kiribati	Developing economy
584	Marshall Islands (the)	Developing economy
583	Micronesia (Federated States of)	Developing economy
520	Nauru	Developing economy
540	New Caledonia	Developing economy
570	Niue	Developing economy
580	Northern Mariana Islands (the)	Developing economy
582	Pacific Islands, Trust Territory	Developing economy
585	Palau	Developing economy
598	Papua New Guinea	Developing economy

612	Pitcairn	Developing economy
882	Samoa	Developing economy
090	Solomon Islands	Developing economy
772	Tokelau	Developing economy
776	Tonga	Developing economy
798	Tuvalu	Developing economy
581	United States Minor Outlying Islands	Developing economy
548	Vanuatu	Developing economy
876	Wallis and Futuna	Developing economy
1300	Transition economies	Transition economy
008	Albania	Transition economy
051	Armenia	Transition economy
031	Azerbaijan	Transition economy
112	Belarus	Transition economy
070	Bosnia and Herzegovina	Transition economy
268	Georgia	Transition economy
398	Kazakhstan	Transition economy
417	Kyrgyzstan	Transition economy
498	Moldova (the Republic of)	Transition economy
499	Montenegro	Transition economy
807	Macedonia (the former Yugoslav Republic of)	Transition economy
643	Russian Federation (the)	Transition economy

688	Serbia	Transition economy
891	Serbia and Montenegro	Transition economy
762	Tajikistan	Transition economy
795	Turkmenistan	Transition economy
804	Ukraine	Transition economy
810	Union of Soviet Socialist Republics	Transition economy
860	Uzbekistan	Transition economy
890	Yugoslavia, Soc. Fed. Rep. of	Transition economy
1100	Developed economies	Developed economy
1120	Developed economies: America	Developed economy
060	Bermuda	Developed economy
124	Canada	Developed economy
304	Greenland	Developed economy
666	Saint Pierre and Miquelon	Developed economy
842	United States of America (the)	Developed economy
1130	Developed economies: Asia	Developed economy
376	Israel	Developed economy
392	Japan	Developed economy
1140	Developed economies: Europe	Developed economy
020	Andorra	Developed economy
040	Austria	Developed economy
056	Belgium	Developed economy

100	Bulgaria	Developed economy
191	Croatia	Developed economy
196	Cyprus	Developed economy
203	Czechia	Developed economy
200	Czech Republic (the)	Developed economy
	Slovakia	Developed economy
208	Denmark	Developed economy
233	Estonia	Developed economy
234	Faroe Islands	Developed economy
246	Finland	Developed economy
251	France	Developed economy
276	Germany	Developed economy
278	Germany, Democratic Republic of	Developed economy
280	Germany, Federal Republic of	Developed economy
292	Gibraltar	Developed economy
300	Greece	Developed economy
336	Holy See	Developed economy
348	Hungary	Developed economy
352	Iceland	Developed economy
372	United Kingdom of Great Britain and Northern Ireland (the)	Developed economy
	Ireland	Developed economy
380	Italy	Developed economy

428	Latvia	Developed economy
440	Lithuania	Developed economy
442	Luxembourg	Developed economy
470	Malta	Developed economy
528	Netherlands (the)	Developed economy
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620	Portugal	Developed economy
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674	San Marino	Developed economy
703	Slovakia	Developed economy
705	Slovenia	Developed economy
724	Spain	Developed economy
752	Sweden	Developed economy
757	Switzerland	Developed economy
	Liechtenstein	Developed economy
926	United Kingdom of Great Britain and Northern Ireland (the)	Developed economy
1150	Developed economies: Oceania	Developed economy
036	Australia	Developed economy
162	Christmas Island	Developed economy
166	Cocos (Keeling) Islands	Developed economy
334	Heard Island and McDonald Islands	Developed economy

554	New Zealand	Developed economy
574	Norfolk Island	Developed economy
1900	Other territories	Developed economy
080	British Antarctic Territory	Developed economy
0000u	World n.e.s.	Developed economy
	Guadeloupe	Unclassified
	Martinique	Unclassified
	Puerto Rico	Unclassified
	Réunion	Unclassified
	Swaziland	Unclassified
	Virgin Island (U.S.)	Unclassified

APPENDIX F: List of sources

List of sources extracted from NVIVO. More detail can be provided on request.

Document Name
05500_20120811_2012_A4_ODEP_IRAN,_Earthquakes,_11_August_2012.pdf
1208_irn_EL.pdf
1208_irn_LU.pdf
120814 Iran earthquake sitrep 2.pdf
120827 STL SitRep Iran Earthquake (1).pdf
40 Tonnes of Relief Supplies sent to Iran
After the earthquake in Tabriz~Iran~ humedica sends out team
Azerbaijan sends humanitarian convoy to Iran's quake-hit region - Iran (Islamic Republic of)
Ban saddened by loss of lives and destruction caused by earthquakes in Iran
Confusion Over How to Aid Iran Quake Victims (Published 2012)
Earthquake~ TSF offered its support to Iranian rescue effort - Iran (Islamic Republic of)
First Turkish package of emergency supplies at Customs Office - Iran (Islamic Republic of)
Full_Report_4331.pdf
German medical team to head for Iran's quake-ravaged region - Iran (Islamic Republic of)
Germany will send medical relief for Iran's earthquake victims - Iran (Islamic Republic of)
Humanitarian_Bulletin_en_July_Aug_2012.pdf
IB120812IRAN.pdf
IB130812IRAN.pdf
IB140812IRAN.pdf
IB160812IRAN.pdf
IB230812Iran.pdf
Information Bulletin n6 Iran EQ.pdf

Document Name
Information Bulletin n7_Iran_EQ.pdf
Information Bulletin n8_Iran_EQ.pdf
Iran accepts Switzerland’s offer of assistance - Iran (Islamic Republic of)
Iran government criticised over earthquake response - Iran (Islamic Republic of)
Iran_120819_Sitrep_3[1].pdf
iran_guidance_earthquake.pdf
iran_sitrep_12august2012.pdf
Iran's quake death toll may rise - Iran (Islamic Republic of)
IRI Veep~ Iran ready for accepting int’l contributions for quake victims - Iran (Islamic Republic of)
Japan dispatches emergency relief goods to the Islamic Republic of Iran in the wake of recent earthquakes - Iran (Islamic Republic of)
Japan provides emergency grant assistance for NW Iran quake - Iran (Islamic Republic of)
Powerful earthquake in NW Iran leaves 40 dead
President approves plan to double assistances for quake-stricken people~ minister - Iran (Islamic Republic of)
Red Crescent on the ground following earthquakes in north-west Iran - IFRC
Relief goods sent to Iran - Iran (Islamic Republic of)
ROK to Provide Iran with US$200,000 in Humanitarian Aid to Help Recover from Earthquake - Iran (Islamic Republic of)
SITREP_1_OCHA_Iran[1].pdf
Treasury Issues General License to Aid Iranian Earthquake Victims
Turkish rescue team in quake hit areas - Iran (Islamic Republic of)
Young Iranians Step Up With Their Own Quake Relief - Iran (Islamic Republic of)
Assistenza alla popolazione
Attività sanitarie
Caritas network responds to earthquake in central Italy - Italy

Document Name
Coordination during disasters saves lives
Earthquake Aftermath in Central Italy~ Order of Malta's Relief Corps on the Frontline of Rescue Operations
ECDM_20160824_Earthquake_Italy_FINAL.pdf
ECDM_20160831_ECHO_Italy_Earthquake.pdf
Forze in campo
Gestione macerie
IB_Italy_Earthquake_24082016.pdf
IB2_Italy_Earthquake_26082016.pdf
IB3_Italy_Earthquake_31082016.pdf
IB4_Italy_Earthquake_09092016.pdf
Italy Earthquake-HR-Sitrep1, 24Aug2016.pdf
ItalyEarthquake-HRSitrep2-25Aug2016.pdf
ItalyEarthquake-HRSitrep3-27Aug2016.pdf
Numbers of the earthquake in central italy
Satellite images reveal full extent of destruction following Italy's earthquake
Shelterbox and Rotary Clubs take action following earthquake in Italy - Italy
Situation Assessment Report-EQ Italy.pdf
Terremoto Italia centrale~ prime verifiche di agibilità sulle scuole - Dettaglio News
The Grand Hospitaller Visits the Earthquake Zone in Italy
Verifiche di agibilità
Viabilità
1770F8B2454F8A9AC1257852002F2AA5-Full_Report.pdf
289B1BF0F9F6B4C7C12578520045004D-Full_Report.pdf
36759EA56A0313EF85257851005EDEA4-Full_Report.pdf
3AB8E925C3E59EC18525785600603727-Full_Report.pdf
41DCF023F72BDF4B4925785400007FF5-Full_Report.pdf
48D68535E4A7DB5B4925785300096BB8-Full_Report.pdf
4B33972673993A14852578540055C1D4-Full_Report.pdf

Document Name
4BB617625CD25196492578560012 1D12-Full_Report.pdf
60C5286F730C9B6449257851004A922B-Full_Report.pdf
63BE97CD840864C7492578540011B7AD-Full_Report.pdf
7464604E0923EEFE4925785300046E3C-Full_Report.pdf
8AFF4E4A0552080A49257858001DD74F-Full_Report.pdf
978774E55FAE228BC1257853004DCF31-Full_Report.pdf
AAR JAPAN embarked on delivering of emergency relief items to the victims of the earthquake and tsunami - Japan
Acceptance of an additional support team from the Republic of Korea - Japan
ACT pledges support to Japan - Japan
After Major Earthquake and Tsunami, International Medical Corps Deploys Emergency Response Team to Japan - Japan
AMDA Emergency Bulletin #1~ Japan Earthquake - Japan
AMDA Emergency Bulletin #2~ Japan Earthquake - Japan
At 00.00 MSK EMERCOM plane with relief aid left for Japan affected by the earthquake - Japan
B695CD6B9CF47956C12578540048D0D6-Full_Report.pdf
Cabinet grants fund and rice in aid of Japan - Japan
Canada Provides Relief Supplies to Japan - Japan
CARE Japan sends relief items to destroyed area - Japan
Caritas Japan responds to earthquake and tsunami - Japan
China delivers humanitarian assistance to Japan - Japan
Chinese rescue team arrives in Japan for quake relief - Japan
Current situation and the Government of Japan's response, March 16, 2011 - Japan
DA3A00733BE646FE492578550001BF09-Full_Report.pdf
DD1929FFF30D0136852578500063E88D-map.pdf
DDBF9EFE1D1A318449257855001BB83A-Full_Report.pdf
DED2C799732D6C53C12578530043E87F-Full_Report.pdf
Determined to help Japan - Japan

Document Name
Disaster lessons put to the test in Japanese response - Japan
EB319587637AF7EFC1257855003FD2F4-map.pdf
EE93048573B6C1CC852578510060018C-Full_Report.pdf
EMERCOM rescuers keep helping Japan. Relief aid being provided - Japan
EU ready to help Japan - Japan
F2F73E7F9C167D1685257856005FE54B-Full_Report.pdf
FCDAFF904C71870C852578500056C8EC-Full_Report.pdf
Foreign Office update - Japanese earthquake 12 March 2011 - Japan
Foreign Office update - Japanese earthquake 13 March 2011 - Japan
Foreign Office update - Japanese earthquake 14 March 2011 - Japan
FY 2011 HUMANITARIAN FUNDING PROVIDED TO JAPAN TO DATE
FY 2011 HUMANITARIAN FUNDING PROVIDED TO JAPAN TO DATE (2)
Group of EMERCOM rescuers arrived in Tokyo are already moving by cars to the epicenter of the disaster - Japan
International Rescue Corps team unable to join operation in Japan - Japan
ITU deploys satellite communication equipment in Japan - Japan
Japan 8.9 Earthquake~Tsunami~ TSF deployed - Japan
Japan quake~ Red Cross ~ Red Crescent family-links website - Japan
Japan~ Acceptance of a rescue team of Mexico - Japan
Japan~ Acceptance of a rescue team of Russia - Japan
Japan~ Acceptance of a rescue team of South Africa - Japan
Japan~ Acceptance of a team of rescue dogs from the Republic of Korea - Japan
Japan~ Acceptance of China's emergency rescue team - Japan
Japan~ Acceptance of emergency relief supplies from China - Japan
Japan~ Acceptance of Mongolia's emergency rescue team - Japan
Japan~ Acceptance of Relief Supplies from Canada - Japan
Japan~ Acceptance of Relief Supplies from the Kingdom of Thailand - Japan
Japan~ Acceptance of rescue teams of Australia and New Zealand - Japan

Document Name
Japan~ Acceptance of rescue teams of Germany and Switzerland - Japan
Japan~ Acceptance of Russia's Rescue Team (Second Dispatch) - Japan
Japan~ Acceptance of Singapore's rescue team - Japan
Japan~ Acceptance of USAID rescue teams including rescue dogs - Japan
Japan~ ADRA Continues Response in Tsunami Affected Region - Japan
Japan~ AmeriCares Identifying Immediate Medical Needs as Rescue Teams Search for Tsunami Survivors - Japan
Japan~ Arrival of a team of UNDAC - Japan
Japan~ Arrival of USAID rescue teams - Japan
Japan~ ASEAN Extends a Helping Hand in Hours of Need - Japan
Japan~ Extra Press Conference by the Defense Minister (11~24-11~46 A.M. March 16, 2011) - Japan
Japan~ Message from the Prime Minister, Sunday, March 13 at 7~50pm, 2011 - Japan
Japan~ Press Conference by the Chief Cabinet Secretary March 16, 2011 at 11~15am - Japan
Japan~ Press Conference by the Chief Cabinet Secretary Monday, March 14 at 09~03pm, 2011 - Japan
Japan~ Press Conference by the Chief Cabinet Secretary, March 17 at 11~30am, 2011 - Japan
Japan~ Reception of emergency relief supplies from India - Japan
Japan~ Red Cross Red Crescent Movement sets up website to reunite families affected by earthquake and tsunami - ICRC
Japan~ Red Cross responds to one of strongest earthquakes on record - Japan
Japan~ Rescue teams from the UK and France - Japan
Japan~ Significant needs in remote quake and tsunami-hit areas - Japan
Japan~ Transportation of emergency relief foods and materials to Kesennuma, Miyagi continues - Japan
Japan~ World Vision International declares partnership-wide response - Japan
Korea Dispatches Rescue Team to Japan - Japan

Document Name
Lanka offers assistance to tsunami-hit Japan - Japan
Maldives to provide 86,400 cans of tuna to Japanese quake victims - Japan
MapAction respond to Japanese emergency - Japan
Mercy Corps and Peace Winds Respond to Needs in Japan's Devastated Earthquake Zone - Japan
Mercy Corps Emergency Response Leader Heads for Japan's Earthquake Zone - Japan
MERCY Malaysia Deploys Team to Tokyo - Japan
Military Gears Up to Help Japan - Japan
Monaco's Fire Brigade detachment leaves for Japan - Japan
NDMA Search & Rescue Team & Field Hospital Ready to go to Japan - Japan
NRC experts deploy to Japan as part of US government response - Japan
NRC sends additional experts to assist Japan - Japan
null
OBI delivers large quantity of rice to devastated Rikuzen Takata, Japan - Japan
Operation Blessing International distributing clean water and food in hard hit Sendai, Japan - Japan
Operation Blessing International preparing to deploy medical team to Japan from Philippines office - Japan
Press Conference by the Chief Cabinet Secretary, Monday, March 14 at 05~15am, 2011 - Japan
Press Conference by the Chief Cabinet Secretary, Sunday, March 13 at 08~00pm, 2011 - Japan
PWJ Disaster Response Team together with Emergency Relief Foods and Materials Arrived in Kesennuma - Japan
Record Earthquake Strikes Japan~ ADRA Responds - Japan
Red Cross responds to massive earthquake and tsunami - IFRC
Rescuers deploy in Japan, no major U.N. aid planned - Japan
Save the Children Deploys Emergency Response Teams to Tsunami-Affected Areas in Japan - Japan

Document Name
SITUATION SUMMARY
Switzerland to send search and humanitarian assessment team to Japan - Japan
The 11 March Earthquake~ Japan to the Test - Japan
Timeline of Operation Tomodachi - The National Bureau of Asian Research (NBR)
Tzu Chi Foundation response to the Massive quake in Japan - Japan
UK to send search and rescue teams to Japan - Japan
UNOSAT supports crowd sourcing community with satellite imagery over Japan - Japan
UNOSAT works with Japan and UN agencies as tsunami spreads across the Pacific - Japan
Update on Disaster Relief Efforts in Japan - Japan
US Search and Rescue Teams Depart for Japan - Japan
USAID Responds Immediately to Japan Earthquake and Tsunami - Japan
What a Difference a Government Makes~ Japan's Earthquake - Japan
WHO Event Management Group activated for Japan earthquake response - Japan
[PRESS RELEASE]TSF sets up connections for coordination and humanitarian aid.pdf
02_iom_dtm_nepal_dashboard_displacement_sites_20150430_v2_0.pdf
04.25.15 - USAID-DCHA Nepal Earthquake Fact Sheet #1.pdf
04.27.15 - USAID-DCHA Nepal Earthquake Fact Sheet #2.pdf
04.28.15 - USAID-DCHA Nepal Earthquake Fact Sheet #3.pdf
04.29.15 - USAID-DCHA Nepal Earthquake Fact Sheet #3.pdf
04.30.15 - USAID-DCHA Nepal Earthquake Fact Sheet #5.pdf
05.01.15 - USAID-DCHA Nepal Earthquake Fact Sheet #6.pdf
05.03.15 - USAID-DCHA Nepal Earthquake Fact Sheet #7.pdf
05.04.15 - USAID-DCHA Nepal Earthquake Fact Sheet #8.pdf
150425_U_CDIR_NepalEarthquake.pdf
150426_U_CDIR_NepalEarthquake.pdf

Document Name
150427_U_CDIR_NepalEarthquake.pdf
150428_U_CDIR_NepalEarthquake.pdf
150429_U_CDIR_NepalEarthquake.pdf
150430_U_CDIR_NepalEarthquake.pdf
150501_U_CDIR_NepalEarthquake.pdf
150502_U_CDIR_NepalEarthquake.pdf
150503_U_CDIR_NepalEarthquake.pdf
150504_U_CDIR_NepalEarthquake.pdf
200848.pdf
200849.pdf
20150429 Humanity Road Special Report Crisismap (1).pdf
26 April USG Nepal.pdf
320,000 Children Homeless in Nepal - Nepal
6 - 01May15.pdf
8-member NGRI team leaves for Himalayas ~ India News - Times of India
A guide to disaster aid acronyms - Nepal
After serious earthquake in Nepal~ humedica sends helpers
Aid agencies pour into Nepal – and then what~
Aid organizations face challenges in rush to help Nepal
Alert 11_2015_Nepal_ Quake_25April2015.pdf
AMDA - AMDA will always be on the frontline as long as there is a life to be saved
AmeriCares Responds to Nepal Earthquake - Nepal
b-150425_acaps_briefing_note_nepal_earthquake.pdf
b-150426_acaps_briefing_note_nepal_earthquake_update.pdf
b-150427_acaps_briefing_note_nepal_earthquake_update2.pdf
b-acaps_briefing_note_nepal_earthquake_update3_-28-april-2015.pdf
Canada Supports Deployment of Canadian Red Cross
Canadian volunteers and Canadian donated medicines en route to Nepal

Document Name
CARE mobilizes to respond, appeals for funds after massive Nepal quake - Nepal
Catholic Relief Services Mobilizes Response to Nepal Earthquake - Nepal
Children in Nepal's rural areas are a priority for Plan - Nepal
DoD Sends Aircraft to Support Disaster-Assistance Operations in Nepal - Nepal
Earthquake in Nepal - Nepal
Earthquake in Nepal~ ~People are still looking for their relatives in the remains of their houses~ - Nepal
Earthquake in Nepal~ CECI on the Scene - Nepal
Earthquake in Nepal~ Switzerland provides additional response on the ground
Earthquake in Nepal~ Switzerland sends rapid response team to the disaster area - Nepal
Earthquake Response Operations Shift in Nepal - Nepal
ECHO Factsheet – 27 April 2015 – Nepal Earthquake - Nepal
Emergency Telecommunications Cluster
Emergency Telecommunications Cluster (2)
Emirates Red Crescent to provide urgent relief to Nepal - Nepal
EU emergency aid to survivors of Nepal earthquake
FAO Executive Brief _ Nepal Earthquake_30.04.15.pdf
Food Security Concerns in Nepal Grow as Demands Exceed In-Country Supply - Nepal
Habitat for Humanity removes earthquake rubble
Habitat for Humanity to assist those affected by Nepal earthquake - Nepal
hc-sitrep-1-26-april-2015.pdf
hc-sitrep-2-27-april-2015.pdf
hc-sitrep-3-28-april-2015.pdf
hc-sitrep-4-29-april-2015.pdf
Health concerns grow in Nepal quake camps
health-cluster-bulletin_040515.pdf
HumanityRoadNepalSitrep1Apr25.pdf

Document Name
HumanityRoadNepalSitrep5Apr29summary.pdf
HumanityRoadNepalSitrep5May3summary.pdf
HumanityRoadNepalSitrep7May1summary.pdf
India swings into action, rushes relief personnel, material to Nepal
Inside the logistics hub at Kathmandu's airport
IRCS mobilizes more relief.pdf
Ireland to provide €1 million in life-saving assistance in response to Nepal earthquake
Is it really time to call off search-and-rescue in Nepal~
Israel responds to earthquake in Nepal 25 Apr 2015
ITU deploys emergency communication equipment in Nepal
Joint Humanitarian Assistance Survey Team Deploys to Nepal from Kadena Air Base
Kathmandu, Staging Area Kathmandu, UN House
Khalifa Foundation to deliver urgent humanitarian assistance to the people of Nepal - Nepal
Launch of the HR.info space for Nepal Earthquake, April 2015 - Nepal
Life-Saving UNICEF Supplies Reach Nepal To Help 1.7 Million Children
logistics_cluster_nepal_conops_150426_0.pdf
logistics_cluster_nepal_conops_150504_final_0.pdf
logistics_cluster_nepal_earthquake_situation_update_150426_0-2.pdf
logistics_cluster_nepal_earthquake_situation_update_150427_0.pdf
logistics_cluster_nepal_earthquake_situation_update_150429_ls.pdf
logistics_cluster_nepal_earthquake_situation_update_150430.pdf
logistics_cluster_nepal_earthquake_situation_update_150501 (1).pdf
logistics_cluster_nepal_earthquake_situation_update_150502_final.pdf
logistics_cluster_nepal_earthquake_situation_update_150503_final (1).pdf
ma001_npl_eq_district_deaths_25April_300dpi.pdf.pdf
ma004_npl_eq_district_injuries_27April_300dpi.pdf.pdf
MA102_V01_Roads_Dhading_A3-300dpi.pdf.pdf

Document Name
MA103_V01_Roads_Gorkha_A3-300dpi.pdf.pdf
ma117_v02_humanitarianinfrastructure-300dpi.pdf
Major Earthquake Hits Nepal~ CRS and Caritas Mobilizing Response - Nepal
MDRNP008_OU1_020515.pdf
Mercy Malaysia responds to the earthquake in Nepal - Nepal
Mercy Relief brings emergency supplies to devastated village despite aftershocks
Mercy Relief deploys 1st disaster response team to ground zero in Nepal - Nepal
Mercy Relief Sends Medical Mission to Nepal - Nepal
MS_support_300415.pdf
NDMA Sends Relief to Earthquake Affected Areas - Nepal
Nearly 1 million children require urgent humanitarian assistance after Nepal earthquake - Nepal
Nearly Two Million Children Affected by Nepal Earthquake, as Save the Children Begins Aid Distribution
Nepal - Earthquake (29 April 2015) - Nepal
NEPAL EARTHQUAKE Factsheet 3 MAY 3 2015.pdf
Nepal - Lessons Learned
Nepal earthquake - Q & A - Nepal
Nepal Earthquake 2015 SitRep 04.pdf
NEPAL EARTHQUAKE FACT SHEET_APRIL 27 2015.pdf
Nepal Earthquake Response 2015
Nepal Earthquake Response 2015 - GlobalMedic
Nepal Earthquake Situation Report_03_26 April 2015.pdf
Nepal Earthquake UK aid response.pdf
Nepal Earthquake_Situation Report 3__4 May 2015.pdf
Nepal Earthquake~ CARE to Distribute Shelter and Hygiene Kits to Survivors in Remote Areas - Nepal

Document Name
Nepal Earthquake~ Direct Relief Commits Initial $50,000 Cash to Emergency Response
Nepal earthquake~ Heavy rains worsen humanitarian situation - Nepal
Nepal Earthquake~ IDP Shelter Location in Kathmandu
Nepal Earthquake~ Medair collaborates with partner agencies to deliver much needed relief - Nepal
Nepal Earthquake~ New appeal for children amid growing need - UNICEF - Nepal
Nepal earthquake~ Oil minister Dharmendra Pradhan visits border town
Nepal Earthquake~ Singapore Red Cross increases contribution to s$200,000 for immediate humanitarian relief - Nepal
Nepal earthquake~ the EU's emergency response - Nepal
Nepal Earthquake~ UNICEF-EU partnership airlifts emergency supplies - Nepal
Nepal Emergency - Nepal
Nepal scrambles in aftermath of quake
Nepal SitRep #6.pdf
Nepal SitRep #4.pdf
Nepal SitRep #5 REVISED.pdf
Nepal SitRep #7.pdf
Nepal SitRep #8.pdf
nepal_flash_appeal.pdf
Nepal_FMDA_040515.pdf
NEPAL_Infographic_(SR3)_270415.pdf
NEPAL_Infographic_(SR5)_290415.pdf
NEPAL_Infographic_(SR7)_010515.pdf
Nepal_Infographic_040515.pdf
Nepal_Snapshot_010515_Final.pdf
Nepal_Snapshot_040515.pdf
nepal_who_flash_appeal_26april2015.pdf

Document Name
Nepal~ MSF starts reaching people in remote mountain regions by helicopter and on foot following the earthquake ~ MSF
Nepal~ Red Cross on the front lines responding to massive quake - Nepal
Nepal~ Red Cross rushes help to quake affected population as needs escalate - IFRC
NPLeq26042105.pdf
OCHANepalEarthquakeSituationReportNo.10(4May2015).pdf
OCHANepalEarthquakeSituationReportNo.6(29April2015).pdf
OCHANepalEarthquakeSituationReportNo.7(30April2015).pdf
OCHANepalEarthquakeSituationReportNo.9(2May2015)_0.pdf
OCHANepalEarthquakeSituationReportNo8(1May2015).pdf
One week on and the earth is still shaking... - Nepal
Oxfam Emergencies Updates 2 to 30 April.pdf
Oxfam trucks in aid to Nepal by land for the first time from India
Press Release on Earthquake in Nepal 2015 - Nepal
Process of Relief Distribution (Embassy of Nepal, New Delhi) - Nepal
Project Hope deploys medical volunteers
Project HOPE Nepal SITREP 1 May 2015.pdf
Project HOPE Nepal SITREP 2 May 2015.pdf
Project HOPE Nepal SITREP 3 May 2015_4.pdf
REACH emergency deployment to Nepal
Rebuilding lives in Nepal through the power of radio - Nepal
Red Cross calls for greater urgency in relief efforts for Nepal earthquake survivors - Nepal
Relief to Severely Impacted Remote Villages Hampered by Inaccessibility, Adverse Weather Conditions - Nepal
Report_Nepal_26042015_vers_2-1.pdf
Responding to the Nepal Earthquake
Rural areas hard to access for assessment in Nepal

Document Name
Second Rescue & Relief Contingent Fly on SLAF C 130 to Nepal to Assist Earthquake Victims - Nepal
Sheikh Mohammed bin Rashid orders an air bridge of humanitarian aid to Nepal - Nepal
Sikh bodies to send food packets for Nepal quake victims - Nepal
SitRep 05_28 April 2015_0.pdf
SitRep 2- Nepal Earthquake.pdf
SitRep_25Apr2015.pdf
SitRep_26April2015_0.pdf
Situation Report~ Nepal ~ Operation USA
Status Update regarding Ushahidi Deployments for Nepal
Supporting Online Volunteer Response to the Nepal Earthquake
Thousands volunteer to scour satellite images of Nepal quake
TURKSAR-AFAD ISTANBUL
UAE renews solidarity with Quake-hit Nepal - Nepal
UAE sends SAR team to rescue survivors in Nepal's devastating quake - Nepal
UN responds to destruction, displacement in wake of Nepal earthquake
UNDAC Update on Nepal RW_28 April 2015 (1).pdf
UNICEF Nepal Earthquake - Infomation Note 25 April 2015.pdf
Update~ TSF on red alert following Nepal earthquake - Nepal
USAR_Snapshot_040515.pdf
'We've given up hope'~ Nepali villagers wait for the aid that never comes
WFP Delivers Emergency Aid in Nepal - Nepal
WFP_nepal_earthquake_release_1.pdf
wfp273989.pdf
wfp274325.pdf
WHO coordinating the health response to Nepal earthquake; working to prevent spread of disease - Nepal
WHO gives emergency health kits, funds to quake-hit Nepal - Nepal
WHO issues rapid health assessment on impact of Nepal earthquake - Nepal

Document Name
WHO sending in more medical supplies
WHO SITREP 8 - 3 May 2015.pdf
WHO works with partners to prevent diarrhoeal diseases - Nepal
WHO, health partners striving to treat quake survivors in Nepal’s remote regions - Nepal
who-sitrep5-30-april-2015.pdf
who-sitrep6-1-may-2015.pdf
who-sitrep7-2-may-2015.pdf
who-sitrep9-4-may-2015.pdf
Why Nepal response will be so hard
Why wasn't quake-prone Nepal better prepared~
· Silke Buhr, Regional Communications Officer silke.buhr@wfp.org

APPENDIX G: NVIVO coding and example of coding

More detail can be supplied on request.

List of sources

Document Type	Document Name	Codes	References	Modified on	Modified by	Classification
PDF	05500_20120811_2012_A4_ODEP_IRAN,_Earthquakes,_11_August_2012.pdf	3	4	2020/12/30 21:48	EM	Iran
PDF	1208_irn_EL.pdf	3	4	2020/12/30 21:48	EM	Iran
PDF	1208_irn_LU.pdf	3	4	2020/12/30 21:48	EM	Iran
PDF	120814 Iran earthquake sitrep 2.pdf	5	20	2020/12/30 21:48	EM	Iran
PDF	120827 STL SitRep Iran Earthquake (1).pdf	8	42	2020/12/30 21:48	EM	Iran
PDF	40 Tonnes of Relief Supplies sent to Iran	3	5	2020/12/30 21:48	EM	Iran
PDF	After the earthquake in Tabriz~Iran~ humedica sends out team	2	4	2020/12/30 21:48	EM	Iran
PDF	Azerbaijan sends humanitarian convoy to Iran's quake-hit region - Iran (Islamic Republic of)	3	6	2020/12/30 21:48	EM	Iran
PDF	Ban saddened by loss of lives and destruction caused by earthquakes in Iran	2	6	2020/12/30 21:48	EM	Iran

Document Type	Document Name	Codes	References	Modified on	Modified by	Classification
PDF	Confusion Over How to Aid Iran Quake Victims (Published 2012)	2	4	2020/12/30 21:48	EM	Iran
PDF	Earthquake~ TSF offered its support to Iranian rescue effort - Iran (Islamic Republic of)	4	7	2020/12/30 21:48	EM	Iran
PDF	First Turkish package of emergency supplies at Customs Office - Iran (Islamic Republic of)	4	7	2020/12/30 21:48	EM	Iran
PDF	Full_Report_4331.pdf	4	12	2020/12/30 21:48	EM	Iran
PDF	German medical team to head for Iran's quake-ravaged region - Iran (Islamic Republic of)	3	6	2020/12/30 21:48	EM	Iran
PDF	Germany will send medical relief for Iran's earthquake victims - Iran (Islamic Republic of)	3	8	2020/12/30 21:48	EM	Iran
PDF	Humanitarian_Bulletin_en_July_Aug_2012.pdf	5	20	2020/12/30 21:48	EM	Iran
PDF	IB120812IRAN.pdf	5	13	2020/12/30 21:48	EM	Iran
PDF	IB130812IRAN.pdf	5	10	2020/12/30 21:48	EM	Iran
PDF	IB140812IRAN.pdf	5	11	2020/12/30 21:48	EM	Iran
PDF	IB160812IRAN.pdf	5	13	2020/12/30 21:48	EM	Iran
PDF	IB230812Iran.pdf	5	15	2020/12/30 21:48	EM	Iran
PDF	Information Bulletin n6 Iran EQ.pdf	5	18	2020/12/30 21:48	EM	Iran

Document Type	Document Name	Codes	References	Modified on	Modified by	Classification
PDF	Information Bulletin n7_Iran_EQ.pdf	4	14	2020/12/30 21:48	EM	Iran
PDF	Information Bulletin n8_Iran_EQ.pdf	4	15	2020/12/30 21:48	EM	Iran
PDF	Iran accepts Switzerland’s offer of assistance - Iran (Islamic Republic of)	3	6	2020/12/30 21:48	EM	Iran
PDF	Iran government criticised over earthquake response - Iran (Islamic Republic of)	3	6	2020/12/30 21:48	EM	Iran
PDF	Iran_120819_Sitrep_3[1].pdf	5	23	2020/12/30 21:48	EM	Iran
PDF	iran_guidance_earthquake.pdf	2	4	2020/12/30 21:48	EM	Iran
PDF	iran_sitrep_12august2012.pdf	5	10	2020/12/30 21:48	EM	Iran
PDF	Iran's quake death toll may rise - Iran (Islamic Republic of)	6	11	2020/12/30 21:48	EM	Iran
PDF	IRI Veep~ Iran ready for accepting int’l contributions for quake victims - Iran (Islamic Republic of)	3	7	2020/12/30 21:48	EM	Iran
PDF	Japan dispatches emergency relief goods to the Islamic Republic of Iran in the wake of recent earthquakes - Iran (Islamic Republic of)	4	10	2020/12/30 21:48	EM	Iran
PDF	Japan provides emergency grant assistance for NW Iran quake - Iran (Islamic Republic of)	4	8	2020/12/30 21:48	EM	Iran
PDF	Powerful earthquake in NW Iran leaves 40 dead	2	6	2020/12/30 21:48	EM	Iran
PDF	President approves plan to double assistances for quake-stricken people~ minister - Iran (Islamic Republic of)	3	7	2020/12/30 21:48	EM	Iran

Document Type	Document Name	Codes	References	Modified on	Modified by	Classification
PDF	Red Crescent on the ground following earthquakes in north-west Iran - IFRC	4	9	2020/12/30 21:48	EM	Iran
PDF	Relief goods sent to Iran - Iran (Islamic Republic of)	3	6	2020/12/30 21:48	EM	Iran
PDF	ROK to Provide Iran with US$200,000 in Humanitarian Aid to Help Recover from Earthquake - Iran (Islamic Republic of)	3	6	2020/12/30 21:48	EM	Iran
PDF	SITREP_1_OCHA_Iran[1].pdf	5	19	2020/12/30 21:48	EM	Iran
PDF	Treasury Issues General License to Aid Iranian Earthquake Victims	2	4	2020/12/30 21:48	EM	Iran
PDF	Turkish rescue team in quake hit areas - Iran (Islamic Republic of)	3	7	2020/12/30 21:48	EM	Iran
PDF	Young Iranians Step Up With Their Own Quake Relief - Iran (Islamic Republic of)	4	14	2020/12/30 21:48	EM	Iran
PDF	Assistenza alla popolazione	3	4	2020/12/30 21:49	EM	Italy
PDF	Attività sanitarie	4	9	2020/12/30 21:49	EM	Italy
PDF	Caritas network responds to earthquake in central Italy - Italy	3	9	2020/12/30 21:49	EM	Italy
PDF	Coordination during disasters saves lives	4	9	2020/12/30 21:49	EM	Italy
PDF	Earthquake Aftermath in Central Italy~ Order of Malta’s Relief Corps on the Frontline of Rescue Operations	4	7	2020/12/30 21:49	EM	Italy
PDF	ECDM_20160824_Earthquake_Italy_FINAL.pdf	3	4	2020/12/30 21:49	EM	Italy

Document Type	Document Name	Codes	References	Modified on	Modified by	Classification
PDF	ECDM_20160831_ECHO_Italy_Earthquake.pdf	1	2	2020/12/30 21:49	EM	Italy
PDF	Forze in campo	5	8	2020/12/30 21:49	EM	Italy
PDF	Gestione macerie	4	5	2020/12/30 21:49	EM	Italy
PDF	IB_Italy_Earthquake_24082016.pdf	4	8	2020/12/30 21:49	EM	Italy
PDF	IB2_Italy_Earthquake_26082016.pdf	5	19	2020/12/30 21:49	EM	Italy
PDF	IB3_Italy_Earthquake_31082016.pdf	4	7	2020/12/30 21:49	EM	Italy
PDF	IB4_Italy_Earthquake_09092016.pdf	4	8	2020/12/30 21:49	EM	Italy
PDF	Italy Earthquake-HR-Sitrep1, 24Aug2016.pdf	5	18	2020/12/30 21:49	EM	Italy
PDF	ItalyEarthquake-HRSitrep2-25Aug2016.pdf	5	26	2020/12/30 21:49	EM	Italy
PDF	ItalyEarthquake-HRSitrep3-27Aug2016.pdf	5	14	2020/12/30 21:49	EM	Italy
PDF	Numbers of the earthquake in central italy	5	17	2020/12/30 21:49	EM	Italy
PDF	Satellite images reveal full extent of destruction following Italy’s earthquake	3	6	2020/12/30 21:49	EM	Italy
PDF	Shelterbox and Rotary Clubs take action following earthquake in Italy - Italy	4	7	2020/12/30 21:49	EM	Italy

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PDF	Situation Assessment Report-EQ Italy.pdf	3	16	2020/12/30 21:49	EM	Italy
PDF	Terremoto Italia centrale~ prime verifiche di agibilità sulle scuole - Dettaglio News	3	4	2020/12/30 21:49	EM	Italy
PDF	The Grand Hospitaller Visits the Earthquake Zone in Italy	4	6	2020/12/30 21:49	EM	Italy
PDF	Verifiche di agibilità	3	11	2020/12/30 21:49	EM	Italy
PDF	Viabilità	3	4	2020/12/30 21:49	EM	Italy
PDF	1770F8B2454F8A9AC1257852002F2AA5-Full_Report.pdf	6	43	2020/12/30 10:09	EM	Japan
PDF	289B1BF0F9F6B4C7C12578520045004D-Full_Report.pdf	6	15	2020/12/30 10:09	EM	Japan
PDF	36759EA56A0313EF85257851005EDEA4-Full_Report.pdf	4	6	2020/12/30 10:09	EM	Japan
PDF	3AB8E925C3E59EC18525785600603727-Full_Report.pdf	4	12	2020/12/30 10:09	EM	Japan
PDF	41DCF023F72BDF4B4925785400007FF5-Full_Report.pdf	5	11	2020/12/30 10:09	EM	Japan
PDF	48D68535E4A7DB5B4925785300096BB8-Full_Report.pdf	3	16	2020/12/30 10:09	EM	Japan
PDF	4B33972673993A14852578540055C1D4-Full_Report.pdf	5	14	2020/12/30 10:09	EM	Japan
PDF	4BB617625CD251964925785600121D12-Full_Report.pdf	7	103	2020/12/30 10:09	EM	Japan

Document Type	Document Name	Codes	References	Modified on	Modified by	Classification
PDF	60C5286F730C9B6449257851004A922B-Full_Report.pdf	3	7	2020/12/30 10:09	EM	Japan
PDF	63BE97CD840864C7492578540011B7AD-Full_Report.pdf	6	55	2020/12/30 10:09	EM	Japan
PDF	7464604E0923EEFE4925785300046E3C-Full_Report.pdf	6	9	2020/12/30 10:09	EM	Japan
PDF	8AFF4E4A0552080A49257858001DD74F-Full_Report.pdf	2	27	2020/12/30 10:09	EM	Japan
PDF	978774E55FAE228BC1257853004DCF31-Full_Report.pdf	4	5	2020/12/30 10:09	EM	Japan
PDF	AAR JAPAN embarked on delivering of emergency relief items to the victims of the earthquake and tsunami - Japan	3	6	2020/12/30 10:09	EM	Japan
PDF	Acceptance of an additional support team from the Republic of Korea - Japan	4	7	2020/12/30 10:09	EM	Japan
PDF	ACT pledges support to Japan - Japan	2	7	2020/12/30 10:09	EM	Japan
PDF	After Major Earthquake and Tsunami, International Medical Corps Deploys Emergency Response Team to Japan - Japan	3	7	2020/12/30 10:09	EM	Japan
PDF	AMDA Emergency Bulletin #1~ Japan Earthquake - Japan	3	7	2020/12/30 10:09	EM	Japan
PDF	AMDA Emergency Bulletin #2~ Japan Earthquake - Japan	3	7	2020/12/30 10:09	EM	Japan
PDF	At 00.00 MSK EMERCOM plane with relief aid left for Japan affected by the earthquake - Japan	4	7	2020/12/30 10:09	EM	Japan
PDF	B695CD6B9CF47956C12578540048D0D6-Full_Report.pdf	4	10	2020/12/30 10:09	EM	Japan

Document Type	Document Name	Codes	References	Modified on	Modified by	Classification
PDF	Cabinet grants fund and rice in aid of Japan - Japan	3	6	2020/12/30 10:09	EM	Japan
PDF	Canada Provides Relief Supplies to Japan - Japan	4	8	2020/12/30 10:09	EM	Japan
PDF	CARE Japan sends relief items to destroyed area - Japan	4	10	2020/12/30 10:09	EM	Japan
PDF	Caritas Japan responds to earthquake and tsunami - Japan	2	5	2020/12/30 10:09	EM	Japan
PDF	China delivers humanitarian assistance to Japan - Japan	4	7	2020/12/30 10:09	EM	Japan
PDF	Chinese rescue team arrives in Japan for quake relief - Japan	3	6	2020/12/30 10:09	EM	Japan
PDF	Current situation and the Government of Japan's response, March 16, 2011 - Japan	3	8	2020/12/30 10:09	EM	Japan
PDF	DA3A00733BE646FE492578550001BF09-Full_Report.pdf	4	9	2020/12/30 10:09	EM	Japan
PDF	DD1929FFF30D0136852578500063E88D-map.pdf	2	3	2020/12/30 10:09	EM	Japan
PDF	DDBF9EFE1D1A318449257855001BB83A-Full_Report.pdf	5	11	2020/12/30 10:09	EM	Japan
PDF	DED2C799732D6C53C12578530043E87F-Full_Report.pdf	5	11	2020/12/30 10:09	EM	Japan
PDF	Determined to help Japan - Japan	3	6	2020/12/30 10:09	EM	Japan
PDF	Disaster lessons put to the test in Japanese response - Japan	3	9	2020/12/30 10:09	EM	Japan

Document Type	Document Name	Codes	References	Modified on	Modified by	Classification
PDF	EB319587637AF7EFC1257855003FD2F4-map.pdf	2	3	2020/12/30 10:09	EM	Japan
PDF	EE93048573B6C1CC852578510060018C-Full_Report.pdf	3	7	2020/12/30 10:09	EM	Japan
PDF	EMERCOM rescuers keep helping Japan. Relief aid being provided - Japan	3	6	2020/12/30 10:09	EM	Japan
PDF	EU ready to help Japan - Japan	3	7	2020/12/30 10:09	EM	Japan
PDF	F2F73E7F9C167D1685257856005FE54B-Full_Report.pdf	3	18	2020/12/30 10:09	EM	Japan
PDF	FCDAFF904C71870C852578500056C8EC-Full_Report.pdf	3	6	2020/12/30 10:09	EM	Japan
PDF	Foreign Office update - Japanese earthquake 12 March 2011 - Japan	4	9	2020/12/30 10:09	EM	Japan
PDF	Foreign Office update - Japanese earthquake 13 March 2011 - Japan	2	6	2020/12/30 10:09	EM	Japan
PDF	Foreign Office update - Japanese earthquake 14 March 2011 - Japan	2	7	2020/12/30 10:09	EM	Japan
PDF	FY 2011 HUMANITARIAN FUNDING PROVIDED TO JAPAN TO DATE	5	10	2020/12/30 10:09	EM	Japan
PDF	FY 2011 HUMANITARIAN FUNDING PROVIDED TO JAPAN TO DATE (2)	4	8	2020/12/30 10:09	EM	Japan
PDF	Group of EMERCOM rescuers arrived in Tokyo are already moving by cars to the epicenter of the disaster - Japan	3	7	2020/12/30 10:09	EM	Japan
PDF	International Rescue Corps team unable to join operation in Japan - Japan	3	6	2020/12/30 10:09	EM	Japan

Document Type	Document Name	Codes	References	Modified on	Modified by	Classification
PDF	ITU deploys satellite communication equipment in Japan - Japan	4	8	2020/12/30 10:09	EM	Japan
PDF	Japan 8.9 Earthquake~Tsunami~ TSF deployed - Japan	4	8	2020/12/30 10:09	EM	Japan
PDF	Japan quake~ Red Cross ~ Red Crescent family-links website - Japan	3	6	2020/12/30 10:09	EM	Japan
PDF	Japan~ Acceptance of a rescue team of Mexico - Japan	5	8	2020/12/30 10:09	EM	Japan
PDF	Japan~ Acceptance of a rescue team of Russia - Japan	4	7	2020/12/30 10:09	EM	Japan
PDF	Japan~ Acceptance of a rescue team of South Africa - Japan	4	7	2020/12/30 10:09	EM	Japan
PDF	Japan~ Acceptance of a team of rescue dogs from the Republic of Korea - Japan	4	7	2020/12/30 10:09	EM	Japan
PDF	Japan~ Acceptance of China's emergency rescue team - Japan	4	7	2020/12/30 10:09	EM	Japan
PDF	Japan~ Acceptance of emergency relief supplies from China - Japan	4	7	2020/12/30 10:09	EM	Japan
PDF	Japan~ Acceptance of Mongolia's emergency rescue team - Japan	4	7	2020/12/30 10:09	EM	Japan
PDF	Japan~ Acceptance of Relief Supplies from Canada - Japan	4	7	2020/12/30 10:09	EM	Japan
PDF	Japan~ Acceptance of Relief Supplies from the Kingdom of Thailand - Japan	4	7	2020/12/30 10:09	EM	Japan
PDF	Japan~ Acceptance of rescue teams of Australia and New Zealand - Japan	4	7	2020/12/30 10:09	EM	Japan

Document Type	Document Name	Codes	References	Modified on	Modified by	Classification
PDF	Japan~ Acceptance of rescue teams of Germany and Switzerland - Japan	4	7	2020/12/30 10:09	EM	Japan
PDF	Japan~ Acceptance of Russia's Rescue Team (Second Dispatch) - Japan	4	7	2020/12/30 10:09	EM	Japan
PDF	Japan~ Acceptance of Singapore's rescue team - Japan	4	7	2020/12/30 10:09	EM	Japan
PDF	Japan~ Acceptance of USAID rescue teams including rescue dogs - Japan	4	7	2020/12/30 10:09	EM	Japan
PDF	Japan~ ADRA Continues Response in Tsunami Affected Region - Japan	4	8	2020/12/30 10:09	EM	Japan
PDF	Japan~ AmeriCares Identifying Immediate Medical Needs as Rescue Teams Search for Tsunami Survivors - Japan	4	8	2020/12/30 10:09	EM	Japan
PDF	Japan~ Arrival of a team of UNDAC - Japan	3	6	2020/12/30 10:09	EM	Japan
PDF	Japan~ Arrival of USAID rescue teams - Japan	3	6	2020/12/30 10:09	EM	Japan
PDF	Japan~ ASEAN Extends a Helping Hand in Hours of Need - Japan	4	8	2020/12/30 10:09	EM	Japan
PDF	Japan~ Extra Press Conference by the Defense Minister (11~24-11~46 A.M. March 16, 2011) - Japan	3	8	2020/12/30 10:09	EM	Japan
PDF	Japan~ Message from the Prime Minister, Sunday, March 13 at 7~50pm, 2011 - Japan	4	8	2020/12/30 10:09	EM	Japan
PDF	Japan~ Press Conference by the Chief Cabinet Secretary March 16, 2011 at 11~15am - Japan	2	6	2020/12/30 10:09	EM	Japan
PDF	Japan~ Press Conference by the Chief Cabinet Secretary Monday, March 14 at 09~03pm, 2011 - Japan	4	8	2020/12/30 10:09	EM	Japan

Document Type	Document Name	Codes	References	Modified on	Modified by	Classification
PDF	Japan~ Press Conference by the Chief Cabinet Secretary, March 17 at 11~30am, 2011 - Japan	5	9	2020/12/30 10:09	EM	Japan
PDF	Japan~ Reception of emergency relief supplies from India - Japan	4	7	2020/12/30 10:09	EM	Japan
PDF	Japan~ Red Cross Red Crescent Movement sets up website to reunite families affected by earthquake and tsunami - ICRC	2	4	2020/12/30 10:09	EM	Japan
PDF	Japan~ Red Cross responds to one of strongest earthquakes on record - Japan	4	9	2020/12/30 10:09	EM	Japan
PDF	Japan~ Rescue teams from the UK and France - Japan	4	7	2020/12/30 10:09	EM	Japan
PDF	Japan~ Significant needs in remote quake and tsunami-hit areas - Japan	4	7	2020/12/30 10:09	EM	Japan
PDF	Japan~ Transportation of emergency relief foods and materials to Kesennuma, Miyagi continues - Japan	3	6	2020/12/30 10:09	EM	Japan
PDF	Japan~ World Vision International declares partnership-wide response - Japan	3	7	2020/12/30 10:09	EM	Japan
PDF	Korea Dispatches Rescue Team to Japan - Japan	3	6	2020/12/30 10:09	EM	Japan
PDF	Lanka offers assistance to tsunami-hit Japan - Japan	3	6	2020/12/30 10:09	EM	Japan
PDF	Maldives to provide 86,400 cans of tuna to Japanese quake victims - Japan	3	7	2020/12/30 10:09	EM	Japan
PDF	MapAction respond to Japanese emergency - Japan	3	6	2020/12/30 10:09	EM	Japan
PDF	Mercy Corps and Peace Winds Respond to Needs in Japan's Devastated Earthquake Zone - Japan	4	8	2020/12/30 10:09	EM	Japan

Document Type	Document Name	Codes	References	Modified on	Modified by	Classification
PDF	Mercy Corps Emergency Response Leader Heads for Japan's Earthquake Zone - Japan	4	9	2020/12/30 10:09	EM	Japan
PDF	MERCY Malaysia Deploys Team to Tokyo - Japan	4	7	2020/12/30 10:09	EM	Japan
PDF	Military Gears Up to Help Japan - Japan	4	9	2020/12/30 10:09	EM	Japan
PDF	Monaco's Fire Brigade detachment leaves for Japan - Japan	3	6	2020/12/30 10:09	EM	Japan
PDF	NDMA Search & Rescue Team & Field Hospital Ready to go to Japan - Japan	4	7	2020/12/30 10:09	EM	Japan
PDF	NRC experts deploy to Japan as part of US government response - Japan	4	7	2020/12/30 10:09	EM	Japan
PDF	NRC sends additional experts to assist Japan - Japan	3	7	2020/12/30 10:09	EM	Japan
PDF	null	5	8	2020/12/30 10:09	EM	Japan
PDF	OBI delivers large quantity of rice to devastated Rikuzen Takata, Japan - Japan	4	8	2020/12/30 10:09	EM	Japan
PDF	Operation Blessing International distributing clean water and food in hard hit Sendai, Japan - Japan	4	8	2020/12/30 10:09	EM	Japan
PDF	Operation Blessing International preparing to deploy medical team to Japan from Philippines office - Japan	3	7	2020/12/30 10:09	EM	Japan
PDF	Press Conference by the Chief Cabinet Secretary, Monday, March 14 at 05~15am, 2011 - Japan	4	7	2020/12/30 10:09	EM	Japan
PDF	Press Conference by the Chief Cabinet Secretary, Sunday, March 13 at 08~00pm, 2011 - Japan	5	9	2020/12/30 10:09	EM	Japan

Document Type	Document Name	Codes	References	Modified on	Modified by	Classification
PDF	PWJ Disaster Response Team together with Emergency Relief Foods and Materials Arrived in Kesennuma - Japan	4	7	2020/12/30 10:09	EM	Japan
PDF	Record Earthquake Strikes Japan~ ADRA Responds - Japan	3	7	2020/12/30 10:09	EM	Japan
PDF	Red Cross responds to massive earthquake and tsunami - IFRC	4	10	2020/12/30 10:09	EM	Japan
PDF	Rescuers deploy in Japan, no major U.N. aid planned - Japan	3	6	2020/12/30 10:09	EM	Japan
PDF	Save the Children Deploys Emergency Response Teams to Tsunami-Affected Areas in Japan - Japan	3	7	2020/12/30 10:09	EM	Japan
PDF	SITUATION SUMMARY	3	7	2020/12/30 10:09	EM	Japan
PDF	Switzerland to send search and humanitarian assessment team to Japan - Japan	3	6	2020/12/30 10:09	EM	Japan
PDF	The 11 March Earthquake~ Japan to the Test - Japan	3	7	2020/12/30 10:09	EM	Japan
PDF	Timeline of Operation Tomodachi - The National Bureau of Asian Research (NBR)	3	24	2021/01/01 12:41	EM	Japan
PDF	Tzu Chi Foundation response to the Massive quake in Japan - Japan	4	7	2020/12/30 10:09	EM	Japan
PDF	UK to send search and rescue teams to Japan - Japan	4	7	2020/12/30 10:09	EM	Japan
PDF	UNOSAT supports crowd sourcing community with satellite imagery over Japan - Japan	3	7	2020/12/30 10:09	EM	Japan
PDF	UNOSAT works with Japan and UN agencies as tsunami spreads across the Pacific - Japan	3	6	2020/12/30 10:09	EM	Japan

Document Type	Document Name	Codes	References	Modified on	Modified by	Classification
PDF	Update on Disaster Relief Efforts in Japan - Japan	2	5	2020/12/30 10:09	EM	Japan
PDF	US Search and Rescue Teams Depart for Japan - Japan	3	6	2020/12/30 10:09	EM	Japan
PDF	USAID Responds Immediately to Japan Earthquake and Tsunami - Japan	3	6	2020/12/30 10:09	EM	Japan
PDF	What a Difference a Government Makes~ Japan's Earthquake - Japan	2	6	2020/12/30 10:09	EM	Japan
PDF	WHO Event Management Group activated for Japan earthquake response - Japan	3	6	2020/12/30 10:09	EM	Japan
PDF	[PRESS RELEASE]TSF sets up connections for coordination and humanitarian aid.pdf	4	9	2020/12/29 20:35	EM	Nepal
PDF	02_iom_dtm_nepal_dashboard_displacement_sites_20150430_v2_0.pdf	2	3	2020/12/29 20:35	EM	Nepal
PDF	04.25.15 - USAID-DCHA Nepal Earthquake Fact Sheet #1.pdf	5	16	2020/12/29 20:35	EM	Nepal
PDF	04.27.15 - USAID-DCHA Nepal Earthquake Fact Sheet #2.pdf	3	13	2020/12/29 20:35	EM	Nepal
PDF	04.28.15 - USAID-DCHA Nepal Earthquake Fact Sheet #3.pdf	5	17	2020/12/29 20:35	EM	Nepal
PDF	04.29.15 - USAID-DCHA Nepal Earthquake Fact Sheet #3.pdf	4	16	2020/12/29 20:35	EM	Nepal
PDF	04.30.15 - USAID-DCHA Nepal Earthquake Fact Sheet #5.pdf	4	10	2020/12/29 20:35	EM	Nepal
PDF	05.01.15 - USAID-DCHA Nepal Earthquake Fact Sheet #6.pdf	3	11	2020/12/29 20:35	EM	Nepal

Document Type	Document Name	Codes	References	Modified on	Modified by	Classification
PDF	05.03.15 - USAID-DCHA Nepal Earthquake Fact Sheet #7.pdf	3	11	2020/12/29 20:35	EM	Nepal
PDF	05.04.15 - USAID-DCHA Nepal Earthquake Fact Sheet #8.pdf	4	12	2020/12/29 20:35	EM	Nepal
PDF	150425_U_CDIR_NepalEarthquake.pdf	5	12	2020/12/29 20:35	EM	Nepal
PDF	150426_U_CDIR_NepalEarthquake.pdf	5	12	2020/12/29 20:35	EM	Nepal
PDF	150427_U_CDIR_NepalEarthquake.pdf	5	13	2020/12/29 20:35	EM	Nepal
PDF	150428_U_CDIR_NepalEarthquake.pdf	5	17	2020/12/29 20:35	EM	Nepal
PDF	150429_U_CDIR_NepalEarthquake.pdf	4	16	2020/12/29 20:35	EM	Nepal
PDF	150430_U_CDIR_NepalEarthquake.pdf	4	15	2020/12/29 20:35	EM	Nepal
PDF	150501_U_CDIR_NepalEarthquake.pdf	4	15	2020/12/29 20:35	EM	Nepal
PDF	150502_U_CDIR_NepalEarthquake.pdf	4	13	2020/12/29 20:35	EM	Nepal
PDF	150503_U_CDIR_NepalEarthquake.pdf	4	13	2020/12/29 20:35	EM	Nepal
PDF	150504_U_CDIR_NepalEarthquake.pdf	4	14	2020/12/29 20:35	EM	Nepal
PDF	200848.pdf	4	15	2020/12/29 20:35	EM	Nepal

Document Type	Document Name	Codes	References	Modified on	Modified by	Classification
PDF	200849.pdf	4	12	2020/12/29 20:35	EM	Nepal
PDF	20150429 Humanity Road Special Report Crisismap (1).pdf	4	7	2020/12/29 20:35	EM	Nepal
PDF	26 April USG Nepal.pdf	3	4	2020/12/29 20:35	EM	Nepal
PDF	320,000 Children Homeless in Nepal - Nepal	3	7	2020/12/29 20:35	EM	Nepal
PDF	6 - 01May15.pdf	5	10	2020/12/29 20:35	EM	Nepal
PDF	8-member NGRI team leaves for Himalayas ~ India News - Times of India	2	6	2020/12/29 20:35	EM	Nepal
PDF	A guide to disaster aid acronyms - Nepal	1	5	2020/12/29 20:35	EM	Nepal
PDF	After serious earthquake in Nepal~ humedica sends helpers	3	5	2020/12/29 20:35	EM	Nepal
PDF	Aid agencies pour into Nepal – and then what~	2	8	2020/12/29 20:35	EM	Nepal
PDF	Aid organizations face challenges in rush to help Nepal	3	7	2020/12/29 20:35	EM	Nepal
PDF	Alert 11_2015_Nepal_ Quake_25April2015.pdf	5	7	2020/12/29 20:35	EM	Nepal
PDF	AMDA - AMDA will always be on the frontline as long as there is a life to be saved	3	5	2020/12/29 20:35	EM	Nepal
PDF	AmeriCares Responds to Nepal Earthquake - Nepal	2	5	2020/12/29 20:35	EM	Nepal

Document Type	Document Name	Codes	References	Modified on	Modified by	Classification
PDF	b-150425_acaps_briefing_note_nepal_earthquake.pdf	3	8	2020/12/29 20:35	EM	Nepal
PDF	b-150426_acaps_briefing_note_nepal_earthquake_update.pdf	3	9	2020/12/29 20:35	EM	Nepal
PDF	b-150427_acaps_briefing_note_nepal_earthquake_update2.pdf	3	8	2020/12/29 20:35	EM	Nepal
PDF	b-acaps_briefing_note_nepal_earthquake_update3_-28-april-2015.pdf	3	7	2020/12/29 20:35	EM	Nepal
PDF	Canada Supports Deployment of Canadian Red Cross	3	7	2020/12/29 20:35	EM	Nepal
PDF	Canadian volunteers and Canadian donated medicines en route to Nepal	4	8	2020/12/29 20:35	EM	Nepal
PDF	CARE mobilizes to respond, appeals for funds after massive Nepal quake - Nepal	4	8	2020/12/29 20:35	EM	Nepal
PDF	Catholic Relief Services Mobilizes Response to Nepal Earthquake - Nepal	5	9	2020/12/29 20:35	EM	Nepal
PDF	Children in Nepal's rural areas are a priority for Plan - Nepal	4	8	2020/12/29 20:35	EM	Nepal
PDF	DoD Sends Aircraft to Support Disaster-Assistance Operations in Nepal - Nepal	4	7	2020/12/29 20:35	EM	Nepal
PDF	Earthquake in Nepal - Nepal	3	7	2020/12/29 20:35	EM	Nepal
PDF	Earthquake in Nepal~ ~People are still looking for their relatives in the remains of their houses~ - Nepal	3	7	2020/12/29 20:35	EM	Nepal
PDF	Earthquake in Nepal~ CECI on the Scene - Nepal	3	6	2020/12/29 20:35	EM	Nepal

Document Type	Document Name	Codes	References	Modified on	Modified by	Classification
PDF	Earthquake in Nepal~ Switzerland provides additional response on the ground	4	6	2020/12/29 20:35	EM	Nepal
PDF	Earthquake in Nepal~ Switzerland sends rapid response team to the disaster area - Nepal	3	6	2020/12/29 20:35	EM	Nepal
PDF	Earthquake Response Operations Shift in Nepal - Nepal	3	7	2020/12/29 20:35	EM	Nepal
PDF	ECHO Factsheet – 27 April 2015 – Nepal Earthquake - Nepal	3	6	2020/12/29 20:35	EM	Nepal
PDF	Emergency Telecommunications Cluster	4	8	2020/12/29 20:35	EM	Nepal
PDF	Emergency Telecommunications Cluster (2)	4	9	2020/12/29 20:35	EM	Nepal
PDF	Emirates Red Crescent to provide urgent relief to Nepal - Nepal	3	6	2020/12/29 20:35	EM	Nepal
PDF	EU emergency aid to survivors of Nepal earthquake	3	6	2020/12/29 20:35	EM	Nepal
PDF	FAO Executive Brief _ Nepal Earthquake_30.04.15.pdf	3	5	2020/12/29 20:35	EM	Nepal
PDF	Food Security Concerns in Nepal Grow as Demands Exceed In-Country Supply - Nepal	3	6	2020/12/29 20:35	EM	Nepal
PDF	Habitat for Humanity removes earthquake rubble	3	7	2020/12/29 20:35	EM	Nepal
PDF	Habitat for Humanity to assist those affected by Nepal earthquake - Nepal	3	6	2020/12/29 20:35	EM	Nepal
PDF	hc-sitrep-1-26-april-2015.pdf	4	11	2020/12/29 20:35	EM	Nepal

Document Type	Document Name	Codes	References	Modified on	Modified by	Classification
PDF	hc-sitrep-2-27-april-2015.pdf	4	10	2020/12/29 20:35	EM	Nepal
PDF	hc-sitrep-3-28-april-2015.pdf	4	15	2020/12/29 20:35	EM	Nepal
PDF	hc-sitrep-4-29-april-2015.pdf	4	6	2020/12/29 20:35	EM	Nepal
PDF	Health concerns grow in Nepal quake camps	4	8	2020/12/29 20:35	EM	Nepal
PDF	health-cluster-bulletin_040515.pdf	3	13	2020/12/29 20:35	EM	Nepal
PDF	HumanityRoadNepalSitrep1Apr25.pdf	2	6	2020/12/29 20:35	EM	Nepal
PDF	HumanityRoadNepalSitrep5Apr29summary.pdf	3	9	2020/12/29 20:35	EM	Nepal
PDF	HumanityRoadNepalSitrep5May3summary.pdf	2	8	2020/12/29 20:35	EM	Nepal
PDF	HumanityRoadNepalSitrep7May1summary.pdf	2	7	2020/12/29 20:35	EM	Nepal
PDF	India swings into action, rushes relief personnel, material to Nepal	3	7	2020/12/29 20:35	EM	Nepal
PDF	Inside the logistics hub at Kathmandu's airport	2	7	2020/12/29 20:35	EM	Nepal
PDF	IRCS mobilizes more relief.pdf	2	4	2020/12/29 20:35	EM	Nepal
PDF	Ireland to provide €1 million in life-saving assistance in response to Nepal earthquake	2	7	2020/12/29 20:35	EM	Nepal

Document Type	Document Name	Codes	References	Modified on	Modified by	Classification
PDF	Is it really time to call off search-and-rescue in Nepal~	2	7	2020/12/29 20:35	EM	Nepal
PDF	Israel responds to earthquake in Nepal 25 Apr 2015	3	8	2020/12/29 20:35	EM	Nepal
PDF	ITU deploys emergency communication equipment in Nepal	3	4	2020/12/29 20:35	EM	Nepal
PDF	Joint Humanitarian Assistance Survey Team Deploys to Nepal from Kadena Air Base	3	7	2020/12/29 20:35	EM	Nepal
PDF	Kathmandu, Staging Area Kathmandu, UN House	3	4	2020/12/29 20:35	EM	Nepal
PDF	Khalifa Foundation to deliver urgent humanitarian assistance to the people of Nepal - Nepal	4	7	2020/12/29 20:35	EM	Nepal
PDF	Launch of the HR.info space for Nepal Earthquake, April 2015 - Nepal	3	6	2020/12/29 20:35	EM	Nepal
PDF	Life-Saving UNICEF Supplies Reach Nepal To Help 1.7 Million Children	4	8	2020/12/29 20:35	EM	Nepal
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PDF	logistics_cluster_nepal_earthquake_situation_update_150426_0-2.pdf	4	6	2020/12/29 20:35	EM	Nepal
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Document Type	Document Name	Codes	References	Modified on	Modified by	Classification
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PDF	logistics_cluster_nepal_earthquake_situation_update_150501 (1).pdf	4	6	2020/12/29 20:35	EM	Nepal
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PDF	logistics_cluster_nepal_earthquake_situation_update_150503_final (1).pdf	4	7	2020/12/29 20:35	EM	Nepal
PDF	ma001_npl_eq_district_deaths_25April_300dpi.pdf.pdf	2	3	2020/12/29 20:35	EM	Nepal
PDF	ma004_npl_eq_district_injuries_27April_300dpi.pdf.pdf	2	3	2020/12/29 20:35	EM	Nepal
PDF	MA102_V01_Roads_Dhading_A3-300dpi.pdf.pdf	2	3	2020/12/29 20:35	EM	Nepal
PDF	MA103_V01_Roads_Gorkha_A3-300dpi.pdf.pdf	2	3	2020/12/29 20:35	EM	Nepal
PDF	ma117_v02_humanitarianinfrastructure-300dpi.pdf	2	3	2020/12/29 20:35	EM	Nepal
PDF	Major Earthquake Hits Nepal~ CRS and Caritas Mobilizing Response - Nepal	3	7	2020/12/29 20:35	EM	Nepal
PDF	MDRNP008_OU1_020515.pdf	5	22	2020/12/29 20:35	EM	Nepal
PDF	Mercy Malaysia responds to the earthquake in Nepal - Nepal	3	7	2020/12/29 20:35	EM	Nepal
PDF	Mercy Relief brings emergency supplies to devastated village despite aftershocks	3	7	2020/12/29 20:35	EM	Nepal

Document Type	Document Name	Codes	References	Modified on	Modified by	Classification
PDF	Mercy Relief deploys 1st disaster response team to ground zero in Nepal - Nepal	3	7	2020/12/29 20:35	EM	Nepal
PDF	Mercy Relief Sends Medical Mission to Nepal - Nepal	3	8	2020/12/29 20:35	EM	Nepal
PDF	MS_support_300415.pdf	4	5	2020/12/29 20:35	EM	Nepal
PDF	NDMA Sends Relief to Earthquake Affected Areas - Nepal	4	7	2020/12/29 20:35	EM	Nepal
PDF	Nearly 1 million children require urgent humanitarian assistance after Nepal earthquake - Nepal	4	8	2020/12/29 20:35	EM	Nepal
PDF	Nearly Two Million Children Affected by Nepal Earthquake, as Save the Children Begins Aid Distribution	4	8	2020/12/29 20:35	EM	Nepal
PDF	Nepal - Earthquake (29 April 2015) - Nepal	4	9	2020/12/29 20:35	EM	Nepal
PDF	NEPAL EARTHQUAKE Factsheet 3 MAY 3 2015.pdf	3	5	2020/12/29 20:35	EM	Nepal
PDF	Nepal - Lessons Learned	2	4	2020/12/29 20:35	EM	Nepal
PDF	Nepal earthquake - Q & A - Nepal	3	7	2020/12/29 20:35	EM	Nepal
PDF	Nepal Earthquake 2015 SitRep 04.pdf	4	10	2020/12/29 20:35	EM	Nepal
PDF	NEPAL EARTHQUAKE FACT SHEET_APRIL 27 2015.pdf	4	6	2020/12/29 20:35	EM	Nepal
PDF	Nepal Earthquake Response 2015	3	6	2020/12/29 20:35	EM	Nepal

Document Type	Document Name	Codes	References	Modified on	Modified by	Classification
PDF	Nepal Earthquake Response 2015 - GlobalMedic	4	15	2020/12/29 20:35	EM	Nepal
PDF	Nepal Earthquake Situation Report_03_26 April 2015.pdf	3	7	2020/12/29 20:35	EM	Nepal
PDF	Nepal Earthquake UK aid response.pdf	4	5	2020/12/29 20:35	EM	Nepal
PDF	Nepal Earthquake_Situation Report 3__4 May 2015.pdf	3	6	2020/12/29 20:35	EM	Nepal
PDF	Nepal Earthquake~ CARE to Distribute Shelter and Hygiene Kits to Survivors in Remote Areas - Nepal	4	8	2020/12/29 20:35	EM	Nepal
PDF	Nepal Earthquake~ Direct Relief Commits Initial $50,000 Cash to Emergency Response	3	11	2020/12/29 20:35	EM	Nepal
PDF	Nepal earthquake~ Heavy rains worsen humanitarian situation - Nepal	2	7	2020/12/29 20:35	EM	Nepal
PDF	Nepal Earthquake~ IDP Shelter Location in Kathmandu	1	2	2020/12/29 20:35	EM	Nepal
PDF	Nepal Earthquake~ Medair collaborates with partner agencies to deliver much needed relief - Nepal	4	8	2020/12/29 20:35	EM	Nepal
PDF	Nepal Earthquake~ New appeal for children amid growing need - UNICEF - Nepal	2	7	2020/12/29 20:35	EM	Nepal
PDF	Nepal earthquake~ Oil minister Dharmendra Pradhan visits border town	2	6	2020/12/29 20:35	EM	Nepal
PDF	Nepal Earthquake~ Singapore Red Cross increases contribution to s$200,000 for immediate humanitarian relief - Nepal	3	7	2020/12/29 20:35	EM	Nepal
PDF	Nepal earthquake~ the EU's emergency response - Nepal	3	7	2020/12/29 20:35	EM	Nepal

Document Type	Document Name	Codes	References	Modified on	Modified by	Classification
PDF	Nepal Earthquake~ UNICEF-EU partnership airlifts emergency supplies - Nepal	4	8	2020/12/29 20:35	EM	Nepal
PDF	Nepal Emergency - Nepal	4	7	2020/12/29 20:35	EM	Nepal
PDF	Nepal scrambles in aftermath of quake	4	9	2020/12/29 20:35	EM	Nepal
PDF	Nepal SitRep #6.pdf	4	7	2020/12/29 20:35	EM	Nepal
PDF	Nepal SitRep #4.pdf	4	8	2020/12/29 20:35	EM	Nepal
PDF	Nepal SitRep #5 REVISED.pdf	4	8	2020/12/29 20:35	EM	Nepal
PDF	Nepal SitRep #7.pdf	4	8	2020/12/29 20:35	EM	Nepal
PDF	Nepal SitRep #8.pdf	4	8	2020/12/29 20:35	EM	Nepal
PDF	nepal_flash_appeal.pdf	3	21	2020/12/29 20:35	EM	Nepal
PDF	Nepal_FMDA_040515.pdf	2	3	2020/12/29 20:35	EM	Nepal
PDF	NEPAL_Infographic_(SR3)_270415.pdf	4	5	2020/12/29 20:35	EM	Nepal
PDF	NEPAL_Infographic_(SR5)_290415.pdf	4	5	2020/12/29 20:35	EM	Nepal
PDF	NEPAL_Infographic_(SR7)_010515.pdf	4	5	2020/12/29 20:35	EM	Nepal

Document Type	Document Name	Codes	References	Modified on	Modified by	Classification
PDF	Nepal_Infographic_040515.pdf	4	5	2020/12/29 20:35	EM	Nepal
PDF	Nepal_Snapshot_010515_Final.pdf	3	4	2020/12/29 20:35	EM	Nepal
PDF	Nepal_Snapshot_040515.pdf	3	4	2020/12/29 20:35	EM	Nepal
PDF	nepal_who_flash_appeal_26april2015.pdf	3	5	2020/12/29 20:35	EM	Nepal
PDF	Nepal~ MSF starts reaching people in remote mountain regions by helicopter and on foot following the earthquake ~ MSF	4	9	2020/12/29 20:35	EM	Nepal
PDF	Nepal~ Red Cross on the front lines responding to massive quake - Nepal	4	9	2020/12/29 20:35	EM	Nepal
PDF	Nepal~ Red Cross rushes help to quake affected population as needs escalate - IFRC	3	7	2020/12/29 20:35	EM	Nepal
PDF	NPLeq26042105.pdf	4	11	2020/12/29 20:35	EM	Nepal
PDF	OCHANepalEarthquakeSituationReportNo.10(4May2015).pdf	5	13	2020/12/29 20:35	EM	Nepal
PDF	OCHANepalEarthquakeSituationReportNo.6(29April2015).pdf	5	12	2020/12/29 20:35	EM	Nepal
PDF	OCHANepalEarthquakeSituationReportNo.7(30April2015).pdf	5	14	2020/12/29 20:35	EM	Nepal
PDF	OCHANepalEarthquakeSituationReportNo.9(2May2015)_0.pdf	5	15	2020/12/29 20:35	EM	Nepal
PDF	OCHANepalEarthquakeSituationReportNo8(1May2015).pdf	5	14	2020/12/29 20:35	EM	Nepal

Document Type	Document Name	Codes	References	Modified on	Modified by	Classification
PDF	One week on and the earth is still shaking... - Nepal	2	6	2020/12/29 20:35	EM	Nepal
PDF	Oxfam Emergencies Updates 2 to 30 April.pdf	2	8	2020/12/29 20:35	EM	Nepal
PDF	Oxfam trucks in aid to Nepal by land for the first time from India	4	8	2020/12/29 20:35	EM	Nepal
PDF	Press Release on Earthquake in Nepal 2015 - Nepal	3	6	2020/12/29 20:35	EM	Nepal
PDF	Process of Relief Distribution (Embassy of Nepal, New Delhi) - Nepal	4	7	2020/12/29 20:35	EM	Nepal
PDF	Project Hope deploys medical volunteers	4	8	2020/12/29 20:35	EM	Nepal
PDF	Project HOPE Nepal SITREP 1 May 2015.pdf	3	6	2020/12/29 20:35	EM	Nepal
PDF	Project HOPE Nepal SITREP 2 May 2015.pdf	4	8	2020/12/29 20:35	EM	Nepal
PDF	Project HOPE Nepal SITREP 3 May 2015_4.pdf	3	6	2020/12/29 20:35	EM	Nepal
PDF	REACH emergency deployment to Nepal	3	5	2020/12/29 20:35	EM	Nepal
PDF	Rebuilding lives in Nepal through the power of radio - Nepal	2	6	2020/12/29 20:35	EM	Nepal
PDF	Red Cross calls for greater urgency in relief efforts for Nepal earthquake survivors - Nepal	4	9	2020/12/29 20:35	EM	Nepal
PDF	Relief to Severely Impacted Remote Villages Hampered by Inaccessibility, Adverse Weather Conditions - Nepal	3	6	2020/12/29 20:35	EM	Nepal

Document Type	Document Name	Codes	References	Modified on	Modified by	Classification
PDF	Report_Nepal_26042015_vers_2-1.pdf	3	13	2020/12/29 20:35	EM	Nepal
PDF	Responding to the Nepal Earthquake	3	13	2020/12/29 20:35	EM	Nepal
PDF	Rural areas hard to access for assessment in Nepal	2	5	2020/12/29 20:35	EM	Nepal
PDF	Second Rescue & Relief Contingent Fly on SLAF C 130 to Nepal to Assist Earthquake Victims - Nepal	3	6	2020/12/29 20:35	EM	Nepal
PDF	Sheikh Mohammed bin Rashid orders an air bridge of humanitarian aid to Nepal - Nepal	4	8	2020/12/29 20:35	EM	Nepal
PDF	Sikh bodies to send food packets for Nepal quake victims - Nepal	4	7	2020/12/29 20:35	EM	Nepal
PDF	SitRep 05_28 April 2015_0.pdf	4	15	2020/12/29 20:35	EM	Nepal
PDF	SitRep 2- Nepal Earthquake.pdf	3	7	2020/12/29 20:35	EM	Nepal
PDF	SitRep_25Apr2015.pdf	4	10	2020/12/29 20:35	EM	Nepal
PDF	SitRep_26April2015_0.pdf	4	10	2020/12/29 20:35	EM	Nepal
PDF	Situation Report~ Nepal ~ Operation USA	5	9	2020/12/29 20:35	EM	Nepal
PDF	Status Update regarding Ushahidi Deployments for Nepal	3	7	2020/12/29 20:35	EM	Nepal
PDF	Supporting Online Volunteer Response to the Nepal Earthquake	3	4	2020/12/29 20:35	EM	Nepal

Document Type	Document Name	Codes	References	Modified on	Modified by	Classification
PDF	Thousands volunteer to scour satellite images of Nepal quake	3	22	2020/12/29 20:35	EM	Nepal
PDF	TURKSAR-AFAD ISTANBUL	3	4	2020/12/29 20:35	EM	Nepal
PDF	UAE renews solidarity with Quake-hit Nepal - Nepal	3	7	2020/12/29 20:35	EM	Nepal
PDF	UAE sends SAR team to rescue survivors in Nepal's devastating quake - Nepal	3	7	2020/12/29 20:35	EM	Nepal
PDF	UN responds to destruction, displacement in wake of Nepal earthquake	3	8	2020/12/29 20:35	EM	Nepal
PDF	UNDAC Update on Nepal RW_28 April 2015 (1).pdf	3	5	2020/12/29 20:35	EM	Nepal
PDF	UNICEF Nepal Earthquake - Infomation Note 25 April 2015.pdf	3	6	2020/12/29 20:35	EM	Nepal
PDF	Update~ TSF on red alert following Nepal earthquake - Nepal	4	7	2020/12/29 20:35	EM	Nepal
PDF	USAR_Snapshot_040515.pdf	3	4	2020/12/29 20:35	EM	Nepal
PDF	'We've given up hope'~ Nepali villagers wait for the aid that never comes	2	6	2020/12/29 20:35	EM	Nepal
PDF	WFP Delivers Emergency Aid in Nepal - Nepal	3	7	2020/12/29 20:35	EM	Nepal
PDF	WFP_nepal_earthquake_release_1.pdf	3	7	2020/12/29 20:35	EM	Nepal
PDF	wfp273989.pdf	3	7	2020/12/29 20:35	EM	Nepal

Document Type	Document Name	Codes	References	Modified on	Modified by	Classification
PDF	wfp274325.pdf	3	13	2020/12/29 20:35	EM	Nepal
PDF	WHO coordinating the health response to Nepal earthquake; working to prevent spread of disease - Nepal	4	8	2020/12/29 20:35	EM	Nepal
PDF	WHO gives emergency health kits, funds to quake-hit Nepal - Nepal	3	7	2020/12/29 20:35	EM	Nepal
PDF	WHO issues rapid health assessment on impact of Nepal earthquake - Nepal	3	7	2020/12/29 20:35	EM	Nepal
PDF	WHO sending in more medical supplies	3	7	2020/12/29 20:35	EM	Nepal
PDF	WHO SITREP 8 - 3 May 2015.pdf	4	9	2020/12/29 20:35	EM	Nepal
PDF	WHO works with partners to prevent diarrhoeal diseases - Nepal	3	7	2020/12/29 20:35	EM	Nepal
PDF	WHO, health partners striving to treat quake survivors in Nepal’s remote regions - Nepal	3	7	2020/12/29 20:35	EM	Nepal
PDF	who-sitrep5-30-april-2015.pdf	4	7	2020/12/29 20:35	EM	Nepal
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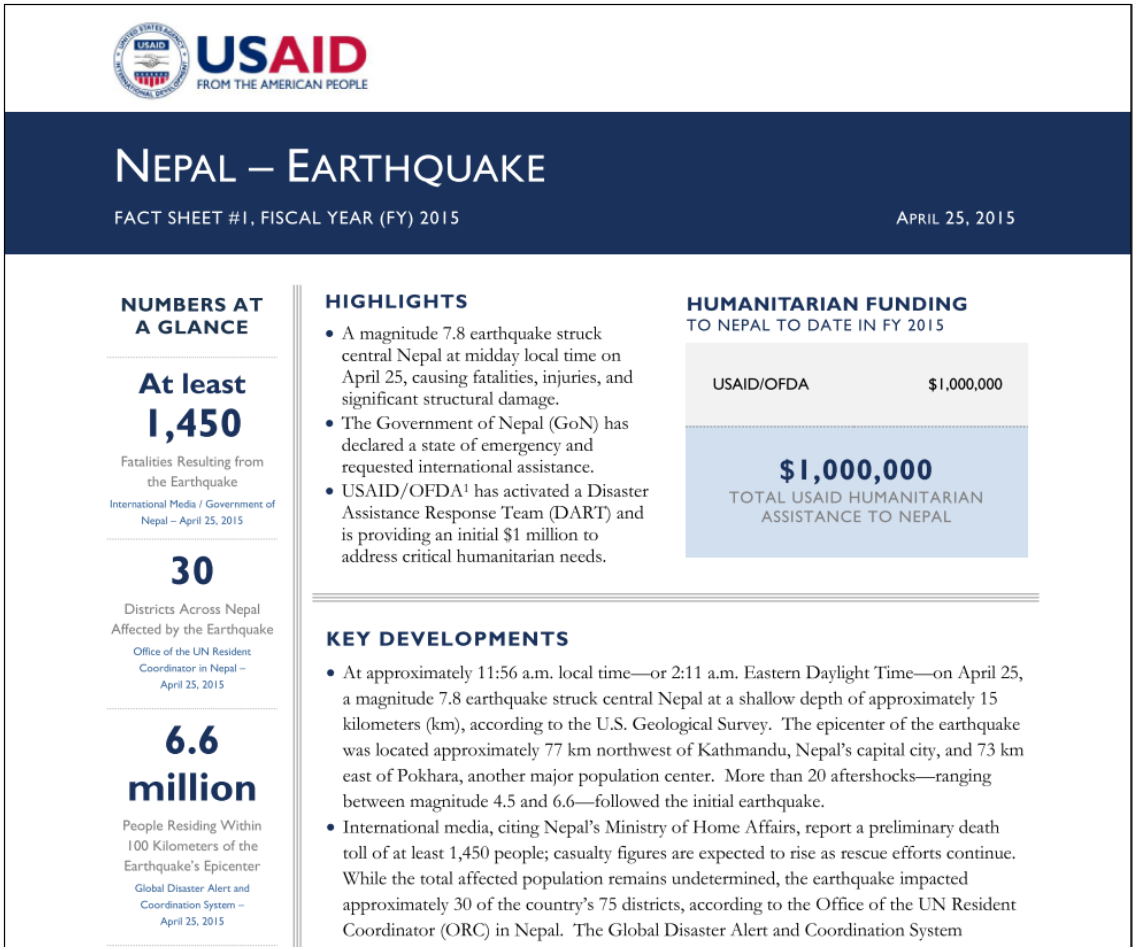
PDF	who-sitrep9-4-may-2015.pdf	4	7	2020/12/29 20:35	EM	Nepal
PDF	Why Nepal response will be so hard	3	9	2020/12/29 20:35	EM	Nepal

Document Type	Document Name	Codes	References	Modified on	Modified by	Classification
PDF	Why wasn't quake-prone Nepal better prepared~	2	8	2020/12/29 20:35	EM	Nepal
PDF	· Silke Buhr, Regional Communications Officer silke.buhr@wfp.org	3	6	2020/12/29 20:35	EM	Nepal

Example of NVIVO coding:



USAID
FROM THE AMERICAN PEOPLE

NEPAL – EARTHQUAKE

FACT SHEET #1, FISCAL YEAR (FY) 2015 — APRIL 25, 2015

NUMBERS AT A GLANCE

At least 1,450
Fatalities Resulting from the Earthquake
International Media / Government of Nepal – April 25, 2015

30
Districts Across Nepal Affected by the Earthquake
Office of the UN Resident Coordinator in Nepal – April 25, 2015

6.6 million
People Residing Within 100 Kilometers of the Earthquake's Epicenter
Global Disaster Alert and Coordination System – April 25, 2015

HIGHLIGHTS

- A magnitude 7.8 earthquake struck central Nepal at midday local time on April 25, causing fatalities, injuries, and significant structural damage.
- The Government of Nepal (GoN) has declared a state of emergency and requested international assistance.
- USAID/OFDA[1] has activated a Disaster Assistance Response Team (DART) and is providing an initial $1 million to address critical humanitarian needs.

HUMANITARIAN FUNDING TO NEPAL TO DATE IN FY 2015

USAID/OFDA	$1,000,000

$1,000,000
TOTAL USAID HUMANITARIAN ASSISTANCE TO NEPAL

KEY DEVELOPMENTS

- At approximately 11:56 a.m. local time—or 2:11 a.m. Eastern Daylight Time—on April 25, a magnitude 7.8 earthquake struck central Nepal at a shallow depth of approximately 15 kilometers (km), according to the U.S. Geological Survey. The epicenter of the earthquake was located approximately 77 km northwest of Kathmandu, Nepal's capital city, and 73 km east of Pokhara, another major population center. More than 20 aftershocks—ranging between magnitude 4.5 and 6.6—followed the initial earthquake.
- International media, citing Nepal's Ministry of Home Affairs, report a preliminary death toll of at least 1,450 people; casualty figures are expected to rise as rescue efforts continue. While the total affected population remains undetermined, the earthquake impacted approximately 30 of the country's 75 districts, according to the Office of the UN Resident Coordinator (ORC) in Nepal. The Global Disaster Alert and Coordination System

