MSc thesis in Engineering and Policy Analysis

The role of data and information sharing
when slow-onset natural disasters and conflict collide

Titia Kuipers
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510

AN INITIATIVE OF THE NETHERLANDS RED CROSS

The role of data and information sharing

When slow-onset natural disasters and conflict collide

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By

Titia Kuipers
Student number: 4149157
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Graduation Committee

Chair	:Prof. dr. B.A. (Bartel) van de Walle - Section Policy Analysis
First supervisor	:Dr. H.G. (Haiko) van der Voort - Section Organization and Governance
Second supervisor	:Dr. T. (Tina) Comes - Section Systems Engineering and Simulation
External supervisor	:Dr. M.J.C. (Marc) van den Homberg - 510, an initiative of the Netherlands Red Cross

Preface

Before you lies my thesis for obtaining the master's degree in Engineering and Policy Analysis at the faculty of Technology Policy and Management. This thesis is the result of months of hard work with many ups and many downs. Looking back, it was an incredible journey diving into the complex worlds of humanitarian response operations and peacekeeping missions. Even though writing a master thesis is predominantly a solitary occupation, I could not have done it alone. I would like to take this opportunity and thank everyone who helped me get to where I am today.

First of all, I am grateful to have Bartel van de Walle, Marc van den Homberg, Tina Comes and Haiko van der Voort as a guiding committee during the process of this research. Thank you for your enthusiasm and expertise throughout the process and challenging me to gather the diamonds and golden nuggets and make the most of my research.

Bartel van de Walle, thank you for inspiring me to explore the world of humanitarians. By sharing your experience within the field of humanitarian assistance. You sparked my interest by explaining that one of the reasons why humanitarian response was still so complicated was despite lots of data and information was being gathered; they lacked the tools and time to translate all of this into something useful and make sense of it. Something I as a technical student could and from then on wanted to contribute to. It has been a real pleasure to spar with you about the topic of this research.

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Haiko van der Voort, van der Voort, Haiko van der Voort! Special thank you for guiding me through this extremely exploratory process. I can't deny the many downs, but having you as a first supervisor has made me look back at an enjoyable journey, which you often referred to as Alice in Wonderland. Thank you for all those metaphors, hours talking, discussing, constructive feedback, new insights and ideas, for being a soundboard with whom I could share crazy observations, your sixth sense for knowing when to boost my confidence that I needed to pursue this research and challenging me to make the most out of it.

I also would like to thank the team of 510 for introducing me to the humanitarian sector. It is amazing to see that so many volunteers, graduate students and staff are continuously choosing to innovate in a sector where the primary beneficiaries are people in need. I remember the day after my first day in the office I had inexplicable muscle ache. It took me a while before I realized it was due to the planking! Thanks for all the random facts, interesting talks and laughs during lunch and the amazing new skill and ability to plank for at least 5 minutes.

Last but absolutely not least, I would like to thank my dear friends and family for all their support, advice, humor and reminding me of the important things in life. Jelle, from the deepest of my heart, thank you for always being there for me even from the other side of the world, for being the most incredible mental support and my all-time favorite distraction. Lastly, I would like to thank my brother Diederik and mother Micky for continuously stimulating me to keep on developing myself and for their unconditional support in all possible ways. Without them I don't know if I would have started my studies at the Delft University of Technology. I'm convinced that all the lessons I have learned during my years as a student, inside and outside the lecture halls will be of great value for the rest of my life.

Titia Kuipers
Delft, April 2019

Executive Summary

The frequency and severity of natural disasters is increasing worldwide, leading to a growing number of people struggling to survive (Hilhorst, 2013; UNISDR, 2009). While climate related natural disasters affect large portions of the world, communities who are already struggling to survive due to conflict, insecurity or poverty are hit the most (IFRC, 2018b). Without the ability to cope or adapt, the impact of a slow-onset natural disaster may force people to move to areas that are more exposed to hazards, making the impact of a disaster bigger and increasing the risk of violence and conflict. Climate related natural disasters have become an issue of international and national security, proliferated with terms as 'catalyzer', 'threat multiplier', 'exacerbating', 'hotspot' and 'tipping point', especially when natural disasters occur in places where conflict has already disrupted the lives of people (Smith & Vivekananda, 2007; Munslow & O'Dempsey, 2010; Ruttinger et al., 2015).

In fragile states, slowly unfolding natural disasters are getting more and more intertwined with conflict, due to a number of reasons such as climate change. In these areas, humanitarian and peacekeeping organizations have increasingly overlapping goals and scarce resources (Mockaitis, 2004; Pugh, 2001; Williams, 2005). Through the whole chain of humanitarian action, from preparedness and early warning to evaluation, information determines priorities, resource allocation and donor's willingness to fund (UN OCHA, 2014). However, humanitarian organizations often lack granular, timely information to know where the most vulnerable people are, what they need, where they move to due to conflicts and how safe certain areas are (Van den Homberg, 2018). In places where conflict has already disrupted the lives of people, peacekeepers are often present; assisting with regional stabilization and the acceleration of development (UN, 2017). Peacekeepers also collect a variety of information to gain insights into what is going on, so that they can intervene and contribute to the long-terms prevention of conflict and reduced human suffering (UNP, 2018).

In light of the changing risks of natural disasters and security, UN Secretary-General Guterres (2018) argues that it would make sense to strengthen the links between peacekeeping and humanitarian organizations. Sharing information between humanitarian and peacekeeping organizations can improve the effectiveness and efficiency of both humanitarian response operations and peacekeeping missions, which may result in not only saving time and money but most importantly saving lives and reducing human suffering. Nevertheless, the process of information sharing between humanitarian and peacekeeping organizations is not common practice.

> **'What are the main dilemmas humanitarian and peacekeeping organizations face when it comes to sharing information in fragile states that are prone to slow-onset natural disasters and conflict?'**

This research is conducted in collaboration with 510, the data initiative of the Netherlands Red Cross and the HumTechLab of the Delft University of Technology. Within the academic world, humanitarian - peacekeeping interaction is a relatively new field of research. As one of the first attempts to explore this field, this research makes use of an exploratory iterative design strategy to identify complexities of information sharing between humanitarian and peacekeeping organizations in fragile states that are prone to slow-onset natural disasters and conflict. The theoretical outcomes from desk research and literature reviews have been combined with findings from attending conferences and conducting interviews with both humanitarians and peacekeepers and System Dynamics modeling approach. Due to the exploratory nature of this research and to be able to conduct a more in-depth and detailed examination of the phenomenon, a case study on information sharing between the Red Cross Movement and Dutch peacekeepers that contribute to the MINUSMA peacekeeping mission

in Mali has been performed. With the case study, the theoretical findings from the first three sub-questions have been tested and expanded by answering the last sub-question.

Sub-question 1: 'In what way can the relationship between a slow-onset natural disaster and conflict and the role of information for humanitarian and peacekeeping organizations in a fragile state be conceptualized and modeled?'
With the help of desk research, literature review and a System dynamics modeling approach, findings suggest that in fragile states where coping strategies are limited, drought fueled food insecurity has an influence on conflict and conflict has an influence on food insecurity. In a fragile state the relationship can be seen as a vicious cycle of cause and effect wherein drought fueled food insecurity and conflict reinforce each other in a downward spiral; causing more and more human suffering. Improving food security can reduce tensions, contribute to a more stable environment and transform the vicious cycle of food insecurity and conflict in a virtuous cycle of food security and stability that reduces drivers of conflict.

Findings suggest that humanitarian food assistance can benefit people in need of food assistance and alleviate their suffering from food shortages. Information is vital in providing humanitarian assistance to the most vulnerable people and helps them recover. By sharing information with humanitarian organizations that aim to alleviate human suffering from food shortages, peacekeeping organizations may indirectly reach their own goals of reduced conflict. Analysis of the model behavior confirms a relationship between the availability of information through sharing information, food security and conflict: The sooner information is available, the sooner humanitarian food assistance can be provided which improves food security and can turn the vicious cycle of food insecurity and conflict into a virtuous cycle of food security and reduced conflict.
When humanitarian and peacekeeping organizations have common values, there is room for cooperation or coordination.

Sub-question 2: 'Which parties are involved in the humanitarian-peacekeeping data ecosystem and what are their roles, responsibilities and relationships?'
To help understand the relationships between humanitarian and peacekeeping organizations and how information exchange takes place, this sub-question consists of two parts: (1) involved parties and their mandates in humanitarian response operations and peacekeeping missions and (2) humanitarian-peacekeeping data ecosystem. Adopted from Oliveira and Lóscio's (2018) definition of a data ecosystem and Van den Homberg and Susha's (2018) definition of a humanitarian data ecosystem, a humanitarian-peacekeeping data ecosystem in a fragile state that is prone to both slow-onset natural disasters and conflict, consists of three components: (1) Information demanders and suppliers, (2) information demand and supply and (3) information sharing infrastructure.

Findings suggest that there is no single organization or entity that decides who does what and where, or who controls a humanitarian relief operation (Balcik et al., 2010). The large number of organizations, frameworks and coordination mechanisms between humanitarian organizations indicate an institutional fragmentation and fragmentation of responsibilities.
In contrast, findings suggest that peacekeeping missions are centralized with a clear line of authority. Findings suggest that peacekeeping missions are becoming increasingly multidimensional, comprising not only military forces, but also civilian personnel and are increasingly participating in humanitarian activities (Egnell, 2013; Foo, 2012). However, humanitarian and peacekeeping organizations often cover different geographical areas as peacekeepers are deployed to some of the most dangerous areas, protecting the most vulnerable people. Both peacekeepers and humanitarians might not be well informed or familiar with the activities of the other party. This may lead to prejudice and misunderstandings.

Findings suggest that planning a response to slow-onset natural disasters is done on a regular basis: early warning systems and the coordination of response give humanitarian organizations time to provide humanitarian assistance to the most vulnerable people in need (Hurt, 2011). To find the most vulnerable people, humanitarians need to go into the drought-affected areas, interview people and assess their needs (Van den Homberg, Monne & Spruit, 2016). Findings suggest that especially in conflict-affected areas information collection may be dangerous or not possible at all. Combined with limited local government data, not much use of Internet and limited information sharing, chances are that assessments are incomplete or unreliable, which subsequently affects accurate decision-making and may make the most vulnerable people even more vulnerable. When deployed to regions that are prone to conflict, peacekeeping organizations collect a lot of information to gain insight into what is going on, in order to intervene and contribute to the long-term prevention of conflict (UNP, 2018b).

Findings suggest that whenever there is room for cooperation or coordination and a 'humanitarian gap' is identified, humanitarian and peacekeeping organizations can turn to each other as a 'last resort' tool, to meet the needs of the affected population (De Coning & Friis, 2011; CCOE, 2018; UN OCHA, 2012a). There is however no common database where both peacekeepers and humanitarians can share their information. UN-CMCoord has been found to be an institutionalized structure where humanitarian and peacekeeping organizations can interact on neutral ground that does not put humanitarian principles at risk (UN OCHA, 2017). Information sharing between humanitarian and peacekeeping organizations happens at these organized meetings or during informal meetings. Findings suggest that this is a non-durable information sharing relationship, since both humanitarian and peacekeeping staff rotate frequently. Without any clear protocols or guidebooks that organize handovers, this causes institutional memory loss; information and personal relationships get lost when people leave (UN DPKO, 2012; Van de Walle & Comes, 2015).

Sub-question 3: 'What are possible institutional barriers for humanitarian and peacekeeping organizations to share information?'

Cooperation and coordination between humanitarian and peacekeeping organizations is complex due to numerous differences between the two institutions. In order to unravel what possible institutional barriers hinder information sharing between humanitarian and peacekeeping organizations, both institutions have been analyzed following Williamson's (2000) framework for institutional analysis and the proposed TOP-framework for barrier analysis.

Table 0.1: Overview of identified differences between humanitarian and peacekeeping organizations following Williamson's (2000) framework for institutional analysis and the TOP-framework for barrier analysis

	TECHNOLOGICAL BARRIER	ORGANIZATIONAL BARRIER	PROCESS BARRIER
Level one: Differences in informal rules of the game			
Motivations, goals and values		• Determined by the mission: to reduce human suffering worldwide, whatever the needs may be, on all sides of a conflict -- • Determined by the mission: political-related or national security-related objective, can be one-sided	
Principles		• Humanitarian principles of neutrality and impartiality, 'last resort' -- • Political and security objectives and therefore not neutrality	
Level three: Differences in governance and play of the game			
Organizational structure		• Flat -- • Hierarchical	• Decision more or less based on consensus --

			• Decisions follow a clear line of command and control
Information management tools	• Low-tech humanitarians in the field -- • High-tech peacekeepers	• Do no harm, data responsibility policy -- • Risk of over classification	
Data and information sharing (policies)	• No common database to share information	• No standardized information sharing policy • Peacekeepers can only officially share information if hierarchy allows this and it is certain that the information is declassified or downgraded	• Market-like structure of information sharing if it in in their best interest to do so, abiding the humanitarian principles
Ad hoc information sharing		•	• Fear and safety concerns • Institutional memory loss due to frequent rotation and lack of handover

Sub-Question 4: 'What are possibilities for humanitarian and peacekeeping organizations to share information in the case study on Mopti, Mali?'

Overcoming the identified technological, organizational and process barriers is not straightforward. Bearing in mind that humanitarian organizations will only share information abiding the humanitarian principles of neutrality and impartiality and peacekeeping organizations may only officially share data and information if it is declassified or downgraded. As each possibility may have undesirable effects, humanitarian and peacekeeping organizations clearly face a dilemma over sharing information (Figure 0.1).

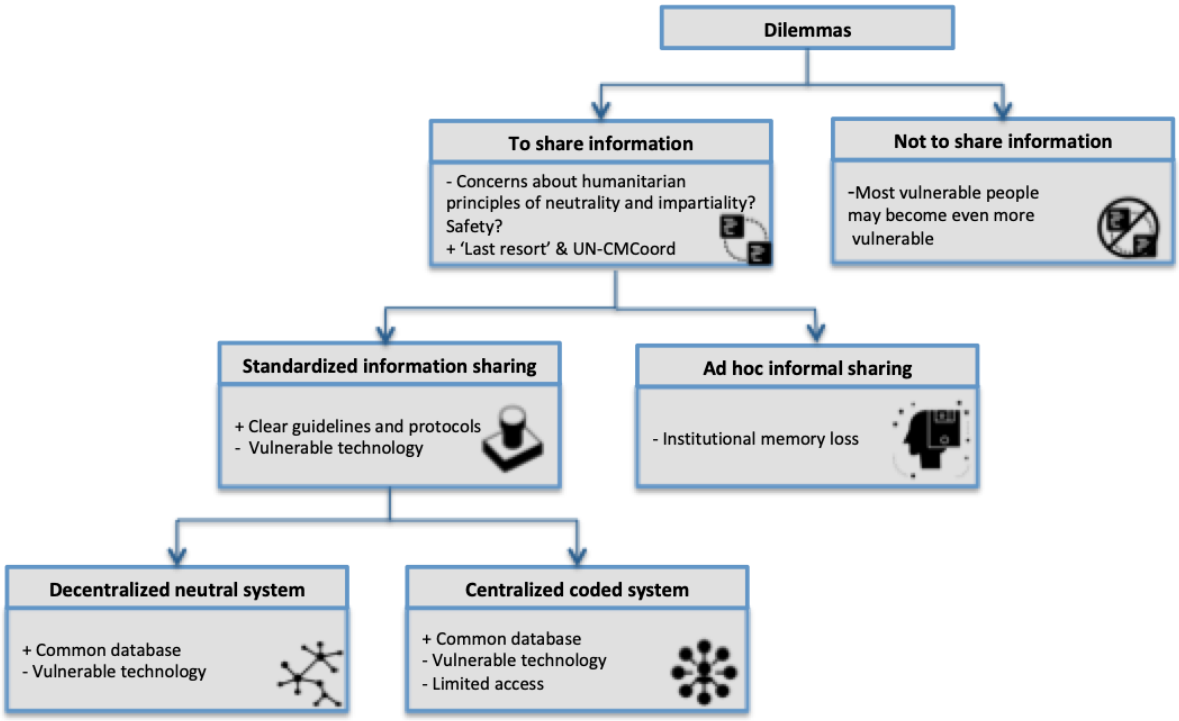

Figure 0.1 Main identified dilemmas humanitarian and peacekeeping organizations face when it comes to sharing information

When it comes to sharing information, there is always a risk of political deduction and abuse of information. Findings suggest that vulnerability of the technological solutions need to be considered. If shared information falls into the hands of malevolent groups, technological solutions may put at risk, the same people the humanitarians and peacekeepers seek to serve. It is recommended to further explore the institutional possibilities to share information. This can

be done by strengthening the current ad hoc way of information sharing, through the existing institutionalized UN-CMCoord meetings or by using the ‘last resort’ mechanism.

To strengthen ad hoc information sharing, make relationship longer lasting and reduce memory loss, it is advised that the internationally deployed humanitarians, as well as the CIMIC peacekeepers, who are responsible for civil-military cooperation, invest in handovers to their successors. This includes contact data or introducing their contact persons to them. For this to work, a level of trust is needed. The level of trust is closely aligned with the perceived risk of harm that information sharing could cause, either to the humanitarians, the affected people or the ability for the peacekeepers to accomplish their mission goals.

Findings suggest that humanitarian and peacekeeping organizations might not be well informed or familiar with the activities of the other party. To combat prejudice, misinterpretation and misunderstanding and build trust, training, education and exercises (before deployment) can be useful mechanisms to advocate a mindset change and to educate about the use of the ‘last resort’ tool and the UN-CMCoord meetings. UN OCHA Civil-Military Coordination Service (CMCS) (Chapter 4) is currently developing programs to train humanitarians and peacekeepers before deployment. It is advised that CMCS educates humanitarians and peacekeepers before deployment on the differences between the humanitarian and peacekeeping organizations, and include examples of humanitarian tasks peacekeepers fulfill in their mission. By including safety and threat assessment tools in the program, humanitarians may improve their safety assessments enabling them to adapt to each specific situation: in a bigger area, the social control may for example be big enough to interact safely with peacekeepers.

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List of Acronyms

ACLED	Armed Conflict Location & Event Data
AF	African Union
AFC	Analysis Fusion Cell
ASIFU	All Sources Information Fusion Unit
CAN	Community Alert Network
CCIR	Collection Coordination and Intelligence Requirements
CCOE	Civil-Military Cooperation Centre of Excellence
CILSS	Permanent Interstate Committee for Drought Control in the Sahel
CLD	Causal Loop Diagram
CMC	Civil-Military Cooperation
CMCS	Civil-Military Coordination Service
CMIM	Civil-Military Information Management
CMO	Civil-Military Operation
CP3	Community Epidemic and Pandemic Preparedness Program
CRED	Centre of Research on the Epidemiology of Disasters
CRM	Croix-Rouge Malienne
DPKO	Department of Peacekeeping Operations
DSRSG	Deputy Special Representative of the Secretary General
EM-DAT	Emergency Event Database
ERC	Emergency Relief Coordinator
EU	European Union
EUMETSAT	Exploitation of Meteorological Satellites
FAO	Food and Agriculture Organization
FSC	Global Food Security Cluster
GDPR	General Data Protection Plan
GFDRR	Global Facility for Disaster Reduction and Recovery
GPC	Global Protection Cluster
GSC	Global Security Cluster
GSDRC	Governance and Social Development Resource Centre
HC	Humanitarian Coordinator
HCT	Humanitarian Country Team
HDX	Humanitarian Data Exchange
HI	Human Intelligence
HNO	Humanitarian Needs Overview
HNPW	Humanitarian Networks and Partnerships Week
HOM	Head of Mission
HOT	Humanitarian OpenStreetMap
HPC	Humanitarian Program Cycle
HQ	Headquarter
HRO	Humanitarian response operation
HumTechLab	Humanitarian Technology Lab
IASC	Inter Agency Standing Committee
ICRC	International Committee of the Red Cross
IDMC	Internal Displacement Monitoring Centre
IDP	Internally displaced person
IFRC	International Federation of the Red Cross and Red Crescent Societies
IHL	International Humanitarian Law
IHRL	International Human Rights Law
IMC	Information Management Cycle
IMWG	Information Management Working Group
IOM	International Organization for Migration

IPC	Integrated Food Security and Humanitarian Phase Classification
IS	Information sharing
ISR-coy	Intelligence, Surveillance & Reconnaissance company
JMAC	Joint Mission Analysis Centre
JOC	Joint Operations Centre
MARCIMS	Marine Civil Information Management System
MFO	Multinational Force Observers
MIAP	Mission Intelligence Acquisition Plans
MINUSMA	Mission multidimensionnelle intégrée des National Unies pour la stabilisation au Mali
MIRA	Multi-cluster/sector initial rapid assessment
MoD	Ministry of Defence
MPIR	Mission Priority Information Requirements
NATO	North Atlantic Treaty Organization
NGO	Non-Governmental Organization
NLRC	The Netherlands Red Cross
NOAA	National Oceanic and Atmospheric Administration
PAX	Protection of Civilians
PfR	Partners for Resilience
PKM	Peacekeeping mission
RCC	Red Cross Climate Centre
RCRC Movement	Red Cross Red Crescent Movement
RPPII	Response Preparedness Program II
SAGE	Situational Awareness Geospatial Enterprise
SATIDA	Satellite Technologies for Improved Drought-Risk Assessment
SC	Security Council
SD	System Dynamics
SitRep	Humanitarian Situations Report
SRP	Situational Response Plans
SRSG	Special Representative of the Secretary-General
TITAAN	Theatre Independent Tactical Adaptive Armed Forces Network
TOP	Technology-Organization-Process
UN	United Nations
UN OCHA	United Nations Office for the Coordination of Humanitarian Affairs
UN-CMCoord	United Nations Civil-Military Cooperation
UN-SPIDER	United Nations platforms for Space-based Information for Disaster Management and Emergency Response
UNCT	United Nations Country Team
UNDP	United Nations Development Program
UNHCR	United Nations Higher Commissioner for Refugees
UNISDR	United Nations Office for Disaster Risk Reduction
UNOOSA	United Nations Office for Outer Space Affairs
USMC	United States Marine Corps
USSG	University Support Surge Group
Virtual OSOCC	Virtual On-Site Operations Coordination Centre
WFP	World Food Programme

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Introduction

The five basic needs for human survival everywhere in the world are the same; oxygen, water, food, shelter and sleep (Koltko-Rivera, 2006). Our entire society is primarily based on the existence and leveraging of these five elements. Without clean air, water, nutrients, shelter and sleep, none of us would survive on earth. Due to geography, geopolitics, climate, institutions and competition for resources, some regions in the world seem to be more prone to natural hazards than others, impacting these five basic needs for human survival.

Since 2000, the Centre of Research on the Epidemiology of Disasters' (CRED) Emergency Event Database (EM-DAT) recorded an annual average of 241 climate related natural disasters. That is an increase of 44% in 1994-2000 and double the number reported 20 years ago (CRED, 2015). As the frequency and severity of natural disasters is increasing worldwide, the number of people struggling to survive is growing due to the rising challenges in the sectors of water, transport & logistics, energy, agriculture and healthcare (Hilhorst, 2013; UNISDR, 2009). According to CRED, every year an average of 218 million people are affected by natural disasters (CRED, 2015) and 172 million are affected by conflict (CRED, 2014).

1.1. Slow-onset natural disasters and conflict

While climate related natural disasters affect large portions of the world, communities who are already struggling to survive due to conflict, insecurity or poverty are hit the most (IFRC, 2018b). Since the definition of a natural disaster is linked to society's response capacity (UNSD, 2008), state and social structures which are weakened by conflict, are less likely to be able to respond to the effects of a natural hazard, making it more likely that a natural disaster will occur, with an even bigger impact (Brooking, 2010). When a slow-onset natural disaster occurs in a fragile state, it can have severe negative impacts on the administration of that state and the already weak state capacity to provide assistance and services. The shock of extreme weather changes disproportionately affect vulnerable people due to their limited coping capacity (ISS, 2016). It decreases their ability to maintain livelihoods and sustain peaceful social relations. This creates a downward spiral of increased vulnerability to future disasters (UN OCHA, 2011). In these areas, climate related natural disasters have become an issue of international and national security, proliferated with terms as 'catalyzer', 'threat multiplier', 'exacerbating', 'hotspot' and 'tipping point', especially when natural disasters occur in places where conflict has already disrupted the lives of people (Smith & Vivekananda, 2007; Munslow & O'Dempsey, 2010; Ruttinger et al., 2015).

The link between slow-onset natural disasters and conflict may be mutually reinforcing. According to the Global Facility for Disaster Reduction and Recovery (GFDRR) (2016), there is growing evidence that people in fragile and conflict affected states are much more vulnerable to natural hazards. Natural disasters "contribute to conflict because they create competition for scarce resources, exacerbate inequality with the unequal distribution of aid, change power relationships between individuals, groups and the organizations that serve them, and create power vacuums and opportunities for warlords to usurp power" (Bhavnani, 2006, p.38). Without the ability to cope or adapt, the impact of a slow-onset natural disaster may force people to move to areas that are more exposed to hazards, making the impact of a disaster bigger and increasing the risk of violence and conflict. As seen in the Horn of Africa, climate change forced

people to move to less arid or drought-prone regions that are already inhabited by people with all the inherent consequences (AGI, 2017). People have always moved to places where they could find a better livelihood, either due to civil or climate related pressures. Meeting the challenge of human migration and dislocation due to either human pressures or pressures from nature, requires for the same five basic elements for human survival: clean air, water, food, shelter and sleep.

1.2. Humanitarian response operations

Humanitarian response operations are aimed at saving lives, alleviating human suffering and maintaining human dignity during and after a natural or man-made disaster occurs, and help strengthening and preparing for such situations in the future (Devint, 2017).

Humanitarian response is driven by data and information. Through the whole chain of humanitarian actions – from early warning to evaluation – information determines priorities, resource allocation and donors' willingness to fund (UN OCHA, 2014). Even though slowly unfolding natural disasters such as droughts may take months or years to develop and emerge gradually over time (Adamo, 2011) in fragile states, humanitarian organizations often lack accurate, granular and timely information, to know where the most vulnerable people are, what they need, where they flee to due to conflicts, how safe the affected areas are and safe access to them (Van den Homberg, Visser & Van der Veen, 2017). Collecting information in non-conflict situations is already a challenging process, and is expected to be even more complex (if possible at all) in conflict-affected areas. Information voids can lead to chaos, targeting the wrong areas, providing wrong relief items and unnecessary delays of humanitarian response times. Lack of information can also bias the distribution of aid with more resources going to areas where more information exists about (Haak, 2017). This may leave the most vulnerable communities with insufficient support exacerbating the risk of conflict. In their paper on information systems for humanitarian logistics, Comes and Van de Walle (2016) argue that to assure that humanitarian needs are addressed without wasting resources and duplication of efforts, cooperation and the coordination of information is crucial. Altay and Labonte (2014) state that there is a growing understanding of the critical role managing and sharing information can play in effective humanitarian response, coordination and decision-making. In their actions, humanitarian organizations are committed to adhere the humanitarian principles of humanity, neutrality, impartiality, and independence, which make information sharing with peacekeeping organizations difficult. However, according to the International Committee of the Red Cross, the international community recognizes that peacekeeping efforts can play a vital role in disaster response (ICRC, 2011).

1.3. Peacekeeping missions

In conflict-affected areas, activities of peacekeepers are aimed at helping host countries navigate their way through the difficult path from conflict to peace and stability and help prevent and address threats to international peace and security caused by such situations (UNP, 2018). In places where conflict has already disrupted the lives of people, peacekeepers are often present; assisting with regional stabilization and the acceleration of development (UN, 2017). To reduce human suffering, peacekeepers collect a variety information to gain insights into what is going on, so that they can intervene and contribute to the long-term prevention of conflict (UNP, 2018).

As conflict prevention, natural disasters, and disaster risk reduction are getting more and more intertwined, peacekeeping and humanitarian organizations have increasingly overlapping goals while resources in mission areas are scarce (Mockaitis, 2004; Pugh, 2001; Williams, 2005). In light of the changing risks of natural disasters and security, UN Secretary-General Guterres (2018) argues that it would makes sense to strengthen the links between peacekeeping and humanitarian organizations.

In the Dutch vision of a coherent commitment to security and stability in fragile states and conflict-affected areas, the importance of cooperation between humanitarian and peacekeeping organizations is stressed (Rijksoverheid, 2014). The 'Guideline Integrated Approach' notes that humanitarian organizations play an important role as a source of country specific insights on culture, norms and values; access to networks; meeting the needs of the population like no other; and to facilitating the dialogue between social groups and the government in conflict-affected areas. The guidelines however say nothing about information sharing between humanitarian and peacekeeping organizations.

1.4. Information sharing

Sharing information between humanitarian and peacekeeping organizations may increase the efficiency and effectiveness of humanitarian response operations and peacekeeping missions, which may result in not only saving time and money but most importantly saving lives and reducing human suffering.

Information that is being used for the coordination of actions of either humanitarian response operations or peacekeeping missions is intended for specific purposes. Yet, this same information can become a threat, endangering these same people, if not handled with care or falls in hand of malevolent groups (Van de Walle & Comes, 2015; CCOE, 2018). Especially in conflict-affected areas, data and information are sensitive, making it more difficult to share than it is in peace or in response to a slow-onset natural disaster in peacetime.

Despite the fact that coordination between humanitarian and peacekeeping organizations is difficult and even though information sharing between humanitarian and peacekeeping organizations is troublesome, there are clear indicators that information sharing is taking place. Past experiences of e.g. the 2010 floods in Pakistan demonstrated that a humanitarian-peacekeeping coordination and information sharing is possible and can be improved when relationships and roles are sorted out before a disaster strikes (Ferris, 2012). There are international guidelines and concepts in place on how peacekeepers and humanitarian entities should interact with each other, however these guidelines and concepts are not binding nor is it clear how they should be used (UN OCHA, 2013). Ferris (2012) argues that clarifying the function and role of information sharing beforehand with rules and institutions, may result in a better response. Nevertheless, information sharing between humanitarian and peacekeeping organizations is not a common practice.

1.5. Research objective

The goal of this research is to identify complexities of information sharing between humanitarian and peacekeeping organizations in fragile states that are prone to slow-onset natural disasters and conflict. In order to do so, this study will be performed from a system dynamics and institutional perspective.

Within the academic world, humanitarian - peacekeeping interaction is a relatively new field of research. Only recently, peacekeeping operations have evolved significantly from exclusively military forces to today's complex, multidimensional missions. So far, little research has been done on the interaction and information sharing between humanitarian and peacekeeping organizations. This research aims to fill that gap and therefore specifically focus on information sharing between humanitarian and peacekeeping organizations.

Several researchers within the field of organizational theory have highlighted that with inter-organizational information sharing, decision-making and overall performance improves (Kapacu, 2006; Kreps, 1990; Li et al., 2006; Simatupang & Sridharan, 2008; Sutcliffe, 2001). This research aims to contribute to this field with regards to the complexity of information sharing between humanitarian and peacekeeping organizations, compared to inter-organizational information sharing.

Within the field of institutional analysis, Williamson (2000) has made a framework to analyze complex institutions including the formal and informal rules and governance. To study the important institutional differences that may hinder information sharing between humanitarian and peacekeeping organizations, Williamson's (2000) framework for institutional analysis will be used. Van de Walle, Van den Eede and Muhren (2009) argue in their paper on humanitarian information management systems, that information sharing should not only be focused on formal, institutional information sharing, but also focus on the social aspect of information sharing. This research aims to tackle both.

This research is carried out to support 510, the data initiative of the Netherlands Red Cross, in collaboration with the Humanitarian Technology Lab (HumTechLab) at the Delft University of Technology. The HumTechLab brings together students, researchers and members of faculties who contribute their skills and expertise and aim to bring technology-driven, evidence-based solutions to humanitarian challenges (HumTechLab, 2019).
There is a huge potential to improve humanitarian response through better use of information. 510 aims to have global impact by providing new data driven solutions with new models and technologies to make humanitarian aid faster and more (cost) effective (510, 2018). By achieving this objective, this research can contribute to 510s aim to shape the future of humanitarian aid by creating understanding of the dilemmas of information sharing and putting it in the hands of humanitarian relief workers, decision makers and people affected, so that they can better prepare for and cope with disasters and crises.

1.6 Scope of research

The focus of this research is information sharing between humanitarian and peacekeeping organizations in fragile states that are prone to slow-onset natural disasters. The determined boundaries for this research are described as follows:

Red Cross

This research will be carried out for 510, the Netherlands Red Cross' data team.

The International Red Cross and Red Crescent Movement (RCRC Movement) is the largest humanitarian network in the world. A short overview of the Worldwide Red Cross is given below:

The RCRC Movement is a global movement that helps people who are facing disasters due to conflict, health and social issues (ICRC, 2018). This movement consists of different organizations worldwide.

The International Committee of the Red Cross (ICRC) is the lead agency to respond to victims of armed conflict and other situations of violence. The ICRC also responds to disasters in conflict-affected areas, as the effects of a disaster is intensified in conflict-affected zones. The ICRC helps people by providing water, healthcare, and protection of civilians, restoring links with family and helping detainees. The ICRC also works closely with the National RCRC Societies (ICRC, 2018).

The International Federation of the Red Cross and Red Crescent Societies (IFRC) is responsible for the preparation and response to disasters in non-conflict situations by coordinating and delivering humanitarian aid in the aftermath of disasters. The IFRC aims to improve the lives of vulnerable people by conducting relief operations in the response to a disaster, in combination with disaster

preparedness and capacity building programs. The IFRC works in close cooperation with National RCRC Societies (IFRC, 2018a).

The Netherlands Red Cross is one of the 190 National Red Cross and Red Crescent Societies present. Each national society relies on staff members and volunteers who provide several services such as supporting public authorities, mitigating human suffering through prevention, disaster relief, education, health and social welfare issues. They also support victims of natural and man-made disasters, supporting the ICRC and IFRC (ICRC, 2018).

Disaster type

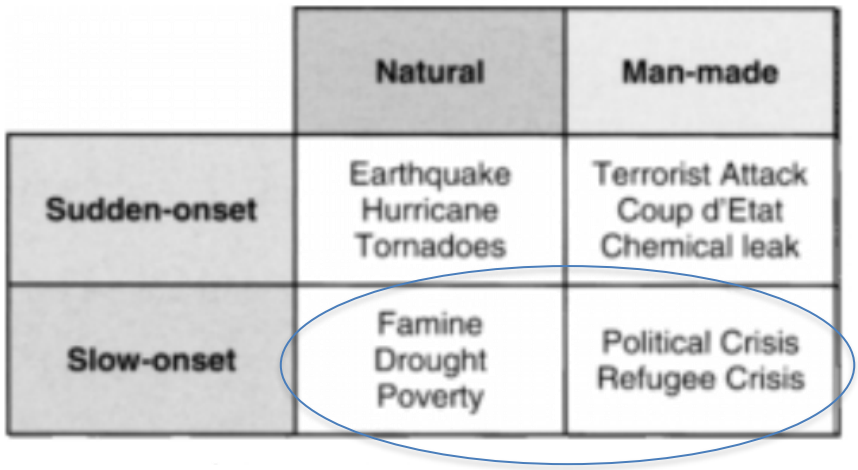


Figure 1.1. Types of disasters (Van Wassenhoven, 2006)

This research will focus on the interplay between slow-onset natural and disasters and conflict, as defined by Van Wassenhoven (2006), (Figure 1.1).

Natural Disaster

"*A natural disaster is an act of nature of such magnitude as to create a catastrophic situation in which the day-to-day patterns of life are suddenly disrupted and people are plunged into helplessness and suffering, and, as a result, need food, clothing, shelter, medical and nursing care and other necessities of life, and protection against unfavorable environmental factors and conditions*". "*It is an event which overwhelms local capacity, necessitating a request to the national or international level for external assistance; an unforeseen and often sudden event that causes great damage, destruction and human suffering*" (UNSD, 2008).

Slow-onset natural disaster

The United Nations Office for the Coordination of Humanitarian Affairs (UN OCHA) defines a slow-onset natural disaster as one that does not emerge from a single, distinct event, but as one that emerges gradually over time. It is therefore difficult to intervene at the right time (UN OCHA, 2011).

Drought and Food security

A drought is a period of unusually or unexpectedly low rainfall, which upsets the ecological balance; a condition in which the amount of water needed for transpiration and direct evaporation exceeds the amount available in the soil, in terms of water needs for particular crops growing under a specific combination of environmental conditions (UN OCHA, 2011).

Droughts have effects on people, their ways of life, crops, livestock, natural vegetation, wildlife, soil, population size and population redistribution.

“Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food for a healthy and active life” (World Food Summit Plan of Action, 1996: p.1). The term ‘famine’ implies a particularly extreme level of severity and suffering.

Slow-onset man-made disaster

Slow-onset man-made disasters or ‘complex emergencies’ in this context refer to disasters in conflict situations. In an interview with the TU Delft Global Initiative (2017), Prof. Van de Walle explained that “though natural disasters are complex enough in their own right, there is a clear common enemy”. A long period of drought for instance. “In complex disasters, other issues play a part too, such as strategic, military and security concerns”. Conflicts can cause large-scale movement of people, food shortages and hunger.

Slow-onset disaster phases

The timeline of a disaster consists of four sequential phases; preparedness, early warning & early action, disaster response and disaster recovery (510, 2018).
Preparedness is the phase where risk-reduction measures are taking in anticipation of a disaster event.
Early warning & early action is the phase where people know what to do as soon as a disaster strikes.
The disaster response phase is when a disaster has taken place and actions are needed to help the affected population in order to reduce human suffering.
Recovery is the phase that consists of community recovery and reconstruction. Along the whole disaster timeline, information is key to overcome a slow-onset disaster. Due to their nature, slow-onset crisis can be monitored, predicted and ideally prevented. This research will focus on all phases of the disaster cycle. 510 and the Red Cross Movement are involved in every step of the disaster timeline, however their activities are focused on the disaster preparedness and disaster response

Humanitarian response operation

Humanitarian response operations are determined to reduce human suffering worldwide, whatever the needs of the most vulnerable people may be, on all sides of a conflict (UN OCHA, 2016).

Peacekeeping missions

Peacekeeping missions and operations entail activities that intend to create conditions that foster lasting peace by monitoring and observing peace processes and assisting in the implementation of peace agreement commitments (DPKO, 2018). In doing so, peacekeepers perform different activities which include taking measures for confidence-building, arrangements for power sharing, electoral support, strengthening the rule of law and economic and social development. There are several organizations that implement

	peacekeeping missions, mainly; the United Nations (UN), North Atlantic Treaty Organization (NATO), the Multinational Force and Observers (MFO), European Union (EU), African Union (AU) and Nonviolent Peace force. This research will focus on United Nations peacekeeping operations. UN peacekeepers are often referred to as blue helmets and can include soldiers, police officers and civilian personnel (UNP, 2018a). Defense creates space for development and diplomacy.
Fragile state	A fragile state is a country characterized by a state with a weak capacity or weak state legitimacy, leaving citizens destitute and vulnerable to shocks (Pritchett & Woolcock, 2004; Romero, Sandefur & Sandholtz, 2017). Fragile states could be trapped in a vicious cycle of conflict and poverty, suffer from scarce natural resources, or face poor governance; many emerging from crisis and cannot provide even the most basic services to their citizens.
Data and Information 	*"An ounce of information is worth a pound of data. An ounce of knowledge is worth a pound of information. An ounce of understanding is worth a pound of knowledge."* Ackoff (1989). Communication of information occurs for many different reasons. In the scope of this research, the focus will be on information in order to make informed decisions. Information to influence others in order to change their behavior or to persuade others will not be taken into account. Information can be shared in two ways: through formal and informal communication. Formal communication is communication through institutionalized mechanisms. Informal communication is communication without prior verification from individual to individual.

1.7 Reading guide

This research is structured as follows: chapter 2 expands on the research framework, the main research question and sub-questions as well as the research methods used to answer each sub-question. Chapter 2 will also elaborate on the societal and scientific relevance of this research. The sub-questions will be answered in chapters 3 to 6. Chapter 7 will discuss the limitations of this research after which chapter 8 will conclude with the results of this research and recommendations for future research.

2

Research Framework

This chapter will discuss the main research question, sub-questions and methods and tools used to answer each question, as well as the societal and academic relevance of this study.
The goal of this research is to identify the complexities of information sharing between humanitarian and peacekeeping organizations in fragile states that are prone to slow-onset natural disasters and conflict. Based on the knowledge gaps presented in chapter 1 and given the objective of this research, the main research question in this research is formulated as follows:

> **'What are the main dilemmas humanitarian and peacekeeping organizations face when it comes to sharing information in fragile states that are prone to slow-onset natural disasters and conflict?'**

To be able to answer the main research question and to guide this study, four sub-questions have been formulated. Section 2.1 elaborates on the research approach and in section 2.2 the flow of this study is visualized in a research flow diagram. Section 2.3 elaborates on the methods used to answer each sub-question. Section 2.4 elaborates on the societal relevance of this study and section 2.5 on the scientific relevance of this research.
The four sub-questions to answer the main research question are determined as follows:

1. In what way can the relationship between a slow-onset natural disaster and conflict and the role of information for humanitarian and peacekeeping organizations in a fragile state be conceptualized and modeled?
2. Which parties are involved in the humanitarian-peacekeeping data ecosystem and what are their roles, responsibilities and relationships?
3. What are possible institutional barriers for humanitarian and peacekeeping organizations to share information?
4. What are possibilities for humanitarian and peacekeeping organizations to share information in the case study on Mopti, Mali?

2.1. Research approach

Within the academic world, humanitarian - peacekeeping interaction is a relatively new field of research. As one of the first attempts to explore this field, chapter 1 has identified several knowledge gaps based on literature review and desk research. Due to the exploratory nature of this research, a clear framework to fill the identified gaps is lacking. To explore and identify the complexities of information sharing between the humanitarian and peacekeeping organizations in fragile states that are prone to slow-onset natural disasters and conflict, this research makes use of an **exploratory iterative design.**

The exploratory iterative design technique is a mixed strategies approach that focuses on collecting, analyzing and mixing both qualitative (desk research, interviews) and quantitative (modeling) data (Creswell & Clark, 2007). The qualitative and quantitative mixed method approach results in a better understanding of the focus problem than either approach alone (Creswell & Clark, 2011). Due to the exploratory iterative nature of this research, after each

step from the starting point onwards, it is checked whether the research question and sub-questions have been formulated correctly. Based on new insights and information gained from experts, the research question and sub-questions are improved.

This approach combines desk research and the theoretical outcomes of a literature review with unique empirical findings resulted from attending conferences and workshops on (1) civil-military cooperation, (2) the influence of climate change on security, (3) data to improve peacekeeping activities and (4) humanitarian networks and partnerships, and conducting interviews with both humanitarians as well as peacekeepers, in combination with a System Dynamics modeling approach. On the grounds of the exploratory nature of this research and to be able to conduct a more in-depth and detailed examination of the phenomenon, this research conducts a case study. The purpose of the case study is to test theory and go beyond it.

While little scientific literature covers the topic of this research, it has been found that several conferences and workshops were organized where people with specific and extensive knowledge about the humanitarian and peacekeeping information landscape were brought together. For the purpose of gathering information and perceptions on the current interface between humanitarian and peacekeeping operations, unique insights were gained from participating in the following four conferences:

(1) 'Analysis Makes the Difference' conference (specifically the 3-day information sharing workshop) organized by the Civil-Military Cooperation Centre of Excellence on October 16th, 17th and 18th, 2018 in The Hague (CCOE, 2018).
This was a 3-day conference on civil-military cooperation where 118 participants from 31 nations and 64 organizations, both military (from different ranks) and civil entities came together to identify solution to civil-military cooperation challenges.

(2) 'Climate and Safety: so what?' conference organized by the Dutch Ministry of Defence on November 6th 2018 in The Hague (MoD, 2018).
This conference was held on the international day for preventing the exploitation of the environment in war and armed conflict. The focus of this conference was climate change and the consequences for international security. It was a closed event for staff of the Ministry of Defence, but they made an exception for a few scholars like the author. At this conference, the role of water scarcity in conflicts, chances for cooperation: case in Mali, current thinking and future advice for Defence and climate and EU & NATO policy were discussed.

(3) 'Applying Data for Peacekeeping: Challenges & Opportunities' organized by PAX Protection of Civilians on November 15th 2018 in The Hague (PoC, 2018).
At this conference, 80 peacekeepers, policy makers and data experts came together to identify opportunities to challenges in the use of open source data and human intelligence for peacekeeping and data management systems.

(4) 'Humanitarian Networks and Partnerships Week' organized by UN OCHA on February 4th - 8th 2019 in Geneva (HNPW, 2019).
The Humanitarian Networks and Partnerships Week brought 2200 experts in crisis preparedness and response from a variety of organizations from all over the world (including Member States, UN agencies, NGO's, peacekeepers, private sector and academia) to find solutions to common humanitarian challenges. On February 6th, the University Surge Support Group (USSG) in collaboration with the HumTechLab of the TU Delft made it possible for academia to present their work, research and ideas. The author had the honor and opportunity to present this work during that event. On February 7th, the findings of this research have also been verified at this conference during the United Nations Humanitarian Civil-Military Cooperation (UN-CMCoord) meeting (Appendix D).

To synthesize existing available and relevant information and to build on existing knowledge, insights gained from these conferences and workshops were combined with relevant desk research and literature review (Crouch & Housdon, 2013).

The interviews are used to gather qualitative information from experts about specific topics. The purpose of the interviews ranges from exploration to verification. In line with the exploratory nature of this research the intention of the interviews is flexible, leaving room for the interviewees to express freely their concerns (Laforest, 2009). For the purpose of verification, to direct the conversation towards useful answers, opinions and/or perceptions for the focus of this research, questions were prepared in advance. Ideally more interviewees would have been included in this research. However, it has been found that many people find the topic of this research contentious and are not open to answer certain questions, making it challenging to find suitable interviewees. To provide valuable answers to the interview questions, a wide range of interviewees with specific and extensive knowledge about the humanitarian and peacekeeping information landscape in a fragile state that is prone to slow-onset natural disasters and conflict have been selected. Based on the expected presence of this kind of knowledge and expertise in combination with the aim to have a set of interviewees from a wide range of functions to be able to compare and be able to come to generic findings Participating in the above-mentioned conferences, in combination with the connections of 510 within the Red Cross network, the Mali platform of the Netherlands and additional interviewees recommended to get in touch with (snowballing effect), led to the set of 23 interviewees as in Table C1 in Appendix C. These respondents can be roughly divided into the following categories: general humanitarian organizations, peacekeepers and interface (between both), as well as Red Cross Movement and peacekeepers who have contributed to the MINUSMA mission in Mali. In Appendix C the interview protocol, the interview invitation and the structured summaries of the interviews can be found.

A case study is performed in order to study a more in-depth and detailed examination of a phenomenon as suggested by Yin (2003). This is a valid approach for researching information sharing. The observations of the case study lead to findings that test theory (Sandtke, 2018). The case study is selected on the criteria of being a fragile state that is prone to slow-onset natural disasters and conflict, where both the Red Cross Movement as well as a UN peacekeeping mission are present. The selected case study is Mali; a country in sub-Saharan Africa that is struggling with the severe impacts of insecurity, conflict and drought fueled food insecurity (UN OCHA, 2018a; UN OCHA, 2018b). The goal of the case study is to test and add to the earlier findings in this research.

2.2. Research Flow Diagram

The four sub-questions enhance the understanding of the complexity of information sharing mechanisms between humanitarian and peacekeeping organizations in fragile states that are prone to slow-onset natural disasters and conflict. A general overview of how this research with an exploratory iterative design approach is structured, is visualized is the Research Flow Diagram in Figure 2.1.

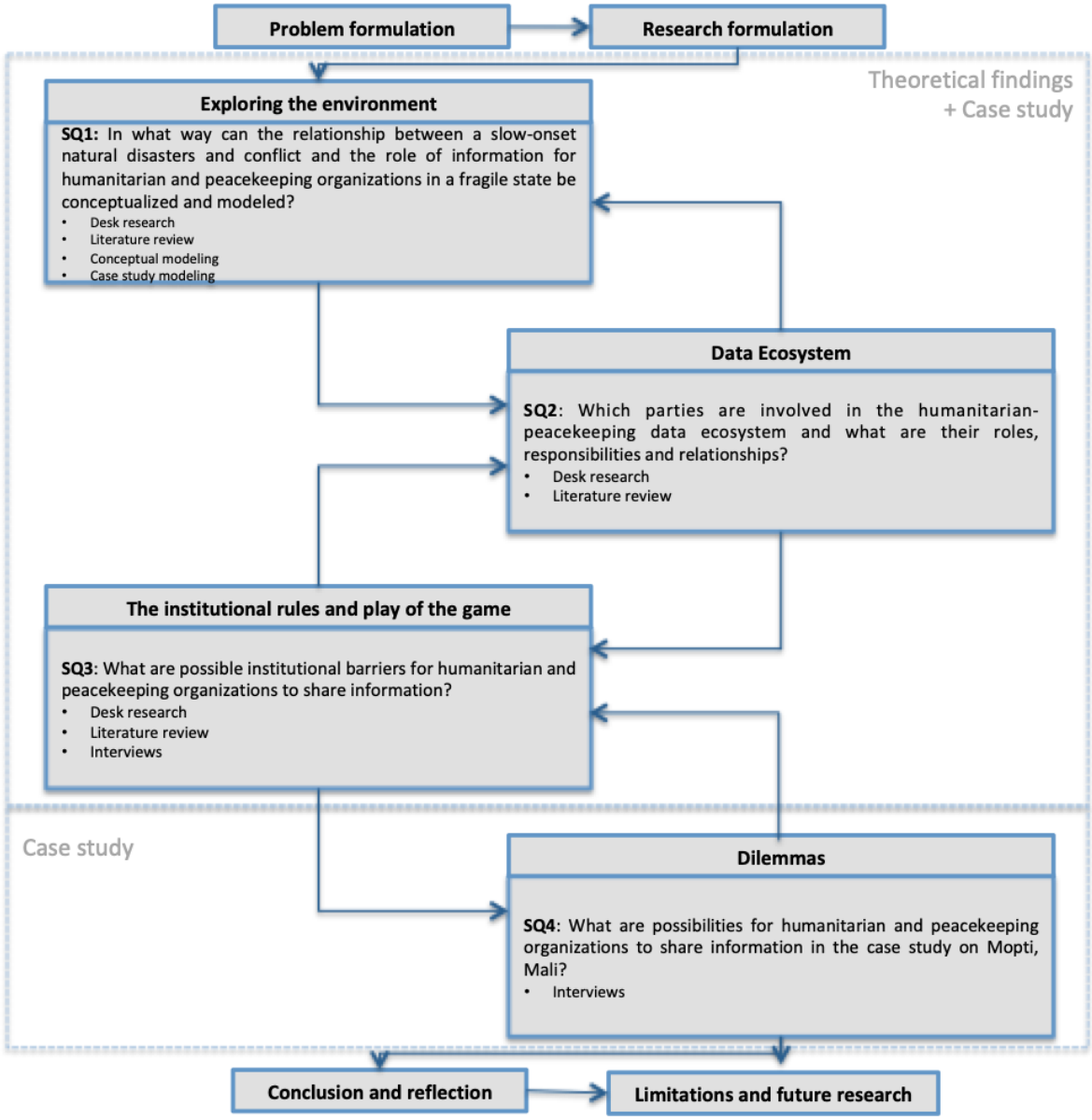


Figure 2.1. Research Flow Diagram

2.3. Research methods

In this study, a variety of research methods are used to answer the different sub-questions. This section provides an elaborated overview of the methods and steps to be taken to answer each sub-question.

> **Sub-question 1: In what way can the relationship between a slow-onset natural disaster and conflict and the role of information for humanitarian and peacekeeping organizations in a fragile state be conceptualized and modeled?**

Humanitarian and peacekeeping organizations both have their own mandates, roles and tasks. The goal of this sub-question is to find out what the relationship is between a slow-onset natural disaster and conflict, what the implications of this relationship are for humanitarian and peacekeeping organizations, and what the effect is of humanitarian and peacekeeping organizations having information on the system. In order to do so, this sub-question is part of the System Dynamics modeling approach.

The System Dynamics model that is designed in this study, relates to the System Dynamic perspective as intended by Jay Forrester (1993). The System Dynamics approach allows to investigate the causal effects, feedback loops and dynamics a slow-onset natural disaster and conflict (Forrester, 1968; Swanson, 2002). The System Dynamics approach develops these interactions into relationships and into mathematical functions. This approach not only shows which relationships exist, but also makes it possible to measure and quantify these relationships. Providing decision makers with insights about the relationship between slow-onset natural disasters and conflict on the systems performance over time. The System Dynamics model can give a high-level view of different scenarios over a longer period in time of the mechanisms of the system and how slow-onset natural disasters and conflict drive information sharing. This is required to properly investigate the (side) effects of interventions (Susnik et al., 2017).

The System Dynamics approach consists of the following steps: problem identification and definition, system conceptualization, model formalization, verification, analysis of behavior and model evaluation (Forrester, 1993).

In chapter 3, the generalized relationship between a slow-onset natural disaster and conflict in a fragile state will be conceptualized. The conceptual model will provide insights of the environment by visualizing the relationship between a slow-onset natural disaster and conflict in causal loop diagrams (CLDs). First, additional literature research will be done to conceptualize the Causal Loop Diagrams. Subsequently, the level of detail of the model will be demarcated and determined. In chapter 6, the conceptual model will be formalized based on the parameterization of the case study. Hereupon the formalized model will be verified, and the behavior of the model will be analyzed and evaluated.

Sub-question 2: Which parties are involved in the humanitarian-peacekeeping data ecosystem and what are their roles, responsibilities and relationships?

In a fragile state that is prone to slow-onset natural disasters and conflict, several parties are involved in a humanitarian response operation and peacekeeping mission. To understand what the roles, responsibilities and relationships of these parties are, how they collect and use data and information and how information exchange takes place in a fragile state that is prone to slow-onset natural disasters and conflict, this sub-question will adopt the definition of a humanitarian-peacekeeping data ecosystem from Oliveira and Loscio's (2018) definition of a data ecosystem and Van den Homberg and Susha's (2018) definition of a humanitarian data ecosystem. The goal of this sub-question is to provide an elaborated overview of the humanitarian-peacekeeping data ecosystem following three components: (1) information demanders and suppliers, (2) information demand and supply and (3) information sharing infrastructure.

This question will be answered by conducting desk research. In chapter 4 a general humanitarian-peacekeeping data ecosystem in a fragile state that is prone to slow-onset natural disasters and conflict will be described. In chapter 6, the humanitarian-peacekeeping data ecosystem will be tested in the case study.

Sub-question 3: What are possible institutional barriers for humanitarian and peacekeeping organizations to share information?

Cooperation and coordination between humanitarian and peacekeeping organizations is complex due to numerous differences between the two institutions. In order to unravel what possible institutional barriers may hinder information sharing between humanitarian and peacekeeping organizations, the differences between both institutions will be analyzed. To answer this sub-question, Williamson's (2000) framework for institutional analysis will be used. This framework for institutional analysis includes the informal and formal institutional rules as

well as the governance or play of the game. Knowledge about the possible barriers may help identify opportunities to overcome them.

This question will be answered by conducting desk research, interviews with various experienced humanitarians and peacekeepers (Appendix C) combined with insights from participating in the 'Analysis Makes the Difference' conference (specifically the information sharing workshop) organized by the Civil-Military Cooperation Centre of Excellence on October 16th, 17th and 18th 2018 (CCOE, 2018), the 'Climate Symposium' organized by the Dutch Ministry of Defence on November 6th 2018 (MoD, 2018) and the 'Applying Data for Peacekeeping: Challenges & Opportunities' organized by PAX Protection of Civilians on November 15th 2018 (PoC, 2018). Chapter 5 will explore the general possible institutional barriers for humanitarian and peacekeeping organizations to share information with each other, which will be tested in the case study in chapter 6.

Sub-question 4: What are possibilities for humanitarian and peacekeeping organizations to share information in the case study on Mopti, Mali?

Knowledge about the possible barriers that may hinder information sharing between humanitarian and peacekeeping organizations, as identified in sub-question 3, may help identify opportunities to overcome these barriers. The goal of this fourth sub-question is to identify what the possibilities are for humanitarian and peacekeeping organizations to share information with each other. In order to do so, a case study will be conducted in chapter 6.
A case study is performed in order to study a more in-depth and detailed examination of a phenomenon as suggested by Yin (2003). This is a valid approach for researching information sharing. The observations of the case study lead to findings that test theory (Sandtke, 2018). The case study is selected on the criteria of being a fragile state that is prone to slow-onset natural disasters and conflict, where both the Red Cross Movement as well as a UN peacekeeping mission are present. The selected case study is Mali; a country in sub-Saharan Africa that is struggling with the severe impacts of insecurity, conflict and drought fueled food insecurity (UN OCHA, 2018a; UN OCHA, 2018b). The focus of the case study is information sharing between the Red Cross Movement and Dutch peacekeepers that contribute to the MINUSMA mission in Mali. The goal of the case study is to test and add to the earlier findings of this research.

The case study in chapter 6 follows four components:
(1) First, additional literature research will be conducted to improve the conceptualized model which is made in chapter 3. The conceptual model of the Drought-Food insecurity-Conflict Nexus in chapter 3 will be improved based on the parameterization of the case on the Mopti region in Mali and will be formalized as part of the formalization phase of the System Dynamics modeling approach. A first version of the model will be built, which will be based on the improved conceptual model. The formalized model will be constructed with the System Dynamics program called Vensim. This model will be improved based on information from experts (Appendix C). The model will be expanded in an iterative process after which it will be verified and model behavior will be analyzed.
(2) The humanitarian-peacekeeping data ecosystem in chapter 4 will be tested and improved to adapt to the data ecosystem of the Red Cross Movement and the Dutch peacekeepers that contribute to the MINUSMA UN peacekeeping mission in Mali. The methods used to do so are by conducting desk research and a literature review.
(3) The differences in formal and informal institutional rules and governance of information sharing as identified in chapter 5 will be tested to find possible institutional barriers for the Red Cross Movement and Dutch peacekeepers that contribute to the MINUSMA mission to share information with each other by conducting interviews with humanitarians from the Red Cross Movement and peacekeepers who contributed to the MINUSMA mission in Mali (Appendix C). On February 7th 2019, these findings have been verified during the United Nations

Humanitarian Civil-Military Cooperation (UN-CMCoord) meeting at the Humanitarian Networks and Partnerships Week (HNPW) 2019 in Geneva (Appendix D).
(4) Based on the potential barriers, potential possibilities for the Red Cross Movement and Dutch peacekeepers that contribute to the MINUSMA mission to share information will be explored.

2.4. Societal relevance

While humanitarian and peacekeeping organizations have increasingly overlapping goals and scarce resources in mission areas, Harris, Keen & Mitchell (2013) point out that climate related natural disasters and conflict will only coincide more and more in the future. Climate related natural disasters affect most parts of the world, however communities who are already struggling to survive due to conflict, insecurity or poverty are hit the most (Ferris, 2010; IFRC, 2018b). In fragile states, humanitarian organizations often lack accurate, granular and timely information to know where the most vulnerable people are, what they need, there they flee to due to conflict, how safe affected areas are and safe access to them. To find the most vulnerable people, humanitarian assessment teams need to go into affected areas, interview people and assess their needs (Van den Homberg, Visser & Van der Veen, 2017). Currently the process of information gathering takes a lot of time and is often unsafe and costly or cannot be done at all due to safety and security issues. In places where conflict has already disrupted the lives of people, peacekeepers are often present assisting with regional stabilization and the acceleration of development (UNP, 2017). To prevent conflict in the long term, peacekeepers collect a lot of information to gain insights into what is going on, so that they can intervene and contribute to the long-term prevention of conflict (UNP, 2018a).

In light of the changing risks of natural disasters and security, UN Secretary-General Guterres (2018) argues that it would makes sense to strengthen the links between peacekeeping and humanitarian organizations. Sharing information between humanitarian and peacekeeping organizations may increase the efficiency and effectiveness of humanitarian response operations and peacekeeping missions, which may result in not only saving time and money but most importantly saving lives and reducing human suffering.

2.5. Scientific relevance

Within the academic world, humanitarian - peacekeeping interaction is a relatively new field of research. Only recently, peacekeeping operations have evolved significantly from exclusively military forces to today's complex, multidimensional missions. So far, little research has been done on the interaction and information sharing between humanitarian and peacekeeping organizations. The scientific field has covered topics on information sharing (Jackson, 2014; Lefebvre, 2003; Sales, 2010; Walsh, 2006), humanitarian information sharing (Altay & Labonte, 2014; Andrews, Pritchett & Woolcock, 2013; Van de Walle & Comes, 2014), multinational military information sharing (Alberts, Garstka & Stein, 1999; Rietjens & Baudet, 2017, Van der Kuijt, 2016) and information sharing between military groups and civil entities; being private citizens, national or international non governmental organizations (NGOs) or official local governments, (Lichtenegger et al., 2015; Rietjens et al., 2009; Van den Heuvel, Grand & Soeters, 2008), however not with humanitarian organizations. Humanitarian organizations are too civil entities, however these organizations solely operate by abiding the humanitarian principles of e.g. neutrality and impartiality, which makes cooperation and coordination with military forces difficult. Peacekeepers are limited in the response to armed situations and have increasingly humanitarian tasks, which may make cooperation and coordination easier for humanitarian organizations than with armed military forces. To the best of the author's knowledge, research on information sharing between humanitarian and peacekeeping organizations has not yet been covered. This research aims to fill that gap and therefore specifically focus on information sharing between humanitarian and peacekeeping organizations and contribute to the fields of peacekeeping and humanitarian response.

To study the complexity of information sharing between humanitarian and peacekeeping organizations in the context of a fragile state that is prone to slow-onset natural disasters and conflict, this study will be performed from a system dynamics and institutional perspective. From a system dynamics perspective, the interplay of a simplified case of drought fueled food insecurity and conflict can be studied as well as the relationship with information for humanitarian and peacekeeping organizations. To the best of the authors' knowledge, the dynamics of a slow-onset natural disaster and conflict have not yet been linked in one model, as well as the implications for humanitarian and peacekeeping organizations.

Several researchers within the field of organizational theory have highlighted that with inter-organizational information sharing, decision-making and overall performance improves (Kapacu, 2006; Kreps, 1990; Li et al., 2006; Simatupang & Sridharan, 2008; Sutcliffe, 2001). This research aims to contribute to this field with regards to the complexity of information sharing between humanitarian and peacekeeping organizations, compared to inter-organizational information sharing.

Within the field of institutional analysis, Williamson (2000) has made a framework to analyze complex institutions including the formal and informal rules and governance. To study the important factors regarding institutional information sharing between humanitarian and peacekeeping organizations, Williamson's (2000) framework for institutional analysis will be used. Van de Walle, Van den Eede and Muhren (2009) argue in their paper on humanitarian information management systems, that information sharing should not only be focused on formal, institutional information sharing, but also focus on the social aspect of information sharing. This research aims to tackle both.

3

Understanding the dynamics of slow-onset natural disasters and conflict

To enhance understanding of the dynamics of slow-onset natural disasters and conflict, this chapter aims to answer the sub-question: **'In what way can the relationship between a slow-onset natural disaster and conflict and the role of information for humanitarian and peacekeeping organizations in a fragile state be conceptualized and modeled?'.** To answer this sub-question, this chapter will conceptualize the interface of drought-fueled food insecurity and conflict in a fragile state and the role of information for humanitarian and peacekeeping organizations, following the conceptualization phase of the System Dynamics modeling approach. With the help of desk research and literature review, section 3.1 will unravel the relationship between a slow-onset natural disaster and conflict in a fragile state and section 3.2 unravels the role of information for humanitarian and peacekeeping organizations in a fragile state that is prone to both slow-onset natural disasters and conflict. In section 3.3 these relationships will be conceptualized and constructed into Causal Loop Diagrams and section 3.4 will conclude with the main findings. In chapter 6 the conceptualized model will be tested and improved and constructed into a formalized model based on the parameterization of a case study.

3.1. Slow-onset natural disasters and conflict in a fragile state

The context in which hazards and potentially catastrophic events occur, determine as much as the nature of the events, the scale and the type of humanitarian needs (HPG, 2003). In Europe, a flood or drought may cause grievance and hardship, maybe even relative impoverishment, but is unlikely to cascade into a humanitarian crisis. Likewise, the conflict in the Balkan region, despite being of great humanitarian concern, did not cause famine. These examples do not only reflect the availability of safety nets, but also people's invulnerability or capacity or ability to cope (UNISDR, 2017). In research on disaster risk reduction in the context of violence, conflict and fragility, Peters (2018) argues that the impact of slowly unfolding extreme weather events and the risk of a disaster are largely determined by the socio, economic and political environmental conditions people live in. Understanding the context is essential to understand humanitarian needs and relative risks.

The United Nations Office for Disaster Risk Reduction (UNISDR) (2017) defines vulnerability as "the conditions determined by physical, social, economic and environmental factors or processes, which increase the susceptibility of a community to the impact of hazards". Individuals, who are affected by slowly unfolding emergencies such as slow-onset disasters, are not passive victims of external events. As these people attempt to cope with the slowly unfolding event, their ways of living and strategies to maintain their livelihood are constantly evolving.

Nel and Righarts (2008) argue in their paper on natural disasters and the risk of violent civil conflict, that slow-onset natural disasters, especially geological and climate-related ones, significantly increase the risk of conflict in both short- and medium-term, specifically in low- and middle-income countries where the inequality rate is high. Research in the field of drought

response have found that economic and institutional functioning as well as the capacity to cope and adapt are critical in terms of making conflict more likely (Feitelson & Tubi, 2017). When a slow-onset natural disaster occurs in a fragile state, it can have severe negative impacts on the administration of that state and the already weak state capacity to provide assistance and services. The shock of extreme weather changes disproportionately affect vulnerable people due to their limited coping capacity (ISS, 2016). It decreases their ability to maintain livelihoods and sustain peaceful social relations. This creates a downward spiral of increased vulnerability to future disasters (UN OCHA, 2011).

The link between slow-onset natural disasters and conflict can be mutually reinforcing. According to the Global Facility for Disaster Reduction and Recovery (GFDRR) (2016), there is growing evidence that people in fragile and conflict affected states are much more vulnerable to natural hazards. Natural disasters "contribute to conflict because they create competition for scarce resources, exacerbate inequality with the unequal distribution of aid, change power relationships between individuals, groups and the organizations that serve them, and create power vacuums and opportunities for warlords to usurp power" (Bhavnani, 2006, p.38). Without the ability to cope or adapt, the impact of a slow-onset natural disaster may force people to move to areas that are more exposed to hazards, making the impact of a disaster bigger and increasing the risk of violence and conflict.

As seen in the Horn of Africa, climate change forced people to move to less arid or drought-prone regions that are already inhabited by people with all the inherent consequences (AGI, 2017). People have always moved to places where they could find a better livelihood, either due to civil or climate related pressures. Meeting the challenge of human migration and dislocation due to either human pressures or pressures from nature, requires for the same five basic elements for human survival: clean air, water, food, shelter and sleep.

Displacement has strong associations with severe food insecurity, as both a result and a cause (UNDP, 2011). People, who are forcibly displaced due to conflict or severe drought, typically lose access to their normal food sources. Displacement is also defined as 'people or groups of people who have been forced or obliged to flee or to leave their homes or places of habitual residence, in particular as a result of or in order to avoid the effects of an armed conflict, situations of generalized violence, violations of human rights or natural or man-made disasters' (UNHCR, 2005). In their research on the consequences of relocating in response to drought, Linke et al. (2018) argue that people who have been internally displaced are consistently more likely to experience violence than the general population. The Food and Agriculture Organization (FAO) and World Food Programme (WFP) who monitors food security in countries with conflict situation, have found that when people abandon their land, homes and jobs, they are not able to grow or afford to buy food and face extremely limited access to basic services (FAO&WFP, 2018). People, who have already experienced traumatic moves due to drought, are even more vulnerable and less capable to withstand new shocks. The impact this has on people's physical and psychological health, basic needs and livelihoods are drivers for conflict which in turn increase the risk of a disaster (ODI, 2013). It is a vicious cycle wherein slow-onset natural disasters and conflict reinforce each other in a downward spiral: causing more and more human suffering.

3.2. The role of information for humanitarian and peacekeeping organizations

In research on weather patterns, food security and humanitarian response, Haile (2005) argues that one of the main challenges is that drought is often considered to be a slow-onset disaster, leading to the assumption that there is enough time for response. For the drought-affected population in a fragile state, this is not the case; without a coping strategy, drought-affected people become trapped in poverty and hunger. The response to most slow-onset events is often treated like a rapid-onset one (NLRC, 2018). Once the slow-onset event peaks,

a large influx of resources aimed at saving lives, creating temporary and parallel coordination structures, and response that is dominated by food, vouchers or cash aid is allocated (UN OCHA, 2011). Waiting until a slow-onset event reaches an acute phase and needs to be dealt with using tools created for rapid-onset disaster, exacerbates human suffering and is a waste of resources. Even though there is a consensus that early intervention in a slow-onset disaster is better than waiting until a critical stage is reached where people are obvious suffering, it is difficult to intervene at the right time with the right humanitarian response.

Conversely, conflict in a region can make it more difficult for humanitarian organizations to deliver food assistance to the most vulnerable people in need. However the actions are the same as in peacetime, the implementation is not. With scarce budgets and resources, humanitarian organizations cannot reach all people in need of humanitarian assistance. Identifying which geographical areas are most affected and identifying the people that are the most in need of humanitarian aid is the core of all humanitarian interventions (NLRC, 2017). Currently, this process takes a lot of time and is often unsafe and costly. To find the most vulnerable people, assessment teams need to go into affected areas, interview people and assess their needs. To do so, humanitarian organizations typically use a checklist of questions (Appendix A). They come to findings based on observations and discussions with key informants and members of the community, together with a review of existing secondary information sources (Van den Homberg, Visser & Van der Veen, 2017). Any method of data and information collection will not capture all data. The problem in a data and information poor context such as a fragile state that is prone to slow-onset natural disasters and conflict is that there is already an information gap to start with. There is not much local government data, not much use of Internet; there are fewer digital traces, etcetera. In this context, there is an inevitable compromise between speed and accuracy of information. In several reports, humanitarian organizations find in the same area and event, a significant variation in estimates of population size. Populations go missing due to war, problems with distinguishing between internally displaced people and host communities, or stating different numbers to get more funding.

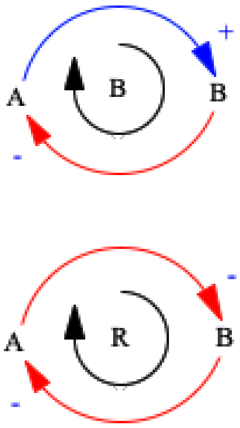
Especially in conflict-affected areas information collection is dangerous or can't be done at all. Combined with limited information sharing, chances are that assessments are incomplete or unreliable, which subsequently impacts accurate decision-making. Moreover, as the selection of priority areas can be politically influenced or influenced by media coverage, this field-based approach is prone to subjectivity (Van de Walle & Comes, 2014; Van den Homberg, Visser & Van der Veen, 2017). Vitoriano et al. (2013) argue in their paper on decision aid models for disaster management and emergencies, that objective and reliable information is one of the main challenges for humanitarian organizations. Due to safety issues, lack of capabilities and scarce resources, humanitarian organizations have little information in conflict-affects areas or situations of displacement, to help the most vulnerable people in need of food assistance (UN OCHA, 2017). Humanitarian organizations often do not have access to these areas due to safety issues, making the affected people in these regions even more vulnerable. A time delay exists in the process of delivering humanitarian food assistance. When information is available, a period of time is needed for the relief teams to reach the place of the disaster. In this research, this will be referred to as delay time, since very little is known about how decisions are made (Van den Homberg, Monne & Spruit, 2016). Humanitarian organizations need information and time to provide humanitarian food assistance. The duration of the delay time can affect among other things the number of people in need of humanitarian food assistance.

When deployed to regions that are prone to conflict, in order to intervene and contribute to the long-term prevention of conflict, peacekeepers collect a lot of information to gain insight into what is going on (UNP, 2018a). At the same time, research on the effectiveness of peacekeeping operations suggest that the presence of peacekeeping organizations in a region reduces conflict (Di Salvatore & Ruggeri, 2017), which can make it easier for humanitarian

organizations to deliver humanitarian food assistance to the most vulnerable people in need of food assistance.

3.3. Conceptualization | Drought-Food insecurity-Conflict Nexus

To analyze the relationship between drought fueled food insecurity and conflict in a fragile state, a highly aggregated conceptual model is made. Within this analysis a simplified case of drought, food insecurity and conflict is deconstructed into causal loop diagrams (CLDs). A CLD is used to describe how variables in a system influence each other's values. The branches with arrows represent the influencing relationship and are labeled with a + or -. Whenever there is s loop, these relationships form either a balancing or reinforcing loop. Figure 3.1 show the difference between a balancing and reinforcing loop.



Balancing Loop (labeled B)
If A increases in value, B also increases in value and
If A decreases in value, B also decreases in value

Reinforcing Loop (labeled R)
If A increases in value, B decreases in value and
If A decreases in value, B increases in value

Figure 3.1. Balancing and reinforcing loops

This section discusses how the causal loop diagrams are conceptualized and analyzes the environment and the interplay of drought, food security and conflict. The conceptualized model of this chapter will be constructed into a formalized System Dynamics model in chapter 6, based on the parameterization of the case study.

Food security: One of the five basic needs for human survival is food (Koltko-Rivera, 2006). The UN committee for World Food Security defines food security as "the condition in which all people at all times, have physical, social and economic access to sufficient and nutritious food" (IFPRI, 2018). To keep this conceptual model highly aggregated, a simplification is made in which the required food supply for a region**,** which is based on the population residing in that region, is defined as energy in kcal.

Food supply usually consists of multiple food types; either plant or animal based, whereas each food type contributes to different water usage levels (Hussein et al., 2017; OECD, 2011). To keep this model highly aggregated, the dynamics of food consumption choices are not included in this model. A simplification is made in which the different types of food are limited to one variable 'food supply'. It is assumed that the total food production and supply is based solely on rain fed agriculture production. In a bad rain year, farmers will harvest fewer crops, which leads to less food supply.

Barriers to food access: While there is food in the markets, if the food supply gap increases, food prices will go up, making food less accessible, which in turn increases the food supply gap (FAO & SOFI, 2004; Pingali, Alinovi & Sutton, 2005).

Food supply gap: Is the difference between the food supply and the required food supply in a region. This includes the economic and physical gap of food and is measured with famine scales (based on rainfall levels and food prices). If the food supply gap reaches a threshold

then there is a critical food supply gap, which triggers the **need for food assistance.** Vulnerability to future risks increases, leading to a poverty and hunger trap.

Internally displaced people (IDP): Displacement is defined as 'people or groups of people who have been forced or obliged to flee or to leave their homes or places of habitual residence, in particular as a result of or in order to avoid the effects of an armed conflict, situations of generalized violence, violations of human rights or natural or man-made disasters' (UNHCR, 2005). Halfway the harvest season, farmers will assess the agricultural prospects of that year. In case of severe food shortages, plans will be made to make it till the next harvest season. Members of families will leave their farms in search for labor elsewhere (Adamo, 2011; Haile, 2005). To keep this model highly aggregated, it is assumed that people become internally displaced and do not migrate to other countries.

Conflict: Arises when people become internally displaced and more people fight over the same limited resources (FAO, 2008). Conflict caused by violence and armed groups also affects access to food. It can be used as a weapon or source of power by destroying complete harvests to cut off the enemies' access to food and social structures. Due to conflict people go on the move again. Conflict also affects the access to food due to competition for resources, which increases the food supply gap and therefore the number of people in need of food assistance (Hendrix & Brinkman, 2013).

Figure 3.2 shows the Causal Loop Diagram, which is based on the conceptualization of the relationship between drought fueled food insecurity and conflict in a fragile state.

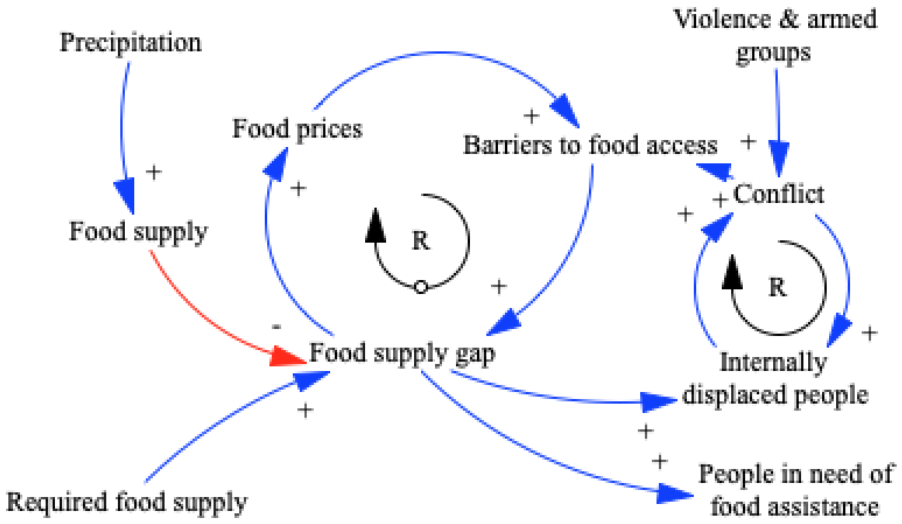


Figure 3.2. Causal Loop Diagram – Drought fueled food insecurity and conflict sub-model

Information available to peacekeeping organizations: When deployed to regions that are prone to conflict, peacekeepers collect a lot of information to gain insight into what is going on, in order to intervene and contribute to the long-term prevention of conflict (UNP, 2018a).

Peacekeeping presence: The presence of peacekeeping organizations in a region reduces conflict (Di Salvatore & Ruggeri, 2017), which can make it easier for humanitarian organizations to deliver humanitarian food assistance to the most vulnerable people in need of food assistance.

Information available to humanitarian organizations: Through the whole chain of humanitarian action, from preparedness and early warning to evaluation, information determines priorities, resource allocation and donor's willingness to fund (UN OCHA, 2014). Due to safety issues, lack of capabilities and scarce resources, humanitarian organizations have little information in conflict-affects areas or situations of displacement, to help the most vulnerable people in need of food assistance (UN OCHA, 2017). In their paper on quantifying communication effects in disaster response logistics, Diedrichs, Phelps and Isihari (2015) define an information delay as the difference between when the demand for humanitarian assistance is generated and the relief teams are aware of it. When information is available, a period of time is needed for the relief teams to reach the place of where humanitarian food assistance is needed the most. This will be referred to as delay time, since very little is known about how decisions are made (Van den Homberg, Monne & Spruit, 2016).

Humanitarian food assistance: Humanitarian food assistance can benefit people in need of food assistance and alleviate their suffering from food shortages. Humanitarian organizations need information and time to provide humanitarian food assistance. The duration of the delay time can affect among other things the number of people in need of humanitarian food assistance.

To understand the dynamics of drought fueled food insecurity and conflict and the implications of relationship of information for humanitarian and peacekeeping organizations, the Causal Loop Diagram in Figure 3.3 is divided into two regions. Figure 3.3 shows the Causal Loop Diagram of the Drought-Food insecurity-Conflict Nexus.

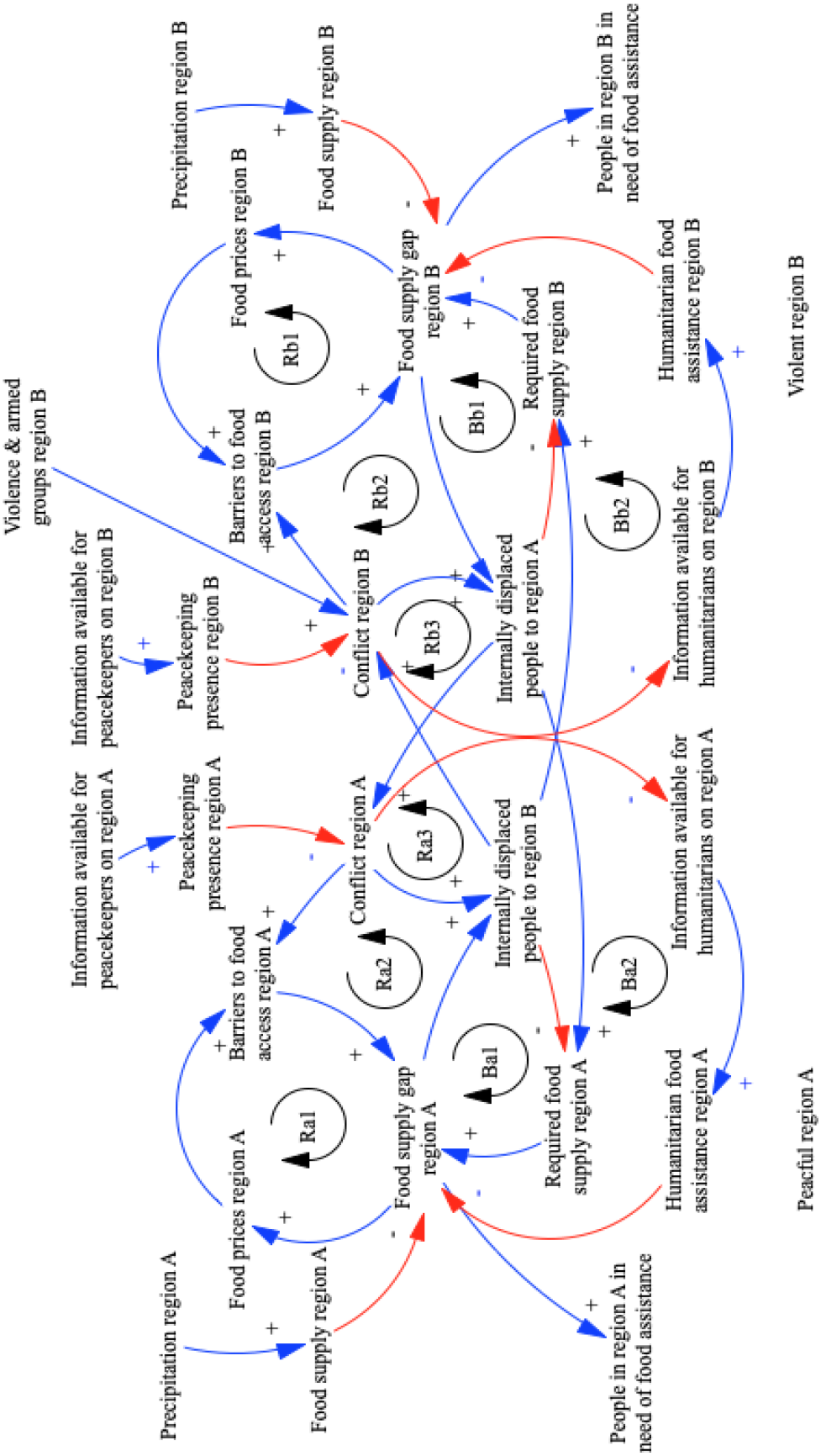


Figure 3.3. Causal Loop Diagram – Drought-Food insecurity-Conflict Nexus

Region A is a peaceful region and Region B is a region that is dominated by flair-ups of violence and armed conflict. The relationships in the Causal Loop Diagram of the Drought-Food insecurity-Conflict Nexus (Figure 3.3) can be described as follows:

- When a region has a bad rainy season with little rainfall, fewer crops will grow leading to less food on the markets, impacting the purchasing power of the farmers. With the same amount of people requiring food in that region, this will increase the food supply gap.
- **Ra1:** The increased food supply gap in region A, causes food prices on the market to go up, making food less accessible which in turn increases the food supply gap in region A, as well as the number of people in need of food assistance in region A.
- **Bb1:** To cope with the increased food supply gap in region A, family members will move to region B in search for a job or better livelihood, which in turn increases the food supply gap in region B, as well as the number of people in need of food assistance in region B.
- **Rb1:** The increased food supply gap in region B, causes food prices on the market to go up, making food less accessible which in turn increases the food supply gap in region B, as well as the number of people in need of food assistance in region B.
- **Ba1:** To cope with the increased food supply gap in region B, family members will move to region A in search for a job or better livelihood, which in turn increases the food supply gap in region A, as well as the number of people in need of food assistance in region A.
- **Ra3:** To cope with the increased food supply gap in region A, family members will move to region B in search for a job or better livelihood, which increases conflict in region B.
- **Rb2:** Conflict in region B has a negative impact on the access to food in region B, which increases the food supply gap in region B and therefore the number of people in need of food assistance in region B.
- **Rb3:** To cope with the increased food supply gap in region B, family members will move to region A in search for a job or better livelihood, which increases conflict in region A.
- **Ra2:** Conflict in region A has a negative impact on the access to food in region A, which increases the food supply gap in region A and therefore the number of people in need of food assistance in region A.
- **Ba2:** Conflict in region A has a delayed effect on information available to humanitarians on region A, and on the humanitarian food assistance in region A. The duration of the delay can affect among others the number of people in need of humanitarian food assistance in region A.
- **Bb2:** Conflict in region B has a delayed effect on information available to humanitarians on region B, and on the humanitarian food assistance in region B. The duration of the delay can affect among others the number of people in need of humanitarian food assistance in region B.

3.4. Chapter synthesis | Drought-Food insecurity-Conflict Nexus

To enhance understanding of the dynamics of a slow-onset natural disaster and conflict, this chapter aimed to answer the following sub-question: '**In what way can the relationship between slow-onset natural disasters and conflict and the role of information for humanitarian and peacekeeping organizations in a fragile state be conceptualized and modeled?**'. With the help of desk research and literature review, the relationship between drought fueled food insecurity and conflict, and the role of information for humanitarian and peacekeeping organizations have been conceptualized and constructed into Causal Loop Diagrams. The main findings of this chapter are in threefold:

Firstly, Findings suggest that in fragile states where coping strategies are limited, drought fueled food insecurity has an influence on conflict and conflict has an influence on food insecurity (Figure 3.3). In a fragile state the relationship can be seen as a vicious cycle of

cause and effect wherein drought fueled food insecurity and conflict reinforce each other in a downward spiral; causing more and more human suffering. Improving food security can reduce tensions, contribute to a more stable environment and transform the vicious cycle of food insecurity and conflict in a virtuous cycle of food security and stability that reduces drivers of conflict.

Secondly, findings suggest that humanitarian food assistance can benefit people in need of food assistance and alleviate their suffering from food shortages. Information is vital in providing humanitarian assistance to the most vulnerable people and help them recover. The sooner right information is available at the right place, the earlier humanitarian organizations can intervene to reduce human suffering and help prevent the downward spiral of increased vulnerability to future disastrous events and risks of violent conflicts. Findings suggest that that budgets and resources of humanitarian organizations are scarce, hindering them from reaching all people in need of humanitarian food assistance. There is a need to identify which areas are the most affected and to identify the people that are the most in need of humanitarian food assistance (NLRC, 2017). To find the most vulnerable people, humanitarians need to go into the drought-affected areas, interview people and assess their needs. This process takes a lot of time and is often unsafe and costly (Van den Homberg, Monne & Spruit, 2016). Especially in conflict-affected areas information collection has found to be dangerous or not possible at all. Conflict safety and security issues hinder humanitarian organizations to perform assessments and deliver humanitarian food assistance to the most vulnerable people in need.

Thirdly, findings suggest that when deployed to regions that are prone to conflict, peacekeeping organizations collect a lot of information to gain insight into what is going on, in order to intervene and contribute to the long-term prevention of conflict (UNP, 2018b). At the same time, the presence of peacekeeping organizations in a region reduces conflict (Di Salvatore & Ruggeri, 2017). By sharing information with humanitarian organizations that aim to alleviate human suffering from food shortages, peacekeeping organizations may indirectly reach their own goals of reduced conflict. By helping each other and sharing information, both humanitarian and peacekeeping organizations could indirectly reach their own goals.

Taking into account all the above, information sharing between humanitarian and peacekeeping organizations remains a challenging issue and is not common practice. There are many parties involved in a humanitarian response operation and peacekeeping mission who all collect and use information in a different way. Besides that, especially in conflict-affected areas, data and information are sensitive, meaning that information sharing comes with specific risks. It can be said that conflict hinders information sharing. The relationship between a slow-onset natural disaster and conflict and the role of information for humanitarian and peacekeeping organizations can be seen as a wicked problem as defined by Levin et al. (2012). Due to complex interdependencies, the effort to solve one aspect of the problem may reveal or create other problems. To understand which parties are involved in humanitarian response operations and peacekeeping missions and how the relationships between these organizations are, chapter 4 will elaborate on the roles, responsibilities and relationships as well as how humanitarian and peacekeeping organizations collect and use data and information and how information exchange takes place. In chapter 5, the differences in institutional rules and governance between humanitarian and peacekeeping organizations will be unraveled, which may lead to possible barriers that may hinder information sharing. In chapter 6 the conceptualized model will be constructed into a formalized System Dynamics model based on the parameterization of a case study.

4

Understanding the roles, responsibilities and relationships of parties involved

In fragile states that are prone to both slow-onset natural disasters and conflict, several parties are involved in humanitarian response operations and peacekeeping missions. To understand what the roles, responsibilities and relationships of these parties are, how they collect and use data and information and how information exchange takes place, this chapter aims to answer the sub-question: **'Which parties are involved in the humanitarian-peacekeeping data ecosystem and what are their roles, responsibilities and relationships?'**. Section 4.1 elaborates on the involved parties and their mandates in humanitarian response operations and peacekeeping missions in fragile states that are prone to slow-onset natural disasters and conflict. Section 4.2 aims to unravel the humanitarian-peacekeeping data ecosystem in fragile states that are prone to slow-onset natural disasters and conflict. Section 4.3 will conclude with the main findings.

4.1. Involved parties and their mandates

This section will present an overview of the parties and organizations involved in fragile states that are prone to both slow-onset natural disasters and conflict: in humanitarian operations in section 4.1.1 and in peacekeeping missions in section 4.1.2. Section 4.1.3 will synthesize section 4.1. Considering humanitarian and peacekeeping organizations being both complex institutions, chapter 5 will elaborate on the formal and informal rules and governance of humanitarian and peacekeeping organizations to share information.

4.1.1. Humanitarian response operations

This section elaborates on the involved parties and their mandates in a humanitarian response operation in a fragile state that is prone to both slow-onset natural disasters and conflict.

Disaster affected populations and their government

Amongst the most significant parties involved are the disaster-affected population and their respective government. When a region is affected by either a rapid- or slow-onset natural or man-made disaster, people in need can claim assistance from their state authority through the framework of International Human Rights Law (IHRL) (UN, 2018). The affected state has ultimate responsibility to provide for and protect its population. The respective government could however be overwhelmed by the impact, lack coping capacity or specific knowledge to respond sufficiently. As nations are sovereign, humanitarian organizations cannot decide to intervene before the concerned government declares a state of calamity and appeals for assistance from the international community to coordinate humanitarian relief operations (UN, 2018).

International humanitarian assistance

A characteristic of response by humanitarian organizations, is that there is no single central authority that decides who does what and where or who controls a relief operation (Balcik et al, 2010). If international assistance is required, the Emergency Relief Coordinator (ERC) of the United Nations appoints a Humanitarian Coordinator (HC) for a country

(Humanitarianresponse.info, 2018b). The HC who is also the Deputy Special Representative of the Secretary General (DSRSG) and Resident Coordinator (RC), leads the humanitarian response. Under the leadership of the HC, the Humanitarian Country Team (HCT) is the centerpiece of humanitarian coordination in a country. The HCT aims to bring together the United Nations Country Team (UNTC), the Inter-Agency Standing Committee (IASC) partners, national and international NGOs, the Red Cross and Red Crescent Movement, advocates principled humanitarian actions and ensures implementation of the cluster system at sub-national level (Humanitarianresponse.info, 2018b, UN OCHA, 2017). The United Nations Office for the Coordination of Humanitarian Affairs (UN OCHA) is part of the UN Secretariat and supports the HC and HCT by aiming to bring humanitarian organizations together (UN OCHA, 2018c). UN OCHA facilitates the inter-cluster coordination as well as the coordination between clusters in order to ensure a coherent response to events, primarily through the Inter-Agency Standing Committee (IASC), which is chaired by the ERC (UN OCHA, 2017). International humanitarians are often deployed for a period of four to six months, after which a successor will take over (Van de Walle & Comes, 2015).

The cluster system is a humanitarian coordination mechanism of the IASC (IASC, 2018). The cluster-approach (Figure 4.1) represents a framework for information sharing among different groups of humanitarian organizations, both UN and non-UN, that are active in the same sector of humanitarian action; water, food, health, shelter, logistics, etcetera (Comes, Meesters & Torjesen, 2017). The clusters support humanitarian organizations in the response by coordinating, implementing and monitoring projects and conducting joint needs assessments and gap analyses in the field (UN OCHA, 2017).

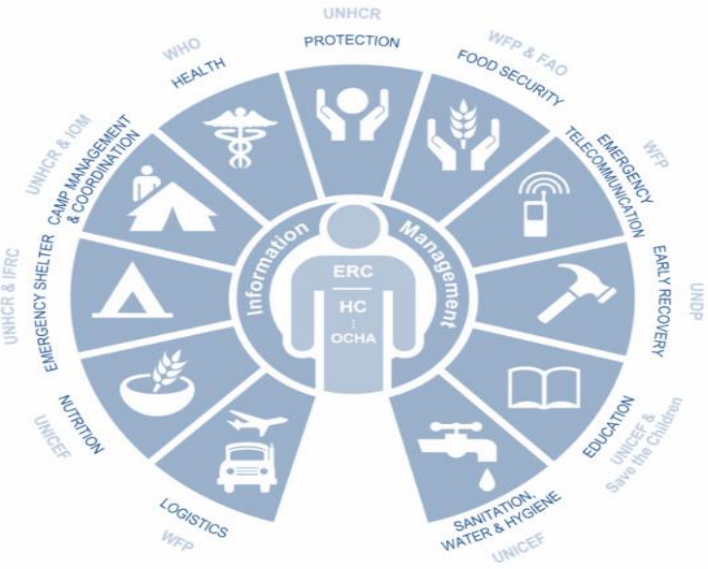


Figure 4.1. Humanitarian Clusters (UN OCHA, 2017)

UN Agencies

In fragile states that are prone to slow-onset natural disasters such as drought fueled food insecurity and conflict as seen in chapter 3, several UN agencies are important parties in the humanitarian response.

World Food Program (WFP) co-leads the Food Security Cluster (FSC) together with the **Food and Agriculture Organization** (FAO). The FSC is committed to saving lives through the coordination of the food security response during a humanitarian crisis, addressing issues of food availability, access and utilization (HR, 2018). The FSC enhances cooperation and partnerships by working directly with its partners; national and international NGOs, the Red Cross and Red Crescent Movement, UN organizations, Governments and Donors (FSC, 2018). The FSC provides guidance at a national level that supports a broad base and timely

response. The FAO, WFP and governments are tasked with monitoring agricultural pre-harvest assessments and send monthly bulletins with baseline weather risk analysis combined with agricultural monitoring (FAO/WFP, 2009). Depending on the assessed need for international food assistance and the available resources, the FSC will plan, implement and monitor appropriate interventions.

United Nations Higher Commissioner for Refugees (UNHCR) leads the Global Protection Cluster (GPC). UNHCR also co-leads the Global Cluster for Shelter (GCS) together with the International Federation of the Red Cross (IFRC). Furthermore, it co-leads the Global Cluster for Camp Coordination and Camp Management (CCCM) together with **International Organization for Migration** (IOM) (UNHCR, 2019). UNHCR and IOM are mandated to protect crisis affected communities, internally displaced people and their host communities and ensure that necessary assistance such as basic food supplied reaches them. In order to do so, UNHCR engages with national authorities, WFP as well as peacekeeping missions. Due to this mandate, a special request from affected governments or from high-level UN bodies is often needed before UNHCR can participate fully in a humanitarian response operation (UN OCHA, 2018c).

The Red Cross and Red Crescent Movement
The International Humanitarian Law states that the Red Cross or Red Crescent emblem is the respected sign of protection. The Red Cross and Red Crescent Movement is the largest humanitarian network in the world with approximately 100 million members, volunteers and supporters worldwide. The Red Cross and Red Crescent Movement constitutes of three components: the International Committee of the Red Cross (ICRC), International Federation of Red Cross and Red Crescent Societies (IFRC), and National Red Cross and Red Crescent Societies (ICRC, 2018). These three components operate with a mission to prevent and alleviate human suffering worldwide wherever the needs may be, protect life and health, and to ensure respect for human beings, particularly in times of armed conflict and other emergencies. For reasons of independence and neutrality, ICRC and IFRC are standing invitees and not members of the Inter-Agency Standing Committee (UN OCHA, 2018c). It is important to clarify the distinction between ICRC and IFRC as they have different roles and responsibilities regarding natural disasters and civil conflict.

International Committee of the Red Cross (ICRC) is the leading agency to respond to victims of armed conflict and other situations of violence. The ICRC also responds to disasters in conflict-affected areas, as the effects of a disaster are intensified in conflict-affected zones. The ICRC helps people by providing water, healthcare, and protection of civilians, restoring links with family and helping detainees. In order to do so, the ICRC works closely with the National RCRC Societies (ICRC, 2018).

International Federation of the Red Cross and Red Crescent Societies (IFRC) is responsible for the preparation and response to disasters in non-conflict situations by coordinating and delivering humanitarian aid in the aftermath of disasters. The IFRC aims to improve the lives of vulnerable people by conducting relief operations in the response to a disaster, in combination with disaster preparedness and capacity building programs. The IFRC co-leads the Global Shelter Cluster together with UNHCR (UN OCHA, 2018c). In case of natural disasters, IFRC takes the lead in the global shelter cluster, and in case of conflict situation, this role is assigned to the UNHCR. IFRC also works in close cooperation with National RCRC Societies (IFRC, 2018a).

In case of a food security crisis in a fragile state, ICRC and IFRC will work closely together with the **National RCRC** to distribute food and funds to people whose lives have been roiled by conflict, armed violence and drought fueled food insecurity (ICRC, 2018). Even though National Red Cross and Red Crescent Societies work closely with their respective governments, they are independent and not controlled or directed by their government.

Governments should recognize National RCRC Societies as legal entities and allow them to operate according to the fundamental humanitarian principles (UN OCHA, 2018c).

Non-Governmental Organizations
In the context of a fragile state that is prone to both slow-onset natural disasters and conflict, Non-Governmental Organizations (NGOs) are organizations that assist in providing relief and can be categorized in two components: international and national NGOs (UN OCHA, 2018c). International NGOs may be deployed to an affected state and national NGOs may work with their own government and country when an emergency occurs.

Humanitarian organizations undertake several actions to help prepare for, manage and respond to a disaster. The IASC has agreed that these coordinated series of action follow the Humanitarian Program Cycle (HPC) (UN OCHA, 2018c). The Humanitarian Program Cycle (Figure 4.4) includes: assessment of needs and analyzing these needs, strategic planning of the humanitarian response, mobilizing resources, implementing and monitoring the response and reviewing and evaluating the operation as a whole.

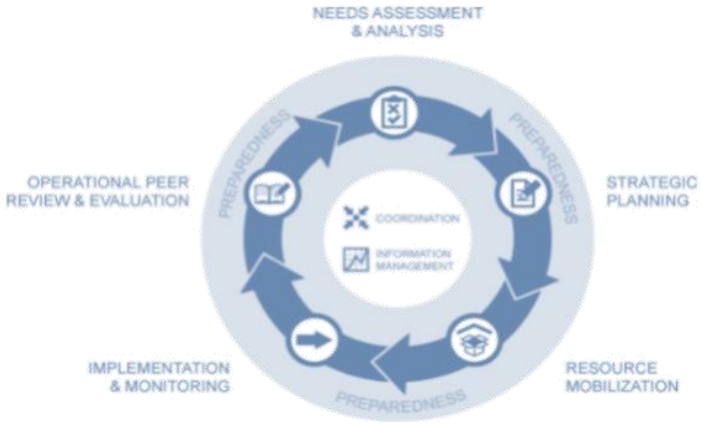


Figure 4.2. Humanitarian Program Cycle (UN OCHA, 2017)

For the Humanitarian Program Cycle (Figure 4.2) to work, coordination and information management is needed. UN OCHA, specifically the Information Management Working Group (IMWG), introduced the humanitarian Information Management Cycle (IMC) (Figure 4.3) in order to manage information management activities (UN OCHA, 2017). The IMC includes: planning the information management, assessing the information that is needed, collecting information, processing and analyzing information (translating information into usable information products), communicating (disseminating the information products) and giving feedback, to enable the right information to be available at the right time to the right person or organization. Information collection should match the information needs expressed or anticipated by the respective partners in the humanitarian response operation.

Figure 4.3. Information Management Cycle (UN OCHA, 2017)

A characteristic of response by humanitarian organizations, is that there is no single central authority that decides who does what and where or who controls a relief operation (Balcik et al., 2010). To assess the operational presence and capacity of other organizations, the so-called '3W' assessment' is conducted: the - who does what where- questions. Knowing the operational presence and capacity of other organizations can help identify potential partners, improve situational awareness and help identify overlap and gaps in the humanitarian response (Humanitarianresponse.info, 2018b).

> *In Afghanistan, they did not share who is doing what, where and when. After many efforts, they found out that three different organizations were building primary schools in the same area. What they did not know was that there were barely enough children in the area to fill one school*[1]

4.1.2. Peacekeeping missions

As stated in the Charter of the United Nations and statute of the International Court of Justice (1945), the United Nations Security Council is responsible for maintaining international peace and security and determines when and where a UN Peacekeeping operation should be deployed, the operation's size, overall objectives and time frame. Member states decide whether to participate in a mission and if so, what personnel and equipment they are willing to contribute (PKO UN, 2018). This is necessary, as the United Nations does not have forces other than those, which member-states provide for each specific peacekeeping operation (UNP, 2018a). Figure 4.4 visualizes this UN Structure. The Department of Peacekeeping Operations (DPKO) provides political and executive direction to UN Peacekeeping operations around the world and maintains contact with the Security Council, troops and financial contributions and parties to the conflict in the implementation of Security Council mandates (PKO UN, 2018).

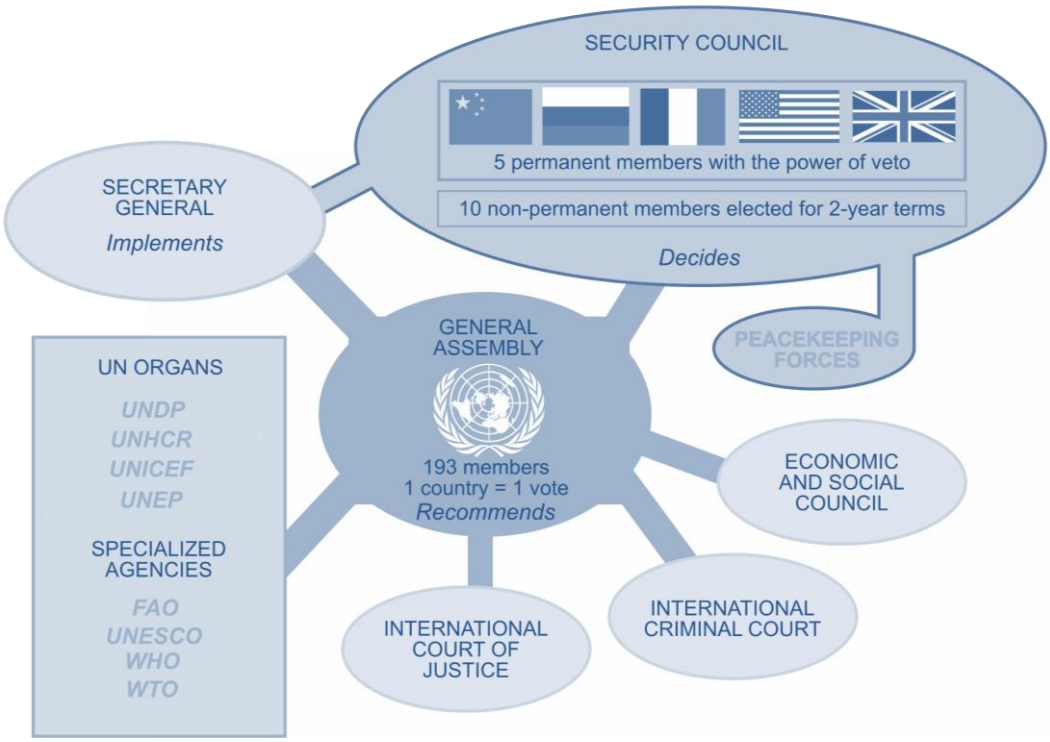


Figure 4.4. UN Structure (The Independent, 2018)

Peacekeepers receive pre-deployment training and education to prepare them for what is expected during the mission (UN DPKO, 2017). UN Peacekeepers are subject to collective

[1] Appendix C, Peacekeeper #8

security law and international law governing the use of force. The trinity of UN peacekeeping principles is consent of the parties, impartiality, and non-use of force except in self-defense and defense of the mandate (UNP, 2018a). These principles reflect the fundamental principles of international law: sovereignty, non-intervention, and non-use of force. Depending on their mandate, peacekeepers may be given orders to deploy in order to prevent the outbreak of conflict or spillover of conflict across borders; stabilize conflict situations after a ceasefire, create an environment for the parties to reach a lasting peace agreement; assist in implementing comprehensive agreements or lead states or territories through a transition to stable government, based on democratic principles, good governance and economic development (UNP, 2018a). UN peacekeepers are often mandated to follow essential peace building activities such as; disarmament, demobilization and reintegration of ex-combatants; mine action; security sector reform and other rule of law; protection and promotion of human rights; electoral assistance; support for the restoration and extension of state authority; promotion of social and economic recovery and development (UNP, 2018).

UN peacekeeping missions aim to help prevent conflict and reduce human suffering by responding to today's challenges of global peace and security (UNP, 2018a). Since the 1990's, peacekeeping operations have evolved significantly from exclusively military forces to today's complex missions. Peacekeeping operations are becoming increasing multidimensional, comprising not only military forces but also civilian personnel, human rights and election monitors, humanitarian assistance personnel and other components (Foo, 2012). Consequently, numerous components within military, developmental and humanitarian actions have become integral to current peacekeeping missions (Egnell, 2013; Frerks et al., 2006; Metcalfe et al., 2012). Peacekeepers are increasingly participating in humanitarian operations and peace-support operations of increasing scope, complexity and frequency. On the grounds of these developments, international peacekeeping organizations are more and more inclined to interact with civilian entities, such as host nation entities, international and national Non-Governmental Organizations (NGOs) and International Organizations (IOs) (Egnell, 2013).

UN peacekeeping missions comprise of three levels of authority: strategic, operational and tactical:
The strategic level has the highest authority; they set political goals, objectives, and guidance and provide resources. The highest UN representative in a UN peacekeeping mission is the Special Representative of the Secretary-General (SRSG), also known as the head of the missions (HOM). The Deputy Special Representative of the Secretary-General (DSRSG) reports to both the United Nations Development Program (UNDP) and the SRSG who is responsible to the Secretary-General for all UN activities, including peacekeeping (UN, 2014).
The operational level is mainly on mission level, which overlaps with the strategic and tactical level. At operational level, the political and military guidance are translated into actions. Resources are used in support of achieving the political goals. The highest authority on mission level is the head of the mission.
The tactical level conducts specific operations and tasks in support of the planned mission. At the Force Headquarters (Force HQ), the staff is divided into 9 branches or components that are responsible for the following activities (UN, 2014):

- U1 is responsible for personnel (where do people come from, where are they going to)
- U2 is responsible for intelligence and security (which is needed for the operation)
- U3 is responsible for operations
- U4 is responsible for logistics (food, drinks, transportation)
- U5 is responsible for planning operation
- U6 is responsible for communication and IT
- U7 is responsible for training
- U8 is responsible for finance and contracts
- U9 is responsible for civil-military cooperation (CIMIC), civil affairs and the ones who interact with civil entities including humanitarian organizations

These components mainly operate in silos and follow the commands of the Force Commander. Peacekeepers are often deployed for a period of four to six months, after which a successor will take over (UNP, 2012).

The Joint Operations Centre (JOC) collects, reports and monitors all daily activities of the different mission components. JOC is responsible for situational awareness to support HQ decision-making (UN, 2014). Whenever there is a crisis, JOC acts as a crisis management center and has to report within 24 hours to the headquarters of the SG in New York.

The Joint Mission Analysis Centre (JMAC) is responsible for multi-source collection of information and analysis to support HQ decision-making based on trends and predictive analytics with their implications and potential developments (UN, 2014).

4.1.3. Section synthesis | Involved parties and their mandates

Section 4.1.1 and 4.1.2 elaborated on the parties and organizations involved in humanitarian response operations and peacekeeping missions in fragile states that are prone to both slow-onset natural disasters and conflict. The most generic formal relations of the identified parties involved in the humanitarian-peacekeeping data ecosystem in a fragile state that is prone to slow-onset natural disasters and conflict, have been put together in figure 4.5 The direction of the relationship is not indicated by the arrowheads, but by the vertical arrangement of the boxes.

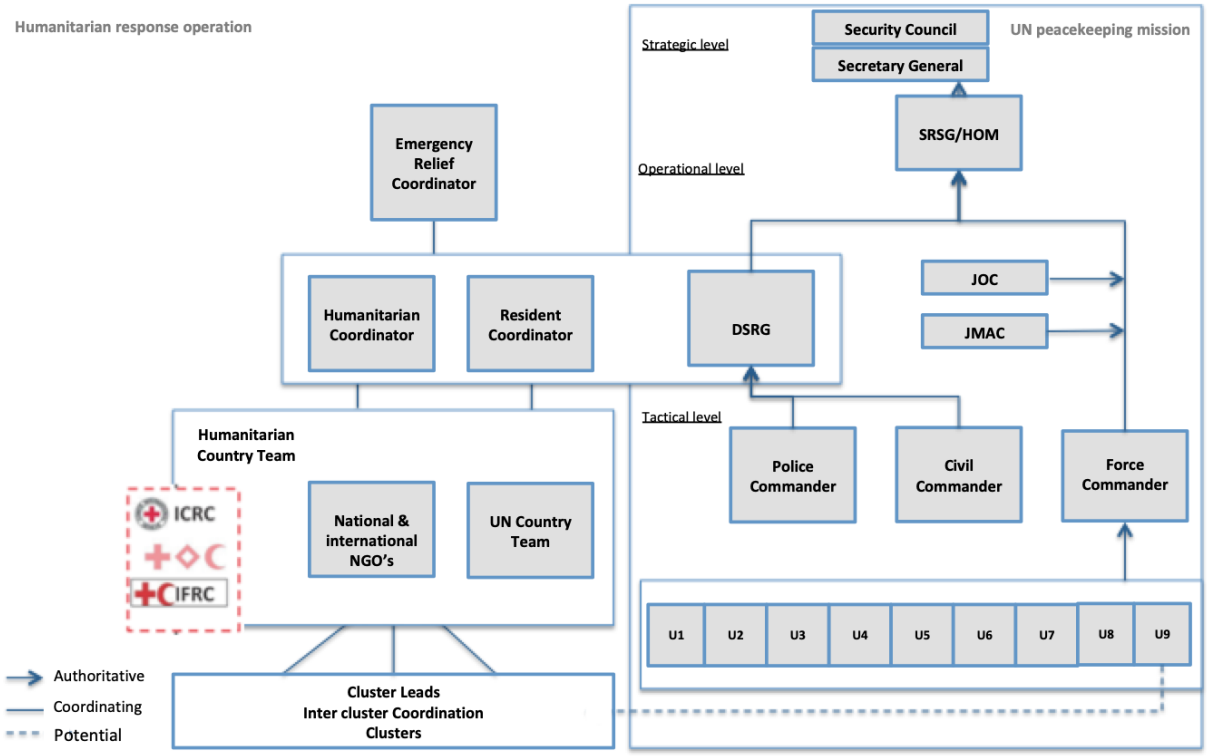


Figure 4.5. Formal relations of the involved parties in the humanitarian–peacekeeping data ecosystem in fragile states that are prone to slow-onset natural disasters and conflict

It has been found that there is no single authority that decides who does what and where and who controls a humanitarian relief operation (Balcik et al., 2010). Findings suggest that the vast amount of organizations, frameworks and coordination mechanisms between humanitarian organizations indicate an institutional fragmentation and fragmentation of responsibilities. In contrast, peacekeeping missions are centralized with a clear line of authority.
To help understand how the relationships between humanitarian and peacekeeping organizations are and analyze how information exchange takes place, section 4.2 aims to unravel the humanitarian-peacekeeping data ecosystem.

4.2. Humanitarian–peacekeeping Data Ecosystem

Different from a biological ecosystem with predators and pray, Oliveira and Lóscio (2018) define a data ecosystem as a system with different stakeholders in which they interact, produce and consume data and information. Van den Homberg and Susha (2018) define a humanitarian data ecosystem as one with five dimensions: involved stakeholders, data demand, data supply, data infrastructure and data ecosystem governance. In their paper, Van den Homberg and Susha (2018) argue that in a mature data ecosystem, data producers have relationships with other stakeholders, including the data consumers. In an immature data ecosystem such as a humanitarian ecosystem, data producers might be not well networked and "incentives to share and use data are not well aligned and user selection differs among actors whereby some open their data, others only on demand or not at all". Adopted from Oliveira and Lóscio's (2018) definition of a data ecosystem and Van den Homberg and Susha's (2018) definition of a humanitarian data ecosystem, a humanitarian-peacekeeping data ecosystem in a fragile state that is prone to both slow-onset natural disasters and conflict, consists of three components: (1) Information demanders and suppliers, (2) information demand and supply and (3) information sharing infrastructure. To analyze and help understand how the relationships between humanitarian and peacekeeping organizations are and how information exchange takes place, section 4.2.1 elaborates on the information demand and supply in fragile states that are prone to slow-onset natural disasters and conflict. Section 4.2.2 elaborates on the information demanders and suppliers and section 4.2.3 will elaborate on the information sharing infrastructure.

4.2.1. Information demand and supply

The aim of this section is to enhance understanding of the humanitarian-peacekeeping data ecosystem in a fragile state that is prone to slow-onset natural disasters and conflict as conceptualized in chapter 3. Paring information demand and supply can help to identify overlaps and gaps. Information demand and supply capture the acquisition of information as well as the availability of information (Van den Homberg & Susha, 2018). This section will elaborate on the information demand and supply in fragile states that are prone to both slow-onset natural disasters and conflict: in humanitarian response operations in section 4.2.1.1 and in peacekeeping missions in section 4.2.1.2.

4.2.1.1. Information demand and supply in humanitarian response operations

Slow-onset disaster management can be divided in four sequential phases; preparedness, early warning, early response and recovery (UNDP, 1992). The 'Inter-Agency Contingency Planning Guidelines for Humanitarian Assistance' discusses two approaches to plan for such an emergency (IASC, 2015). In general, *preparedness planning* focuses on putting a broad set of measures in place to prepare for and build capacity to respond to different disastrous events. The Humanitarian Country Team should undertake these actions. *Contingency planning* focuses on an emerging or anticipated event, this can be either a new event or an existing situation, which is deteriorating. In such cases, early warning systems are important tools for humanitarian organizations.

Planning a response to slow-onset natural disasters is done on a regular basis. When early warning signs indicate that a humanitarian crisis is emerging, preparation and specific response plans are undertaken by humanitarian organizations (UN OCHA, 2011). Preparedness, early warning systems and early response are key to recover from a slow-onset disaster (Hurt, 2011). The planning, which is based on clear triggers for early response, allows humanitarian organizations to identify interventions such as selling animals, water conservation interventions or distribution of short cycle seeds etcetera. Contingency planning, which is based on clear triggers and early response actions, can help break the cycle of increasing vulnerability and costly interventions. Information is vital for the functionality of preparedness; early warning systems and the coordination of response that gives humanitarian organizations time to provide humanitarian assistance to the most vulnerable

people in affected areas and help them recover. Across all phases of the disaster cycle, information is therefore needed. For each area and sector, the triggers would be different and depend on available information.

For humanitarian organizations to prepare for and respond to a slow-onset natural disaster in fragile states that are prone to conflict as in the Drought-Food insecurity-Conflict Nexus in chapter 3, various types of information are needed. In their paper on humanitarian information needs in response to sudden onset disasters Gralla et al. (2013) argue that information needs are context and scope dependent and encompass need of the affected population, priorities, operational situation, capacity and response planning, coordination and institutional structures etc. In the Drought-Food insecurity-Conflict Nexus, the humanitarian information needs are categorized in food security data, internally displacement data and conflict data (Figure 4.6).

Phases of slow-onset disaster:

!!Emergency!!
****

	Preparedness	**Early warning**	**Early response**	**Recovery**
In peacetime	Baseline information Monitoring indicators -Meteorological data -Food supply -Food prices -Access to food	Trigger mechanism - People in need of food assistance	Assessment of humanitarian needs	Long term development
In conflict-affected area	Baseline information Monitoring indicators -Meteorological data -Food supply -Food prices -Access to food	Trigger mechanism - People in need of food assistance	Assessment of humanitarian needs Safety and security	Long term development

Figure 4.6. Humanitarian information needs across the different phases of a slow-onset natural disaster in a fragile state that is prone to conflict

The way humanitarian organizations are prepared is the same in peacetime and in conflict, however in early response in conflict, safety and security information is needed. It has been found that due to safety issues, humanitarian organizations often do not have access to conflict-affected areas. In case a slow-onset natural disaster occurs in such a dangerous area, it is difficult for humanitarian organizations to perform assessments and reach the most vulnerable people in need, making them even more vulnerable. Due to safety issues, lack of capabilities and scarce resources, humanitarian organizations have little information in conflict-affects areas or situations of displacement, to help the most vulnerable people in need of food assistance (UN OCHA, 2017). Information regarding safety and security of affected areas is vital for humanitarian organizations to help the most vulnerable people in need of food assistance (Figure 4.6).

With scarce budgets and resources, humanitarian organizations cannot reach all people in need of humanitarian assistance. Identifying which geographical areas are most affected and identifying the people that are the most in need of humanitarian aid is the core of all humanitarian interventions (NLRC, 2017). To find the most vulnerable people, assessment teams need to go into affected areas, interview people and assess their needs. To do so, humanitarian organizations typically use a checklist of questions (Appendix A). They come to findings based on observations and discussions with key informants and members of the community, together with a review of existing secondary information sources (Van den Homberg, Visser & Van der Veen, 2017). Any method of data and information collection will not capture all data. The problem in a data and information poor context such as a fragile state that is prone to slow-onset natural disasters and conflict is that there is already an information gap to start with. There is not much local government data, not much use of the Internet, there

are fewer digital traces, etcetera. In this context, there is an inevitable compromise between speed and accuracy of information. In several reports, humanitarian organizations find in the same area and event, a significant variation in estimates of population size. Populations go missing due to war, problems occur in distinguishing between internally displaced people and host communities, or different population numbers are reported to receive more funding.

4.2.1.2. Information demand and supply in peacekeeping missions

Peacekeepers deploy to some of the most dangerous areas worldwide to protect the most vulnerable people. To support effective and efficient implementation of the mission's mandate, collection and management of information is required (UN DPKO, 2017). The head of the mission decides in which direction information is required and in which direction information must be collected. UN peacekeepers collect exclusively information that supports effective and efficient implementation of their missions' mandate, and must be conducted with full respect for human rights, in particular the rights to privacy, freedom of expression, peaceful assembly and association including safety and security of United Nations personnel (UN DPKO, 2017). Data and information collected on local level is used for strategic decision-making, providing insights into factors that might affect the mission. Early warning indicators are used to develop scenarios to be able to respond to events that may affect the peacekeeping missions mandate and to be able to take preventative actions.

4.2.2. Information demanders and suppliers

This section will elaborate on the information demanders and suppliers in fragile states that are prone to both slow-onset natural disasters and conflict: in humanitarian response operations in section 4.2.2.1 and in peacekeeping missions in section 4.2.2.2.

4.2.2.1. Information demanders and suppliers in humanitarian response operations

For humanitarian organizations to prepare for and respond to a slow-onset natural disaster in fragile states that are prone to conflict as in the Drought-Food insecurity-Conflict Nexus in chapter 3, various types of information are needed (Figure 4.6) as various information demanders and suppliers are involved in humanitarian response operations. For sake of simplification, information demanders and suppliers will be distinguished in three categories: (1) Food Security data, (2) Internally Displacement data and (3) Conflict data.

Food security data: FAO, WFP and governments are tasked with monitoring agricultural pre-harvest assessments and sending monthly bulletins with baseline weather risk analysis combined with agricultural monitoring (FAO/WFP, 2009). As a result of technological developments, agricultural monitoring is improving rapidly due to projects as the Satellite Technologies for Improved Drought-Risk Assessment (SATIDA) (Enenkel et al., 2015). With the latest satellite technologies, development of different kinds of crops can be monitored as well as accurate estimates of the yield (Haile, 2005).
Several organizations such as the European Organizations for the Exploitation of Meteorological Satellites (EUMETSAT) and the National Oceanic and Atmospheric Administration (NOAA) for example provide free of charge, a variety of near-real time datasets derived from satellites. Many organizations are building tools and systems that build consensus about the nature, severity and extent regarding geographical locations and monitor emerging slow-onset disaster (UN OCHA, 2011). A global multi-level, multi-sectorial initiative that builds on consensus for food security is the Integrated Food Security and Humanitarian Phase Classification (IPC) system (IPC, 2018). This is an important source for food security data.

Internally Displacement data: The Internal Displacement Monitoring Centre (IDMC) is a world authoritative source of data and analysis on IDP and aims "to provide high-quality data, analysis and expertise on internal displacement with the aim of informing policy and operational decisions that can reduce the risk of future displacement and improve the lives of

internally displace persons (IDPs) worldwide (IDMC, 2019). In collaboration with among others UN OCHA, UNHCR, International Organization for Migration (IOM), IDMC is a reference for internal displacement data and "provides verified, consolidated and multi-sourced estimates of the number of people internally displaced or at risk of becoming displaced by conflict, violence, disasters and development projects across the world" (IDMC, 2019).

Conflict data: It has been found that due to safety issues, humanitarian organizations often do not have access to conflict-affected areas. In case a slow-onset natural disaster occurs in such a dangerous area, it is difficult for humanitarian organizations to perform assessments and reach the most vulnerable people in need, making them even more vulnerable. Due to safety issues, lack of capabilities and scarce resources, humanitarian organizations have little information in conflict-affects areas or situations of displacement, to help the most vulnerable people in need of food assistance (UN OCHA, 2017). Information regarding safety and security of affected areas is vital for humanitarian organizations to help the most vulnerable people in need of food assistance (Figure 4.6).

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4.2.2.2. Information demanders and suppliers in peacekeeping missions

The head of the mission decides in which direction information is required and in which direction information must be collected, which is captured in a Peacekeeping Intelligence Cycle (Figure 4.7).

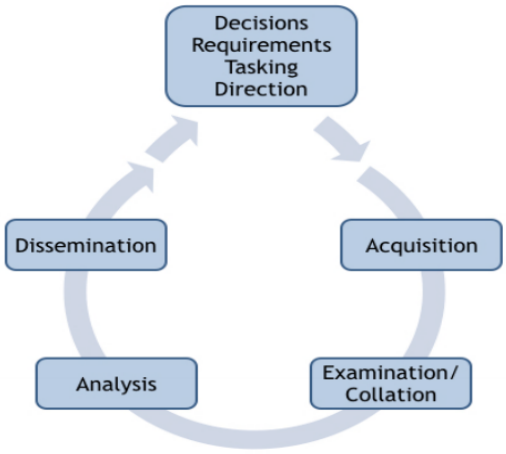

Figure 4.7. Peacekeeping information management cycle (UNDPKO, 2017)

UN peacekeepers collect exclusively information that supports effective and efficient implementation of their missions' mandate (UN DPKO, 2017). The mission may receive information voluntarily provided by member states and other entities disconnected from the missions and will ensure secure handling of these information products. Data and information collected on a local level is used for strategic decision-making, providing insights into factors that might affect the mission. Early warning indicators are used to develop scenarios to be able to respond to events that may affect the peacekeeping missions mandate and to be able to take preventative actions.

4.2.2.2 Information demanders and suppliers in peacekeeping missions

The Joint Operations Centre (JOC) collects, reports and monitors all daily activities of the different mission components. JOC is responsible for situational awareness to support HQ decision-making (UN, 2014). Whenever there is a crisis, JOC acts as a crisis management center and has to report within 24 hours to the headquarters of the SG in New York.

The Joint Mission Analysis Centre (JMAC) is responsible for multi-source collection of information and analysis to support HQ decision-making based on trends and predictive analytics with their implications and potential developments (UN, 2014).

4.2.3. Information sharing infrastructure

The aim of this section is to generate insight in the various forms wherein information sharing takes place. Information can be shared in two ways: through formal and informal communication. Communication of information takes place at different levels; local, national or international level (UN OCHA 2011): in the field, face to face or via various platforms. This section will elaborate on the coordination mechanisms and information sharing infrastructure in fragile states that are prone to both slow-onset natural disasters and conflict: in humanitarian response operations in section 4.2.3.1, in peacekeeping missions in section 4.2.3.2 and between humanitarian and peacekeeping organizations in section 4.2.3.3.

4.2.3.1. Information sharing infrastructure in humanitarian response operations

Humanitarian coordination and information sharing mechanisms are voluntary agreements; based on a conviction that coordination among each other is crucial to be predictable and reliable partners, to join resources, avoid gaps and duplications of efforts and to improve the quality and speed of the response (UN OCHA, 2017). Humanitarian organizations associate to collaborate, cooperate, and coordinate when it is in their interest to do so. Within the clusters, all humanitarian organizations have the same goal; to save lives, alleviate human suffering and promote human dignity in the middle of natural or man-made disasters. Despite having similar objectives, humanitarian organizations often have different primary motives, missions and operating constraints, as well as different geographical, cultural and organizational policies that contribute to ineffective coordination and information sharing amongst humanitarian organizations. Van de Walle and Comes (2015) argue in their research on information management challenges which is based on observations in humanitarian response operations in both sudden-onset natural- and complex disasters, that humanitarian organizations operate in a very fragmented information landscape, which is characterized by secrecy, mistrust issues of confidentiality, security concerns and individual networks. Humanitarian organizations rely on donor funding to be able to initiate their relief operation (Balcik et al., 2010). As a result of this, humanitarian organizations often compete with each other for resources and donor funding (Stephenson, 2005). Competition induces these organizations to withhold information or be reluctant to share with other humanitarian organizations what they are doing and when and where they are planning to deliver what kind of response (Underwood, 2016). The motivation is to keep a competitive advantage in attracting attention and donor funding (Balcik et al., 2010).

As a slow-onset natural disaster may be geographically spread, various coordination hubs may be needed. Within the humanitarian community, the Clusters and the HCT are important coordination mechanisms to share information. Cluster coordinators and their members can choose to have an inter-cluster IMC. Clusters in the field are responsible for collecting their own data and information, sharing this with their clusters at national level and subsequently with UN OCHA (Humanitarianresponse.info, 2018b).

Various organizations have developed technology-based platforms to facilitate information sharing amongst different humanitarian organizations. In states that are prone to slow-onset natural disasters, FAO, WFP and governments are tasked with monitoring agricultural pre-harvest assessments and publishing monthly bulletins with baseline weather risk analysis

combined with agricultural monitoring (FAO/WFP, 2009). The International Displacement Monitoring Center provides different types of analyses and reporting to inform decision-makers at different levels and across different sectors (IDMC, 2019). UN OCHA collects this information and publishes it in situational reports, maps and visuals (UN OCHA, 2018c) including a Monthly Humanitarian Bulletin, Regular Humanitarian Situation Reports (SitReps), Multi-cluster/sector initial rapid assessments (MIRA), Humanitarian Needs Overview (HNO), Strategic Response Plans (SRP) or Action Plans, Humanitarian Snapshots: overview of humanitarian actors, sub-national presence, needs and population movement, all in one visual. This information is all publicly available on irinnews.org (humanitarian news and analysis), reliefweb.int (near real-time information on humanitarian emergencies in disasters) humanitarianresponse.info, humanitarian.id, preventionweb.net, unocha.org and can be used in the preparedness, early warning, response and recovery phase.
The United Nations Platform for Space-based Information for Disaster Management and Emergency Response (UN-SPIDER) is a platform under the United Nations Office for Outer Space Affairs (UNOOSA) that aims to improve the flow of information on risks and impacts of a disaster between all stakeholders and affected populations which have limited access to specialized technologies in all phases of a disaster (UNOOSA, 2019).

In the early response phase of a disaster, the Humanitarian Data Exchange (HDX), Virtual On-Site Operations Coordination Centre (Virtual OSOCC) and Humanitarian ID can be used. HDX is an open source platform which aims to make humanitarian data and information easy to find and easy to use for analysis, by also advocating a simple common Humanitarian Exchange Language (HXL). Currently, HDX contains information from over 1100 sources, 250 locations and 8300 datasets (HDC, 2019). HDX does not contain personal information, data that exposes people or can put them in danger. In case of non-sensitive data, this information is either publicly available or private. In case it is uncertain if information is sensitive, it is possible to connect with HDX by requesting meta-data. Sensitive data and information will not be shared. As a joint initiative of UN OCHA and the European Commission to improve early warning, disaster alerts and information sharing during a crisis, Virtual OSOCC is part of the Alert and Coordination System (GDACS) (GDACS, 2019).

Besides these global platforms led by professionals, there are also many initiative from communities such as the Humanitarian OpenStreetMap Team (HOT), MissingMaps as well as the use of Facebook, twitter and other open source platforms for information sharing. People and communities wherever in the world have the means to post pictures and videos on social media and send them to news agents. This results in a vast amount of data and information. A complication that comes with dealing with open source information is the challenge to deal with huge amounts of unstructured data and information (Stottlemyre & Stottlemyre, 2013). Whether information from the ground can be acquired through open source means, depends on the Internet and social media coverage in the area. Challenges that go hand in hand with the use of social media are credibility and verification of sources. There are always different truths communicated on social media, with the chance of people deliberately spreading fake information it becomes difficult to distinguish between what is real and what is not. It is crucial to check and verify every piece of image, for instance by reverse image search to check if it is not an old image that is being reused. Stottlemyre and Stottlemyre (2013) argue that without a shared ethical standard, they may not only risk losing the trust of the people they seek to severe and influence, but they could also increase the number of people being hurt, arrested or even killed without knowing that they are in fact doing so.

During the humanitarian response to typhoon Haiyan in 2015, Comes, Vybornova and Van de Walle (2015) observed that in contrary to all the above, mostly low technology or no-technological tools such as paper surveys, questionnaires, contact lists, maps and whiteboards with updated information were often used in the field, even when more sophisticated technological tools were available. The most commonly used technology-based information sharing platforms were found to be Dropbox folders and Skype chat groups. Comes,

4.2.3.1 Information sharing infrastructure in humanitarian response operations

Vybornova and Van de Walle (2015) argue that information sharing in the field frequently takes place on an ad-hoc basis, among individual humanitarians that have similar interests or know each other from earlier deployments to humanitarian response operations. Findings suggest this is not a durable information sharing relationship, as humanitarians rotate frequently, taking their relationships and face-to-face contacts with them home.

4.2.3.2. Information sharing infrastructure in peacekeeping missions

Every participating country in a peacekeeping mission has its own database and defense network for classified information. All these different networks of information go one way up to mission headquarters. Peacekeeping missions encompass a variety of data and information sharing platforms; daily and weekly troops and mission component reports, reports compiled by the Joint Operations Center (JOC), Community Alert Networks (CANs); stakeholder mapping conducted by Political Affairs and Civil Affairs; early warning and flash reports prepared by the Joint Missions Analysis Center (JMAC); violations recorded by Human Rights Division; special analytical products produces by consultants; geospatial and signals intelligence (derived from satellite imagery); open source data; as well as information sharing through engagement with humanitarian and development entities (PAX, 2018).

Via the Situational Awareness Geospatial Enterprise (SAGE) system, UN peacekeepers, police and civilian entities involved in a mission can log and share information regarding incidents, activities and events (Karlsrud & Duursma, 2018). It is a web-based system for all peacekeeping missions to store data and information on incidents, events, activities and related casualties/damages. SAGE allows data and information to be distilled to a point wherein information can be shared. Currently ten peacekeeping missions use SAGE; it is however an UN internal system, NATO & NGOs cannot access it.

Information retrieved from websites that end with '.org' can be copied, and therefore be on two places. Information on websites that end with '.mil' are highly classified and not neutral[2].

Systems where peacekeepers share only unclassified information do also exist. The Marine Civil Information Management System (MARCIMS) is an example of such a network of 'unclassified: for public data only' information, which is open on request[3]. MARCIMS is an initiative of the United States Marine Corps (USMC) that contributes to actionable knowledge of civil components in operational environments in order to improve effective civil affairs operations and Civil-Military Operation (CMO) (Marines, 2019). With MARCIMS, information products from past operations can be used to inform future missions; the effectiveness of current civil operations can be measured, and it is possible to share vital information with partner organizations in an efficient way during missions. Through an open source database, information is stored at the fact level in the MARCIMS net-centric system and is accessible via standard interoperable web services (Marines, 2019).

4.2.3.3. Information sharing infrastructure between humanitarian and peacekeeping organizations

This section will elaborate under which circumstances humanitarian and peacekeeping organizations may interact with each other based on the spectrum of Co-existence, Cooperation and Coordination as defined by De Coning and Friis (2011) in section 4.2.3.3.1 and the current information sharing mechanisms 4.2.3.3.2

4.2.3.3.1. Spectrum of Co-existence, Cooperation and Coordination

When peacekeepers are for example mandated to assist in relief operations or when a humanitarian crisis emerges as a consequence of an armed conflict, peacekeepers may be the parties providing security and safety (UN OCHA, 2018c). The type and nature of the

[2] Appendix C, Peacekeeper #6
[3] Appendix C, Peacekeeper #6

relationship between humanitarian and peacekeeping organizations may however depend on the situation and the nature of the missions and range from co-existence to cooperation and coordination (UN OCHA, 2018c, De Coning & Friis, 2011; Skidd, 2017).

Co-existence: In a violent, hostile environment where peacekeepers encounter threats, while humanitarian organizations are occupied with providing support to the affected population, peacekeepers and humanitarian are more likely to co-exist (De Coning & Friis, 2011). Information is always a source of influence or power and can especially in conflict-affected areas be sensitive, making information sharing more difficult. To ensure humanitarian organizations present and maintain independence in all aspects of non-conflict operations, the majority of the humanitarian organizations will likely distance themselves from direct contact with peacekeeping organizations (CCOE, 2018). Humanitarian and peacekeeping goals are not aligned, hence the environment is referred to as co-existence. In order to establish humanitarian space and ensure independence from peacekeepers, shared information will likely be focused on separation of operations. Primary information sharing needs consist of information about threats to humanitarians and affected communities.

Cooperation: In the aftermath of a disaster, peacekeeping organizations can provide unique capabilities that are not available in the humanitarian environment (De Coning & Friis, 2011; CCOE, 2018). When a 'humanitarian gap' is identified between the needs of the affected community and the available resources to meet these needs, humanitarian and peacekeeping organizations may turn to each other as a 'last resort' tool to complement existing relief mechanisms (UN OCHA, 2012a). Humanitarian and peacekeeping organizations may interact closely and share information regarding situational awareness; hence this environment is referred to as cooperation.

Coordination: In times of peace, peacekeepers will have a role in providing and enabling an environment for humanitarian operations with limited direct participation in the humanitarian operation (De Coning & Friis, 2011). This environment is often found in peacekeeping and stability operations where sustained combat operations are not anticipated (CCOE, 2018). Humanitarian and peacekeeping organizations do not interfere with each other's missions; hence this environment is referred to as coordination and is in between cooperation and co-existence**.**

4.2.3.3.2. Information sharing infrastructure

For humanitarian organizations to engage and interact with peacekeeping organizations in a way that does not compromise the core humanitarian principles, UN OCHA Civil-Military Coordination Service (CMCS) organizes and coordinates the United Nations Humanitarian Civil-Military Coordination (UN-CMCoord) meetings (UN OCHA 2018). The institutionalized UN-CMCoord is a neutral ground that does not put humanitarian principles at risk, aims to avoid competition, minimize inconsistency and when appropriate pursue common goals (UN OCHA, 2017).

The CMCS also develops several programs that aim to train humanitarians and peacekeepers with skills and knowledge necessary to communicate and when appropriate, to effectively interact and coordinate with one another. In recent years, various exercises have been organized for civilian, humanitarian, peacekeeping and police entities to prepare for deployment and experience without the acute pressure of a real disaster, how to interact with each other (CMCS, 2019).

Other entry points for peacekeeping organizations to the humanitarian community are the, inter-cluster coordinators, the OCHA country office and the Humanitarian Coordinator. Representatives of specific military units might be invited to attend HCT or cluster meetings on an ad hoc basis, and only in specific contexts (UN OCHA, 2017). There is no common database where both peacekeepers and humanitarians can share their information.

Information sharing happens at these meetings, face-to-face, via emails with reports or phone calls.

Information exchange also takes place in informal meetings. This is not a long lasting relationship, since both humanitarian and peacekeeping staff turnover, every four to six months. Within this period, a relationship of trust can be gained between humanitarians and peacekeepers, as well as entry points for informal information sharing. However, without any clear protocols or guidebooks that organizes handover, this causes institutional memory loss; information and personal relationships going lost when people leave (UN DPKO, 2012; Van de Walle & Comes, 2015).

4.3. Chapter synthesis | Data Ecosystem

To understand how the relationships between humanitarian and peacekeeping organizations are and analyze how information exchange takes place, this chapter aimed to unravel the humanitarian-peacekeeping data ecosystem. With the help of desk research and literature review aimed to answer the following sub-question: '**Which parties are involved in the humanitarian data ecosystem and what are their roles, responsibilities and relationships?**'. This chapter consisted of two parts (1) involved parties in humanitarian response operations and peacekeeping missions and (2) humanitarian-peacekeeping data ecosystem, which is defined as (2.1) information demanders and suppliers (2.2) information demand and supply and (2.3) information sharing infrastructure. The main findings of this chapter are fourfold:

Firstly, findings suggest that there is no single organization or entity that decides who does what and where, or who controls a humanitarian relief operation (Balcik et al., 2010). The vast amount of organizations, frameworks and coordination mechanisms between humanitarian organizations indicate an institutional fragmentation and fragmentation of responsibilities. Findings suggest that humanitarian organizations are often reluctant to share information with other humanitarian organizations, to keep a competitive advantage in attracting attention and donor funding (Balcik et al., 2010; Stephenson, 2005; Underwood, 2016).

Secondly, findings suggest that peacekeeping missions are centralized with a clear line of authority. The head of the peacekeeping mission decides in which direction information is required and in which direction information must be collected, this is captured in a peacekeeping intelligence cycle. Findings suggest that peacekeeping missions are becoming increasing multidimensional, comprising not only military forces, but also civilian personnel and are increasingly participating in humanitarian activities (Egnell, 2013; Foo, 2012). However, humanitarian and peacekeeping organizations often cover different geographical areas as peacekeepers are deployed to some of the most dangerous areas, protecting the most vulnerable people. Both peacekeepers and humanitarians might not be well informed or familiar with the activities of the other party. This may lead to prejudice and misunderstandings.

Thirdly, findings suggest that planning a response to slow-onset natural disasters is done on a regular basis: early warning systems and the coordination of response give humanitarian organizations time to provide humanitarian assistance to the most vulnerable people in need (Hurt, 2011). To find the most vulnerable people, humanitarians need to go into the drought-affected areas, interview people and assess their needs. Findings suggest that especially in conflict-affected areas information collection may be dangerous or not possible at all. Combined with limited local government data, not much use of Internet and limited information sharing, chances are that assessments are incomplete or unreliable, which subsequently affects accurate decision-making and may make the most vulnerable people even more vulnerable. When deployed to regions that are prone to conflict, peacekeeping organizations collect a lot of information to gain insight into what is going on, in order to intervene and contribute to the long-term prevention of conflict. By sharing information with humanitarian

organizations that aim to alleviate human suffering from food shortages, peacekeeping organizations may indirectly reach their own goals of reduced conflict.

Fourthly, findings suggest that whenever there is room for cooperation or coordination and a 'humanitarian gap' is identified, humanitarian and peacekeeping organizations can turn to each other as a 'last resort' tool, to meet the needs of the affected population (De Coning & Friis, 2011; CCOE, 2018; UN OCHA, 2012a). Data and information are sensitive, especially in conflict-affected areas where knowledge can be used as power of leverage. Despite peacekeeping organizations having an image of only using closed classified systems for data and information sharing, there are examples of peacekeeping systems that handle unclassified, for public release information. There is however no common database where both peacekeepers and humanitarians can share their information. UN-CMCoord has been found to be an institutionalized structure where humanitarian and peacekeeping organizations can interact on neutral ground that does not put humanitarian principles at risk (UN OCHA, 2017). Information sharing between humanitarian and peacekeeping organizations happens at these organized meetings, face-to-face, via emails with reports or phone calls. Information exchange also takes place in informal meetings. Findings suggest that this is a non-durable information sharing relationship, since both humanitarian and peacekeeping staff turnover every four to six months. However, without any clear protocols or guidebooks that organize handover, this causes institutional memory loss; information and personal relationships are lost when people leave (UN DPKO, 2012; Van de Walle & Comes, 2015).

Bearing in mind all the above, it can be concluded that coordination and cooperation between humanitarian and peacekeeping organizations is complex due to numerous differences between the organizations. Chapter 5 will elaborate on the differences in institutional rules and governance that may lead to possible barriers that may hinder information sharing between humanitarian and peacekeeping organizations. In chapter 6 the findings of this chapter will be tested in the case study.

5

Understanding the differences in rules and play of the game

Humanitarian - peacekeeping cooperation and coordination is complex due to numerous differences between the two organizations. Both humanitarian and peacekeeping organizations are complex institutions with formal and informal rules and governance structures: the rules and play of the game. In this chapter, the differences between both complex institutions will be analyzed, in order to unravel possible institutional barriers for humanitarian and peacekeeping organizations to share information with each other. This chapter aims to answer the sub-question: '**What are possible institutional barriers for humanitarian and peacekeeping organizations to share information?**'. Knowledge about the possible barriers may help identify opportunities to overcome them. To answer this sub-question, Williamson's (2000) framework for institutional analysis will be used.

Recipient of the Nobel prize in Economic Sciences, Williamson (2000), has constructed a framework to analyze complex institutions following four levels of institutional analysis: (1) social embeddedness and cultural foundations which encompass informal rules, (2) formal rules, laws and regulations, (3) governance and contracts, or in other words the play of the game and (4) resource allocation. This chapter will focus on the first three levels of Williamson's (2000) framework, respectively the informal and formal rules of the game and the governance or play of the game to analyze the differences between humanitarian and peacekeeping organizations which may lead to possible institutional barriers for both organizations to share information with each other. Level four: resource allocation is not within the scope of this research. This analysis is performed with the help of desk research, literature review and enhanced with observations from a set of interviews with 15 humanitarians, peacekeepers and interface (between both) (Appendix C). Section 5.1 will focus on level one of Williamson's (2000) framework of institutional analysis by analyzing the differences in informal rules. Section 5.2 will focus on level two of Williamson's (2000) framework of institutional analysis by analyzing the differences in formal rules. Section 5.3 will focus on level three of Williamson's (2000) framework of institutional analysis by analyzing the differences in governance and play of the game and section 5.4 will conclude with the main findings.

5.1. Level one: Differences in terms of informal rules of the game

Level one encompasses social embeddedness and cultural foundations. Social embeddedness is the concept of customs, norms and traditions. Williamson (2000) argues that the basic social and cultural foundations of an institution change very slowly, with adaptation periods between 100 and 1000 years and are considered to be the informal constraints. This section will analyze the differences in terms of informal rules between humanitarian and peacekeeping organizations, which may possibly lead to barriers for both organizations to share information with each other.

Cultural perceptions: Many researchers suggest that difference in cultural perceptions is one of the barriers of effective interaction between humanitarians and peacekeepers (Barry &

Jefferys, 2002; James, 2003; Franke, 2006; Scheltinga et al., 2005; Metcalfe et al., 2012). The word 'culture' seems to be an umbrella term to which many specific problems refer; differences in goals, motivations, values, ways to accomplish goals and principles can all be brought back to this concept of 'culture'. These differences may lead to prejudice and misconception between the two parties.

Motivations, goals and values: Humanitarian response is in essence motivated by the desire to reduce human suffering worldwide (UN OCHA, 2018c). Humanitarian organizations are long-term committed to address whatever needs may arise, on all sides of a conflict, distributing humanitarian aid solely on the basis of need (UN OCHA, 2012b).
Member states decide based on political-related or national security-related objectives whether to participate in a peacekeeping mission and if so, what personnel and equipment they are willing to contribute[4] (PKO UN, 2018). This is necessary, as the United Nations does not have forces other than those, which member-states provide for each specific peacekeeping operation (UNP, 2018a). The mission and its mandate determine the goals and motivations of peacekeepers, which are ordered to be present UNP, 2018a). Peacekeeping activities aim to contribute to basic human rights and democratization (Rijksoverheid, 2014). These differences in motivations, goals and approaches between humanitarian and peacekeeping organizations may lead to prejudice and misconception between the two parties.

Closeness vs. distance: Humanitarians often place themselves in the midst of local population with few boundaries between them and no emphasis on violence. Due to closeness, they incorporate local cultural modes and often adapt to the local manners, have a close relationship with the community and extensive knowledge of the cultural context, something peacekeepers often lack (Rijksoverheid, 2014).
Peacekeepers are concerned with maintaining objectivity, which can lead to maintaining distance from the local population. Observations from an interview with a peacekeeper suggest that before two conflicting communities can be brought together, a lot of effort is needed to make the dialogue work. In an interview with an experienced peacekeeper in the field, observations suggest that peacekeeping missions sometimes lack dialogues on local level, something they can benefit from humanitarian organizations[5]. Findings suggest that the difference in ways of accomplishing goals may lead to misunderstanding and misperception between the community and the mission[6].

Neutrality and impartiality vs. political mandates: To assist the wounded on the battlefields of the 19th century, the founders of the International Red Cross and Red Crescent Movement codified the humanitarian principles that enabled them to gain access and acceptance by all parties to the conflict and allowed them to carry out their humanitarian missions successfully (Van Liempt & Van Kooten, 2017). Later the United Nations General Assembly formally adopted these principles as the basis for humanitarian action in all setting, whether natural or man-made disasters, conflict or other types of crises (UN OCHA, 2012b). Based on the seven core humanitarian principles of humanity, impartiality, neutrality, independence, voluntary service, unity and universality; humanitarian aid must be distributed solely on the basis of need; humanitarian aid organizations cannot take sides in a conflict; and humanitarian aid should only go towards humanitarian needs (UN OCHA, 2002). By adhering to these principles, humanitarian organizations can gain access to people in need, also in situations of conflict.
Peacekeepers deploy to regions to help prevent escalation of conflict, based on political-, economical- or national security-related objectives[7]. In doing so, peacekeepers follow three principles; consent of the parties, impartiality and non-use of force except in self-defense and defense of the mandate, when ordered to do so by their respective national governments

[4] Appendix C, Peacekeeper #12, #15, #16
[5] Appendix C, Peacekeeper #13
[6] Appendix C, Peacekeeper #13
[7] Appendix C, Peacekeeper #12, #15, # 16

(UNP, 2018a). It is important to define impartiality and should not be mixed with being neutral or inactive. It is crucial for peacekeepers to be impartial while dealing with parties to the conflict, however they should not be neutral in execution of their mandate (UNP, 2019). The activities of peacekeepers are thus politically legitimated and not neutral. Findings suggest that for humanitarians to work together with peacekeepers, this can be contrary to the humanitarian principles of neutrality, impartiality and independence and form a barrier for information sharing.

Humanitarian gap and 'last resort': Humanitarian and peacekeeping organizations can turn to each other as a 'last resort' tool, to complement existing relief mechanisms whenever a 'humanitarian gap' is identified between the needs of the affected community and the available resources to meet those needs by providing unique advantages in terms of capability, availability, and timeliness (UN OCHA, 2012a). This is stated in the 'Oslo Guidelines' and 'Guidelines on the use of military and civil defense assets to support UN Humanitarian activities in complex emergencies', which are developed by humanitarian organizations, member states and other international, regional and non-governmental organizations that participated in the 'Consultative Group on the Use of MCDA'. These guidelines are also consistent with other humanitarian guiding documents (UN OCHA, 2012a).

5.2. Level two: Differences in terms of formal rules of the game

Level two encompasses the formal rules of the game. Williamson (2000) argues that change in governance arrangements take place more quickly than in level one, about 10 to 100 years. As chapter 4 elaborates on the different parties and their mandates in humanitarian response operations and peacekeeping missions in fragile states that are prone to slow-onset natural disasters and conflict, this section will analyze the difference in terms of formal laws between humanitarian and peacekeeping organizations which may possibly lead to barriers for both organizations to share information with each other.

International Law: When a region is affected by either a rapid- or slow-onset natural or man-made disaster, people in need can claim assistance from their state authority through the framework of International Human Rights Law (IHRL) (UN, 2018). International law legitimized humanitarian operations. The Governance and Social Development Resource Centre (GSDRC) state that international humanitarian assistance is subject to international law, in the form of International Humanitarian Law (GSDRC, 2013). Guided by the International Humanitarian Law (IHL), humanitarian organizations can support people in need, also in situations of armed conflict. In hostile environments, occupants are obliged to cooperate with humanitarian organizations (ICRC, 1988).
UN Peacekeepers are subject to international law and also collective security law governing the use of force. The trinity of UN peacekeeping principles of consent of the parties, impartiality, and non-use of force except in self-defense and defense of the mandate (UNP, 2018a), reflect on the fundamental principles of international law: sovereignty, non-intervention, and non-use of force.

UN Charter: Charter of the United Nations and statute of the International Court of Justice (1945), the United Nations Security Council is responsible for maintaining international peace and security and determines when and where a UN Peacekeeping operation should be deployed, the operation's size, overall objectives and time frame. Member states decide whether to participate in a mission and if so, what personnel and equipment they are willing to contribute (PKO UN, 2018). This is necessary, as the United Nations does not have forces other than those, which member-states provide for each specific peacekeeping mission (UNP, 2018a).

In the scope of this research, differences in formal laws between humanitarian and peacekeeping organization that may hinder information sharing between both parties are not taken into account.

5.3. Level three: Differences in terms of governance and the play of the game

Level three encompasses the institutional governance. Williamson (2000) argues that change in governance arrangements takes place more quickly than in level two, about 1 to 10 years. This section will analyze the differences in terms of governance between humanitarian and peacekeeping organizations, which may possibly lead to barriers for both organizations to share information with each other.

Hierarchical vs. flat: The organizational structure of peacekeeping organizations can be described as hierarchical with a clear line of authority and discipline defined in mandates and doctrines with a top-down command and control decision-making process (Franke, 2006; Frerks et al., 2006).
Humanitarian organizations are on the other hand the complete opposite and in general less hierarchical (Egnell, 2013; Franke, 2006; Metcalfe et al., 2012). In most humanitarian response operations, no single organization or agency, including the UN, has authority over other involved parties (Balcik et al., 2010). In general, the organizational structure of humanitarian organizations is more horizontal and flat, where decisions are often made in a more or less informal setting through consensus.

Centralized vs. decentralized information management: Information management of peacekeeping organizations can be seen as central, vertically organized with a top-down command and control decision-making process (Franke, 2006; Frerks et al., 2006). The Head of the Mission determines the guidelines on Mission Priority Information Requirements (MPIR) and Mission Intelligence Acquisition Plans (MIAP)[8] (UN DPKO, 2017). Observations from interviews with peacekeepers suggest that in peacekeeping missions, information is sent one way up[9]. In interviews with peacekeepers observations suggest that various mission components collect data and information to inform interventions, test assumptions and identify potential threats[10].
Information management in humanitarian organizations can be seen as more decentralized. Each humanitarian organization makes its own decisions based on their mission, tasks and goals, which define their information needs. When necessary, humanitarian organizations start collecting information internally and externally, through assessments in the field or from secondary resources (UN OCHA, 2016). Abiding the humanitarian principles, the thirteen principles for humanitarian information management have been determined as: accessibility, inclusiveness, interoperability, accountability, verifiability, relevancy, objectivity, humanity, timeliness, sustainability, reliability, reciprocity and confidentiality (Van de Walle & Comes, 2015; UN OCHA, 2002). In humanitarian response operations, data and information is used to inform decision-making to provide humanitarian assistance to the most vulnerable people in need (UN OCHA, 2012b). In both humanitarian operations and peacekeeping missions, a lot of information is gathered through different systems, with different tools and by a myriad of people[11]. Information comes in various forms and sizes and is not always interoperable.

Classified vs. do no harm: Information is always a source of influence or power and especially in conflict-affected areas come with specific risks. Information sources may possibly provide wrong information[12], which could influence decision-making. At the same time,

[8] Appendix C, Peacekeeper #12, #13, #16
[9] Appendix C, Peacekeeper #5
[10] Appendix C, Peacekeeper #13, #16
[11] Appendix C, Peacekeeper #5, #8, #13, #14, Interface #1
[12] Appendix C, Peacekeeper #11

confidentiality is needed to protect trustworthy sources (CCOE, 2018). If information falls into the wrong hands, it could be misused and put people in danger. To deal with sensitive information in a good manner, peacekeeping organizations make use of classification system which securely handle information to protect the safety and security of sources, minimizes the risk of unauthorized diffusion of information, protects the interests of the mission and meets the obligations of International Law and General Data Protection Regulation (GDPR) when sharing information[13] (UN DPKO, 2017). Information from external sources may place those sources at risks or compromise them, especially if it is a human source. To protect their movements or future operational plans, prevent counter moves by opponents and ensure safety or security of sources, data and information which is collected, stored and shared as part of the peacekeeping intelligence cycle (Figure 4.7) is labeled as 'confidential', 'strictly confidential' or 'unclassified' (UN DPKO, 2017). Information gained from a classified system may disclose either a capability or a limitation of that system, or both. This is however information that can be shared within a mission. Observations from interviews with peacekeepers suggest that peacekeepers may not always have the same trust that information shared with another party will not be passed to other organizations[14]. Therefore, information shared with entities outside the mission has to be considered 'for public release only' since control of the shared information is not certain and may end up in the public domain.

Findings suggest that humanitarian organizations do not have the same level of classification systems (UN DPKO, 2017). Systems humanitarian organizations use, do classify information as public, internal or confidential; this information will be publicly available, shared on request or not shared at all. Several humanitarian organizations, including UN OCHA are committed to 'do no harm' with data and are currently developing and improving their data responsibility policy (UN OCHA, 2016). Data responsibility encompasses data protection, local and humanitarian context and ethical standards and principles.

> A risk of the classification system is 'over-classification' of non-sensitive information that ends up in the system
>
> *At a meeting where humanitarians and peacekeepers were present, a humanitarian prepared something on a piece of paper and gave it to a peacekeeper. After the meeting the humanitarian noticed that he did not have a spare copy with him. The next time the humanitarian saw the peacekeeper; he asked if he could have the information he gave, back. Unfortunately the peacekeeper could not give this information back to the humanitarian. It had already got into the system and became classified information*[15]
>
> *In Afghanistan peacekeepers were watching a village for months, trying to figure out who is who, only to find out after four months that other peacekeepers had already completed this assessment and knew exactly who was who. This information got so classified, it could not be found*[16]

Centralized vs. decentralized information sharing: In interviews with peacekeepers, observations suggest that in peacekeeping organizations, a person with higher authority may have release authority for most of the information sharing processes with the affected state or humanitarian organizations[17] (Goldenberg, Soeters & Dean, 2017; UN DPKO, 2017). Delegating a list of information products the peacekeepers may share (CCOE, 2018). Information shared with entities outside the mission has to be considered 'for public release only' since control of the shared information is not certain and may end up in the public domain (UN DPKO, 2017).

[13] Appendix C, Peacekeeper #5, #8, #12, Interface #1, #2, #3
[14] Appendix C, Peacekeeper #5, #6
[15] Appendix C, Interface #2
[16] Appendix C, Peacekeeper #8
[17] Appendix C, Peacekeeper #12, #13, #16

UN OCHA is an example of a centralized coordination mechanism that aims to facilitate humanitarian response operations by conducting needs assessments in affected areas and sharing this information with other humanitarian organizations. Findings suggest that humanitarian organizations operate in a more decentralized, market-like information sharing environment. Humanitarian organizations concentrate on specific efforts and each humanitarian organization makes its own decision to share information when and if it supports the specific efforts, abiding the humanitarian principles (UN OCHA, 2012a). Findings suggest that humanitarians typically work to ensure the safety of their staff and that of the affected population. Keeping a competitive advantage in attracting attention and donor funding could delay, limit or stop altogether the information provided to both the affected state and the responding peacekeepers[18] (Balcik et al., 2010; Stephenson, 2005; Underwood, 2016). Information comes in various forms and sizes and is not always interoperable. There is no common database for humanitarian and peacekeepers to share information[19].

Language: Observations from interviews suggest that apart from the language barrier between the different international communities, humanitarian and peacekeeping organizations have different terminology and words meaning different things, leading to misinterpretation[20]. Humanitarians often use the word 'information' where peacekeepers for example use 'human intelligence' (CCOE, 2018; PAX, 2018). Experience from participating in the information sharing workshop organized by the Civil-Military Cooperation Center Of Excellence on October 15th, 16th and 17th 2018, have taught the author the importance of common definitions. Despite the fact that the UN and NATO have definitions for certain terminology, the various peacekeepers present seemed to have their own definitions for terms as Civil-Military Cooperation (CMC), Civil-Military Information Management (CMIM), Information Sharing (IS) and Human Intelligence (HI). Terms as 'doctrine' and 'U9' are also not familiar to every humanitarian.

5.4. Chapter synthesis | Differences in rules and play of the game

This chapter, with the help of desk research, literature and interviews with a set of 15 humanitarians and peacekeepers (Appendix C), aimed to answer the sub-question: "**What are possible institutional barriers for humanitarian and peacekeeping organizations to share information?**'. By following Williamson's (2000) framework for institutional analysis the informal and formal rules and governance or play of the game of humanitarian and peacekeeping organizations have been analyzed. Table 5.1 provides an overview of the identified differences between humanitarian and peacekeeping organizations.

Table 5.1: Overview of identified differences between humanitarian and peacekeeping organizations following Williamson's (2000) framework for institutional analysis

	Humanitarian Organizations	**Peacekeeping Organizations**
Level one: Differences in informal rules of the game		
Goals	• Determined by the mission: to reduce human suffering worldwide[21]	• Determined by the mission: peacekeepers are often sent in order to prevent escalation of the conflict, this can be one sided[22]
	Humanitarian Organizations	**Peacekeeping Organizations**
Motivations	• Long term commitment to address whatever needs the most vulnerable may have, on all sides of a conflict[23]	• Political-related objectives or national security-related objectives[24]

[18] Appendix C, Interface #1, #2, #3
[19] Appendix C, Peacekeeper #5, #8, #13, #14, Interface #1
[20] Appendix C, Peacekeeper # 11, Interface #1, #2
[21] (UN OCHA, 2018)
[22] (UNP, 2018a)
[23] (Metcalfe et al., 2012)
[24] Appendix C, Peacekeeper #12, #15, #16

		• Peacekeepers are told to be there[25]
Values	• Humanitarian aid contributes to basic human rights and must be distributed solely on the basis of need[26]	• Peacekeeping activities aim at contributing to basic human rights and democratization[27]
Ways to accomplish goals	• Humanitarians often place themselves midst of the local population with few boundaries. Due to closeness, they incorporate local cultural modes[28]	• Peacekeepers are concerned with maintaining objectivity which can lead to maintaining distance from the local population[29]
Principles	• Abiding the core humanitarian principles: humanity, impartiality, neutrality, independence, voluntary service, unity and universality[30] • Can turn to peacekeepers as 'last resort'[31]	• Consent of the parties involved, non-use of force - except in self-defense and defense of the mandate, impartial when dealing with parties to the conflict, however not neutral in executing the missions mandate[32]
Level two: Differences in formal rules of the game		
International Law	• International Humanitarian Rights Law: people in need can claim assistance[33] • International Humanitarian Law: can support people in need, also in hostile environments[34]	• International Law: Sovereignty, nonintervention, nonuse of force[35] • UN Charter: responsible for maintaining international peace and security[36]
Level three: Differences in governance and play of the game		
Organizational structure	• Horizontal structure, decentralized, decisions are often made in a more or less informal setting through consensus[37]	• Hierarchical with clear line of authority and discipline, defined in mandates and doctrines, centralized, top down command and control[38]
Information management	• The mission, tasks and goals define information needs[39] • Data and information is used to inform decision making to provide humanitarian assistance to the most vulnerable people in need[40] • Information is collected internally and externally through field assessments and secondary sources by a myriad of people, abiding the humanitarian principles[41]	• The head of the mission determines in which direction information is needed and must be collected[42] • Data and information is used to inform interventions, test assumptions, and identify potential barriers to buy-in on parties[43] • A lot of information is gathered through different systems, with different tools and by a myriad of people[44]
	•	•
	Humanitarian Organizations	**Peacekeeping Organizations**
Security and classification	• Sensitivity: Information as source of power, confidentiality needed[45]	• Sensitivity: Information as source of power, confidentiality needed[47]

[25] (UNP, 2018a)
[26] (UN OCHA, 2012b)
[27] Appendix C, Peacekeeper #13
[28] (Rijksoverheid, 2014)
[29] (Rijksoverheid, 2014), Appendix C, Peacekeeper #13
[30] (UN OCHA, 2012b)
[31] (UN OCHA, 2012b)
[32] (UNP, 2018a)
[33] (UN, 2018)
[34] (GSDRC, 2013)
[35] (UN, 1945)
[36] (UNP, 2018a)
[37] (Egnell, 2013; Franke, 2006; Metcalfe et al., 2012)
[38] (Franke, 2006)
[39] (UN OCHA, 2016)
[40] (UN OCHA, 2016)
[41] (UN OCHA, 2016; UN OCHA, 2002)
[42] (Franke, 2006; Frerks et al., 2006; UNDPKO, 2017), Appendix C, Peacekeeper #12, #13, #16
[43] Appendix C, Peacekeeper #13, #16
[44] Appendix C, Peacekeeper #5, #8, #13, #14, Interface #1
[45] (Goldenberg, Soeters & Dean, 2017; UNDPKO, 2017), Appendix C, Peacekeeper #5, #8 #11 #12, Interface #1, #2, #3
[47] (UNDPKO, 2017), Appendix C, Peacekeeper #5, #8 #11 #12, Interface #1, #2, #3

	• Do no harm, data responsibility[46]	• Classification system[48] risk of over-classification[49]
Information sharing policies	• Market-like structure of information sharing. Information is shared horizontally when and if it is in their best interest to do so[50] • Information is shared abiding the humanitarian principles including 'last resort'[51] • Sensitivity of information; this will not be shared, or only on request with trustworthy partners[52]	• Information is shared one way up[53] • Top decides what to share with the affected state or humanitarian organizations and what not; if it is classified as 'for public release only'[54] • Sensitivity of information; this will not be shared, or only on request with trustworthy partners[55]
Ad hoc information sharing	• High rotation rate of internationally deployed humanitarians, no guiding protocols or overlap to handover knowledge and contacts[56]	• High rotation rate of internationally deployed peacekeepers, no guiding protocols or overlap to handover knowledge and contacts[57]
Language[58]	• Different terminology and words meaning different things, which may lead to misinterpretation	• Different terminology and words meaning different things, which may lead to misinterpretation

Looking at level one and the differences in informal rules between humanitarian and peacekeeping organizations, findings suggest that differences in goals, motivations, values and ways to accomplish goals may lead to prejudice and misunderstanding and misconception. Findings also suggest that for humanitarian organizations to work together with peacekeeping organizations, this may be contrary to the humanitarian principles of neutrality, impartiality and independence as peacekeeping organizations have political objectives and are therefore not neutral. This may form a possible organizational barrier for humanitarian and peacekeeping organizations to share information with each other.

In the scope of this research, differences in formal laws between humanitarian and peacekeeping organization that may hinder information sharing between both parties are not taken into account.

Looking at level three and the differences in governance between humanitarian and peacekeeping organizations, findings suggest that differences in organizational structure and language may form possible organizational barriers for humanitarian and peacekeeping organizations to share information with each other. Findings also suggest that differences in information management, information security and classification and ad hoc relationships may form possible barriers regarding the process of sharing information between humanitarian and peacekeeping organizations. Lastly findings suggest that the lack of a common database and difference in technological means may form possible technological barriers for humanitarian and peacekeeping organizations to share information with each other.

Findings suggest that the institutional barriers for humanitarian and peacekeeping organizations to share information with each other can be grouped together in three categories: (1) Technological barriers, (2) Organizational barriers and (3) Process barriers. Therefore, the

[46] (UN OCHA, 2016)
[48] (UN DPKO, 2017).
[49] Appendix C, Peacekeeper #5, #8
[50] (Balcik et al., 2010; Stephenson, 2005; Underwood, 2016; UN OCHA, 2012)
[51] (UN OCHA, 2012), Appendix C, Humanitarian #1
[52] (UNDPKO, 2017), Appendix C, Peacekeeper #5, #8 #11 #12, Interface #1, #2, #3
[53] Appendix C, Peacekeeper #5
[54] (UN DPKO, 2017), Appendix C, Peacekeeper #12, #13, #16
[55] (UNDPKO, 2017), Appendix C, Peacekeeper #5, #8 #11 #12, Interface #1, #2, #3
[56] (Van de Walle & Comes, 2015)
[57] (UNDPKO, 2015), Appendix C, Peacekeeper #5, #6, #9, #13
[58] (CCOE, 2018; PAX, 2018), Appendix C, Peacekeeper #11, Interface #1, #2

following framework for barrier analysis is being proposed: the Technology-Organization-Process (TOP) Framework.

(T) Technological barriers encompass interoperability and differences in technological means to share information
(O) Organizational barriers encompass differences in culture, language and principles, which may lead to prejudice, misinterpretation and misunderstanding
(P) Process barriers encompass differences in information management, information security and classification and relationships with other parties to share information

In chapter 6 Williamson's (2000) framework for institutional analysis and the proposed TOP-framework for barriers analysis will be tested in the case study.

6

Case Study Mopti, Mali

The aim of this research is to identify and enhance the understanding of differences between humanitarian and peacekeeping organizations that may lead to possible barriers for both organizations to share information with each other in fragile states that are prone to both slow-onset natural disasters and conflict. Due to the exploratory nature of this study and in order to test and add to the findings of chapter 3, 4 and 5 and to answer the sub-question: 'What are possibilities for humanitarian and peacekeeping organizations to share information in the case of Mali?'. a case study on Mali is performed. The focus of the case study is information sharing between the Red Cross Movement and Dutch peacekeepers that contribute to the MINUSMA peacekeeping mission within the context of drought, food security and conflict in Mopti, Mali.

With the help of desk research, literature review and by conducting interviews with a set of 8 humanitarians from the Red Cross Movement and peacekeepers who contributed to the UN peacekeeping mission MINUSMA in Mali, this case study comprises of five components. Section 6.1 will elaborate on the scope of the case study and the narrative of the Drought-Food insecurity-Conflict Nexus in Mopti, Mali. In section 6.2, the conceptual model of the relationship between drought fueled food insecurity and conflict (Chapter 3) will be improved, formalized and constructed into a System Dynamics model based on the parameterization of the case on Mopti, Mali. In section 6.3 the Red Cross Movement – Dutch MINUSMA peacekeeping data ecosystem will be explored. In section 6.4 possible institutional barriers for the Red Cross Movement and Dutch MINUSMA peacekeepers in Mali will be explored by identifying differences in institutional rules and governance or play of the game of information sharing following Williamson's (2000) framework for institutional analysis and the proposed Technology-Organization-Process framework found in chapter 5. Section 6.5 will explore possibilities for the Red Cross Movement and Dutch peacekeepers that contribute to the MINUSMA peacekeeping mission to share information with each other in the case of Mali. Section 6.6 will conclude with the main findings.

6.1. Scope Case Study

This section elaborates on the scope of the case study. The focus of the case study is information sharing between the Red Cross Movement and Dutch peacekeepers that contribute to the MINUSMA peacekeeping mission within the context of drought, food security, internal displacement and conflict in Mopti, Mali. Section 6.1.1 elaborated on the context of Mali. Section 6.1.2 elaborates on the narrative of the Drought-Food insecurity-Conflict Nexus in Mopti, Mali. Section 6.1.3 elaborates on the Red Cross Movement humanitarian food response. Section 6.1.4 elaborates on the mission of the Dutch peacekeepers that contribute to the MINUSMA mission. The scope of the case study in this research is determined as follows:

Country Mali

Mali is a country in the Sahel (Figure 6.1) that is wrapped in conflict and instability. It is a fragile state that is prone to slow-onset natural disasters and conflict, due to both ongoing tensions between the government and armed groups, temperatures that are rising 1.5 times faster than average and prolonged periods of drought (Chauzel & van Damme, 2015; RCC, 2018; UN OCHA, 2018a; UN OCHA, 2018b). This research will conduct a simplified case study on information sharing between the Red Cross Movement and Dutch peacekeepers that contribute to the MINUSMA peacekeeping mission in Mali, in the context of drought fueled food insecurity and conflict.

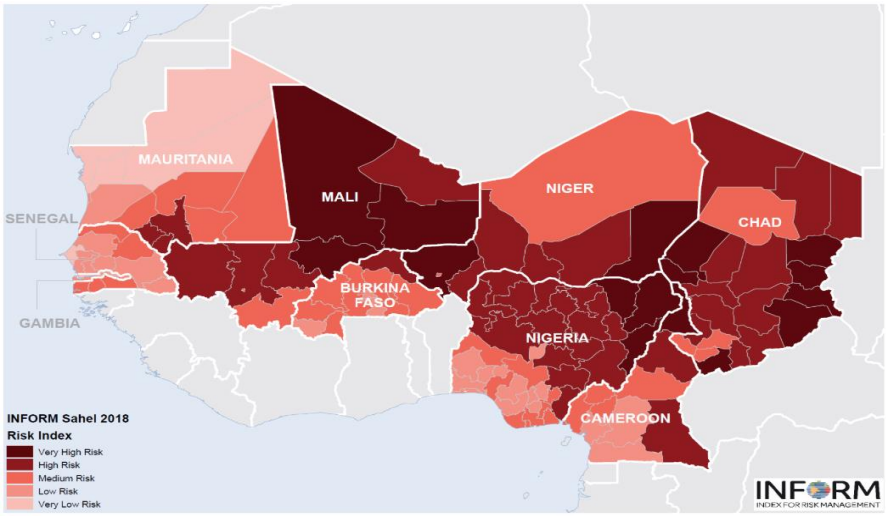

Figure 6.1. Risk assessment of the Sahel (INFORM, 2018)

Drought and Food insecurity

A drought is a period of unusually or unexpectedly low rainfall, which upsets the ecological balance; a condition in which the amount of water needed for transpiration and direct evaporation exceeds the amount available in the soil, in terms of water needs for particular crops growing under a specific combination of environmental conditions (UN OCHA, 2011).
Droughts have effects on people, their ways of life, crops, livestock, natural vegetation, wildlife, soil, population size and population redistribution.
“Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food for a healthy and active life” (World Food Summit Plan of Action, 1996: p.1). The term ‘famine’ implies a particularly extreme level of severity and suffering.

Mopti region

Figure 6.2. Mopti, Mali (Fewsnet, 2019)

Mopti is a region in the south of Mali that is prone to both slow-onset natural disasters and conflict (Figure 6.2). The INFORM Index For Risk Management which is based on more than 40 indicators, is being used to support the Humanitarian Program Cycle. According to the INFORM risk index, which is scaled from 0 to 10, the food insecurity probability in Mopti is 9.4, the drought probability is 7 and the conflict probability is 8.5 (INFORM, 2018). According to UN OCHA (2018), in August 2018, of the 2.5 million people in Mopti, approximately 1 million were in need of protection and humanitarian assistance; the highest proportion of people in need in the whole country.

Dutch efforts in Mali

Figure 6.3. Thank you Netherlands for your service and sacrifice (UNP, 2018c)

In line with recommendations from the Planetary Security Initiative, the Netherlands contributes to Mali and the Sahel through an integrated approach to tackle root causes of limited socio-economic perspectives, instability and irregular migration as can be seen in Figure 6.4 (Ministry of Foreign Affairs, 2019). Minister Blok of Foreign Affairs and Minister Kaag of Foreign Trade and Development Cooperation state that the Netherlands is strengthening its commitment to climate adaptation, food security, sustainable water use and the prevention of land degradation and desertification. The main objective is to make the population more resistant to the effects of climate change and preventing conflicts about scarce natural resources. The link between climate change, management of natural resources and local government is already embedded in current programs such as the Strategic Partnership 'Partners for Resilience' (Wetlands International, Red Cross and CARE).

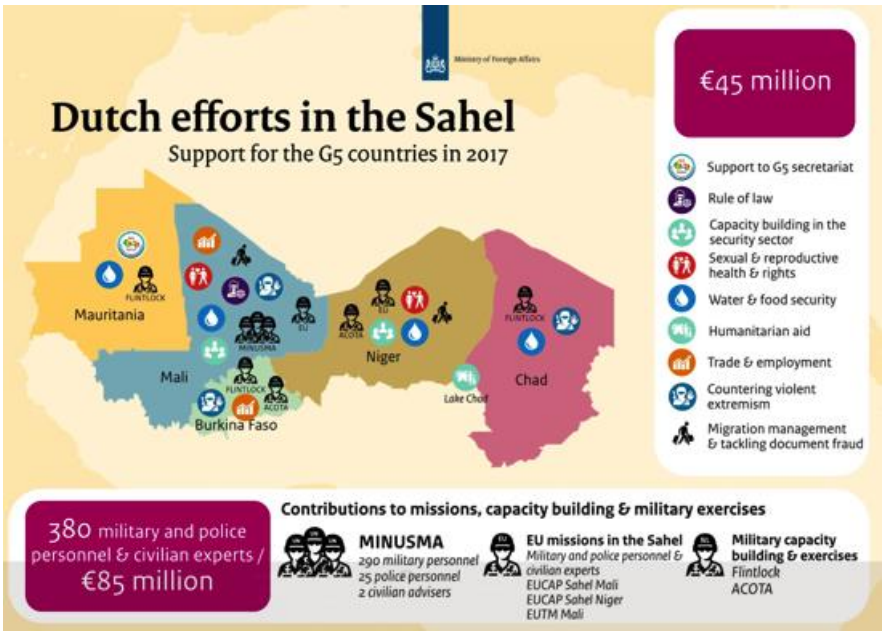

Figure 6.4. Dutch efforts in the Sahel (Ministry of Foreign Affairs, 2018)

Red Cross Movement

In close cooperation with the Mali Red Cross: Croix-Rouge Malienne (CRM), the Netherlands Red Cross (NLRC) and 510 are contributing to several efforts in Mali.

Currently, the NLRC, ICRC and IFRC are working closely with the CRM to distribute food and basic household necessities in Mali. Together they also improved access to water and healthcare services for people and livestock whose lives have been roiled by conflict, armed violence and drought (ICRC, 2018).

In Mali, the ICRC works closely with the CRMC to connect people again with their loved ones with whom they have lost contact due to conflict (ICRC, 2018). ICRC also treats people who have become wounded or injured due to fighting, visits detainees, rebuilds and reconnects water supply systems, distributes seeds and tools to

farmers, vaccinates livestock and raises awareness of International Humanitarian Law (ICRC, 2018).

The Red Cross Climate Centre together with 15 other partners on the Multi-Agency program Building Resilience and Adapting to Climate Extremes and Disasters (BRACED). BRACED supports for example communities to plant vegetables and fruit-tree saplings that thrive in arid climates (RCC, 2019). In close cooperation with the Dutch Ministry of Foreign Affairs, Care, Cordaid, RCRC Climate Centre and Wetlands International, NLRC is working on Partners for Resilience (PfR). They target the most vulnerable communities in Mali, mainly caused by floods and droughts (PfR, 2018). “The overall goal of this program is to make vulnerable fishers, herders and farmers living in the wetlands and basins more resilient to crises in the context of climate change and environmental degradation and to enable sustainable inclusive economic growth and preservation of ecosystems” (PfR, 2018).

Other NLRC contributions in Mali are stated below:
Through the Response Preparedness Program II (RPP II), the Red Cross aims to enable a better prepared response mechanism of the RCRC Movement partners and surrounding stakeholders in case disasters strike, and therefore complements community-based resilience and Disaster Risk Reduction activities. Through the RPPII, the Red Cross is working on an Impact-Based-Forecasting, information management and data preparedness, Cash Transfer Programming in preparedness and improved sanitation in emergency response (NLRC, 2018).

The IFRC has long focused on helping communities prepare and respond to health emergencies through its 190 Red Cross and Red Crescent National Societies. The Community Epidemic and Pandemic Preparedness Program (CP3) scales up that effort. This program strengthens the ability of communities, National Societies and other partners in Mali and 7 other target countries to prevent, detect and respond to disease and threats and plays a significant role in preparing for future risks (IFRC, 2018a).

Dutch peacekeepers

This research focuses on the Dutch peacekeepers that contribute to the United Nations Multidimensional Integrated Stabilization Mission in Mali called MINUSMA (in French: *Mission multidimensionnelle intégrée des Nations Unies pour la stabilisation au Mali)*. MINUSMA helps support political processes and helps to stabilize the country.
In the UN Security Resolution for the United Nations Multidimensional Integrated Stabilization Mission in Mali, climate change has been considered (UNSC, 2018).

The Dutch peacekeepers are currently training Malian police and conducting a long-range exploration. The Dutch peacekeepers are also contributing to the All Sources Information Fusion Unit (ASIFU) with a complete intelligence unite: the Intelligence, Surveillance & Reconnaissance company (ISR-coy) (MoD, 2018). In the scope of this case study, this research will solely focus on the information part. It is assumed that the Dutch peacekeepers have a high information

need from external sources, because they are tasked to provide intelligence for the mission. Interaction with civil entities is thus more likely which makes this case ideal for investigating humanitarian-peacekeeping information sharing. Rietjens and Baudet (2017) argue that MINUSMA is likely to serve as a model for future multilateral operations. The Dutch peacekeepers that contribute to the MINUSMA mission will be referred to as Dutch peacekeepers.

6.1.1. Context of Mali

Mali is a low-income country in sub-Saharan Africa with a population similar to the Netherlands (World Bank, 2018), which is prone to both conflict and slow-onset natural disasters such as drought and famine (Chauzel & van Damme, 2015; UN OCHA, 2018a). As already one of the hottest countries in the world, Mali is now experiencing even higher temperatures, less precipitation and creeping desertification (WFP, 2018). Food insecurity and malnutrition are serious issues in the country (Hoije, 2015). With the prolonged lean season, the period between when farmers' food stocks runs out and the next harvest time, more than 5.2 million people are food insecure and more than 1.6 million are facing the consequences of malnutrition (OCHA, 2018). One out of every four Malians is in desperate need of humanitarian food assistance and this number is only increasing (Figure 6.5).

Due to climate change, Mali is experiencing rising temperatures and longer periods of drought (UN OCHA, 2018a). The African Union has noted that periods of drought used to occur every five to seven years in the past, but now they are seen every two years (AU, 2015). In 'The State of Food Security and Nutrition in the World' the authors note that the frequency of extreme climate events such as heat and droughts has doubled since the early 1990s (FAO, 2017). Changes in weather patterns leading to climate extremes does not only have a direct impact on crop yields and the availability of food, but also on the number of healthy and fit people available to grow and harvest crops and on the time and money people have to find nutritious and safe food (FAO, 2018). One of the biggest problems for people who live in areas that are stung by water scarcity, is that they are not able to get clean drinking water, while the human body can only survive a couple of days without it (Timmermans, 2016). Without water, crops will not grow and cattle will die, leading to starvation (Chutel, 2016).

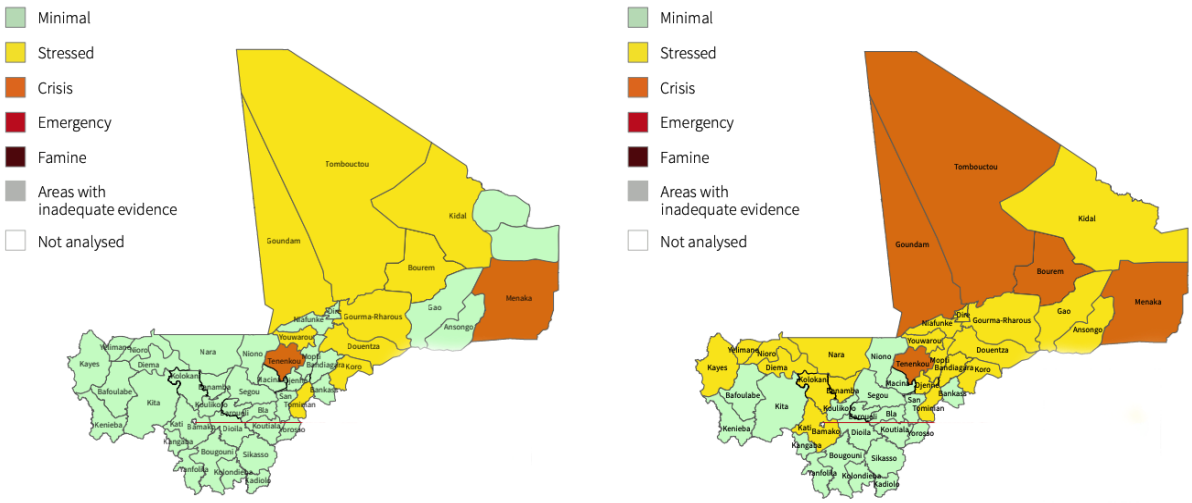

Figure 6.5. Projected food insecurity situation in Mali: left March-May 2018; right June-August 2018 (Cadre Harmonise Mali, 2018)

The government of Mali has committed to provide everyone in Mali with the essentials by 2030 and agrees that without them, people can't live dignified, healthy lives. However, due to recent

political unrest and irregular rainfall, solutions need to fit with wider plans to tackle these complex issues (Water Aid, 2018).

Since the independence from France in 1960, there have been several waves of Tuareg rebellion in the north of Mali (Tranchant & Masset, 2018). Relentless feelings of marginalization and grievances among these traditionally nomadic pastoralists, recurring disasters such as devastating drought and a military coup triggered a political and security crisis in the country (ISS, 2016). Militant Islamist, non-Tuareg armed groups and transnational criminal groups who obtained weaponry after the Libya crisis in 2011, battles between the government and armed groups and violence against civilians all contribute to destabilization in Mali (Chauzel & Van Damme, 2015; Tranchant & Masset, 2018).

In 2013, the UN Security Council resolution established the United Nations Multidimensional Integrated Stabilization Mission in Mali (MINUSMA) to support political processes as well as a number of security-related tasks (UNP, 2018b). Despite peace negotiations, the situation in Mali remains volatile, preventing large-scale returns of those who fled to other areas (WFP, 2018). Displacement has strong associations with severe food insecurity, as both a result and a cause (UNDP, 2011). Large internal population movements will place further strain on already scarce resources (IFRC, 2012). The Deputy Humanitarian Chief of UN OCHA argues that people in Mali are in desperate need of food, security, protection and peace (UN OCHA, 2018a; UN OCHA, 2018b) and therefore the assistance of humanitarian and peacekeeping organizations.

By definition, there is more time to plan and implement an appropriate response to a slow-onset natural disaster such as a drought. At the high level of food insecurity as in Mali, it is difficult to pinpoint when people enter a situation of acute need for humanitarian assistance. To help humanitarian organizations determine when they should engage in a more detailed planning of their response, early warning systems are important tools (UN OCHA, 2011). However, slow-onset disasters peak and are often treated like rapid-onset disasters[59](UN OCHA, 2011). In Mali, events of drought occur in such frequency that people do not have time to recover before another drought hits. The fragile state of Mali is likely to exacerbate the impact of the food crisis. These people are in desperate need of humanitarian assistance.

Early warning systems can allow humanitarian organizations to identify interventions in the early response phase. For example by reaching out to farmers to inform them about the coming season, or to distribute short cycle seeds for them to make it till the next harvesting season. Preparing for a slow-onset disaster can help break the cycle of increasing vulnerability and costly interventions.

6.1.2. Narrative of the Drought-Food insecurity-Conflict Nexus in Mopti, Mali

Mopti is a region in the south of Mali (Figure 6.4) that relies heavily on rainfed agriculture production, while suffering from frequent drought, conflict and instability (Birhanu, 2016; Butt et al., 2005; Care, 2018; Government of Mali, 2007). In once an important trade center where the Bani River flows into the almost dry Niger River, the so-called Venice of Mopti is now a network of open sewers (Zwarts & Frerotte, 2012).

In the Mopti region in Mali, from the start of the harvest season to the end of the harvest season, this period is often referred to as the lean season. This is the period where complete households work on their farms with a low level of technology, minimal use of fertilizers and limited access to credit. This is also the period where household food stocks often run out (Haile, 2005). According to estimates by the World Food Program (2016), 24% of the population is chronically food insecure.

[59] Appendix C, Red Cross Movement # 2

Due to extreme weather events that lead to droughts and reduced agricultural productivity, these households who depend on rainfed agriculture as their main livelihood activity, sell less crops, which reduces their purchasing power and access to food (WFP, 2017). Without the ability to adapt a coping strategy targeted at diversifying livelihoods and ensuring access to food, changes in precipitation patterns can exacerbate food insecurity in this region. These rural communities who face acute food shortages are forced to adopt coping strategies to meet their immediate food requirements (Haile, 2005). When faced with extreme food shortages and a tipping point of irreversible livelihood transformation is crossed, a common coping strategy is labor migration where family members migrate to help their families maintain rights to their land (Adamo, 2011; Hunnes, 2012). Sometimes whole families migrate or may be forced to sell their assets, leaving them destitute which increases the risk of conflict (Salazar, Diaz & Lopez, 2002). They become internally displaced people who look elsewhere for labor in either the agricultural or non-agricultural sector. Sometimes these people bring their livestock with them when they move. When their livestock graze on other people's land, this may create ground for conflict, leading to people continuing to search for a better livelihood elsewhere. Figure 6.6 shows a seasonal calendar and time of critical events in Mali.

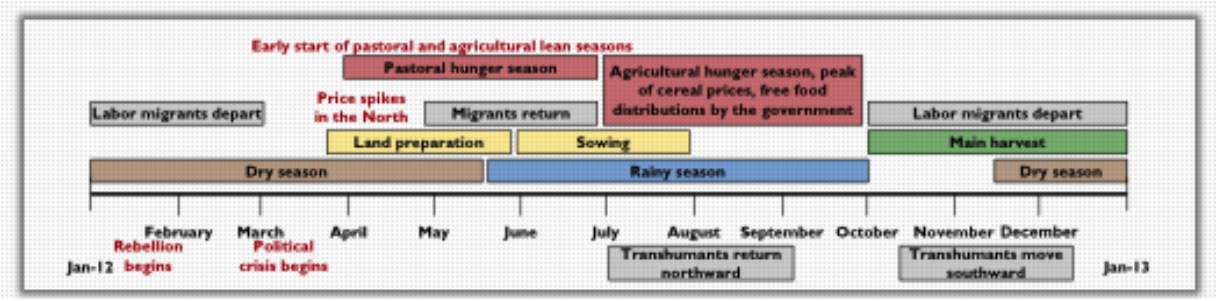

Figure 6.6. Seasonal calendar and time of critical events in 2012 (FEWS NET, 2013)

According to the Armed Conflict Location & Event Data (ACLED) database, conflict in Mali peaked during 2013. However, unlike the regions of Gao, Kidal and Timbuktu that experienced a general decline in conflict events after 2013, the Mopti region is experienced an increase in conflict events in 2015 and 2016 of respectively 7% and 22% (ACLED, 2018). Despite the peace agreement in 2015, intercommunal clashes and attacks by unidentified armed groups continue to force thousands of people to leave their homes (DTM, 2018). In 2018 alone, the Mopti region registered 16613 people as to be internally displaced (DTM, 2019). People, who are forcibly displaced due to conflict or severe drought, typically lose access to their normal food sources (FAO, 2015). Due to conflict and competition for resources, the access to food decreases (Hendrix & Brinkman, 2013). The ongoing violence and displacement has resulted in Mopti in the abandonment of many agricultural-based livelihoods, resulting in loss of income, immediate food sources and an increasing reliance on humanitarian food assistance. Violent and armed groups often burn down farms. The complex emergency combining drought and conflict in Mopti is severely threatening the food security in the region. Humanitarians from the Red Cross Movement and peacekeepers who contribute to the MINUSMA mission in Mali have confirmed this image[60].

6.1.3. The role of information for the Red Cross Movement

This section elaborates on the humanitarian response by the Red Cross Movement to food insecurity in Mopti, which is based on interviews with humanitarians from the Red Cross Movement (Appendix C).

For the Red Cross Movement to prepare for and respond to drought fueled food insecurity, information is needed. Despite deteriorating situation of conflict in Mopti, monitors and early warning systems for food insecurity are still in place. Ideally, whenever humanitarian food

[60] Appendix C, Red Cross Movement #3, #4, Peacekeeper MINUSMA #3, # 4

assistance is triggered, sufficient food assistance will be provided to decrease the food supply gap to zero. However, one of the main challenges in the food security in Mopti is that even though scientific information is available at higher level, it is not always shared on the field. Due to conflict it is challenging for the Red Cross Movement to gather and give back information in the Mopti region. This makes it difficult to reach farmers in time to inform them about the forecast for the coming harvesting season or to distribute short-cycle seeds for them to make it till the next harvesting season.

Humanitarian food assistance in the form of food and cash based aid is triggered by a critical food supply gap. The threshold for humanitarian response is when the food insecurity reaches phase 2 or higher as defined by the Integrated Food Security Phase Classification (IPC) (FAO, 2008). Ideally, when humanitarian food assistance is triggered, sufficient food assistance will be provided to decrease the food supply gap to zero. If there is a drought in peacetime, humanitarian organizations combine weather data with satellite pictures to know which areas are experiencing drought. To make sense of what is actually going on in those areas, to find out how many people are in need; is 20% of a village food insecure, or 80%, or have they all moved out? To know this, the Red Cross Movement needs to go into the field and perform assessments. In case of a conflict going on, it may be too dangerous and not possible to go and assess. Due to safety issues in Mopti, lack of capabilities and scarce resources, the Red Cross Movement has limited information in conflict-affects areas or situations of displacement, to help the most vulnerable people in need of food assistance in Mopti. The Red Cross Movement often does not have timely information about these areas due to safety issues, limited local government data, limited access to internet and limited information sharing with other parties, make the affected people in these regions even more vulnerable. With increased food shortages, families will move to other areas in search for a job, putting pressure on the food security of other regions, which creates room for conflict. Food insecurity in Mopti fuels to the flame of conflict. Conflict may in turn weaken the effectiveness of humanitarian food assistance: for instance, when cash or people cannot move due to violence. Improving food security can reduce tensions, contribute to a more stable environment and transform the vicious cycle of food insecurity and conflict into a virtuous cycle of food security and stability that reduces drivers of conflict.

6.1.4. The role of information for Dutch peacekeepers

This section elaborates on the activities of Dutch peacekeepers that contribute to the MINUSMA mission in Mopti, which is based on desk research and interviews with MINUSMA peacekeepers (Appendix C).

Since 2013, UN Peacekeepers are deployed to Mali following a violent insurrection by rebel groups who attempt to take control of the north of the country and a subsequent military-led coup. The main objective of the MINUSMA mission is to help maintain a fragile peace agreement in support of the national authorities and to protect civilians (Refworld, 2018). Since 2014, Dutch troops have been deployed to Mali as part of this UN peacekeeping mission called (Military Spectator, 2015). The Dutch peacekeepers that contribute to the MINUSMA mission are mandated to conduct a long-range exploration in order to acquire knowledge in support of the mission and its mandate. The Dutch peacekeepers are also contributing to the All Sources Information Fusion Unit (ASIFU) with a complete intelligence unite: The Intelligence, Surveillance & Reconnaissance company (ISR-coy) (MoD, 2018).

Among other tools, local informants provide Dutch MINUSMA peacekeepers of information about the deteriorating situation of conflict in Mopti. Due to the different layers of conflict and the difficult to access marsh area, the situation in Mopti remains fragile. At the same time, MINUSMA is the most dangerous peacekeeping mission, with blue helmets as specific

targets[61]. The MINUSMA mission is often referred to as 'Big brain with tiny hands[62]. The relationship between the presence of peacekeepers and reduced conflict is in this region not straightforward.

6.2. Formalization of the Drought-Food insecurity-Conflict nexus model

The aim of this section is to answer the sub-question: "*In what way can the relationship between a slow-onset natural disaster and conflict and the role of information for humanitarian and peacekeeping organizations in a fragile state be conceptualized and modeled?".* To understand the implications of and the relationship between drought, food security and conflict and the effect of information sharing between the Red Cross Movement and Dutch peacekeepers on the performance of the system, two villages respectively 'region A' and ' region B' in Mopti are deconstructed into a System Dynamics (SD) model with stocks (entities that accumulate or deplete over time) and flows (the rate of change in a stock). In the scope of this case study, this model will focus on the humanitarian food assistance provided by people in the field, which is mainly the CRM. To better demonstrate the relationship and interdependencies of factors, the effects that each one of these factors can have in the system are quantified. Appendix B elaborates more on the System Dynamics approach. Section 6.2.1 elaborates on the parameterization of the formalized model. Section 6.2.2 elaborates on the Key Performance Indicators. Section 6.2.3 elaborates on the verification of the constructed model and section 6.2.4 explores various scenarios and elaborates on the model behavior. Section 6.2.5 will conclude with the main findings.

6.2.1. Parameterization of the model

This approach is based on estimated food availability in Mopti, a calculation of calories available per capita that is based on the estimated population. The two indicators for food supply are rainfall and food access. The specifics and the code used to build this model can be found in Appendix B2. Figure 6.7 shows the constructed Stock-Flow Diagram of the Drought-Food insecurity-Conflict Nexus in Mopti.

The population: of the Mopti is estimated to be 2.570.500 people in 2018 (Populationdata, 2018). In this study, two villages in Mopti are modeled; region A and region B. In both areas, the initial population is 350.000 people. In this model, the birth rate and initial death rate are assumed to be the same in both region A and region B.

Birth rate: is the dominant factor in determining the rate of population growth. It is assumed that the birth rate is the same in both region A and region B: 43.2 births/1000 people per year (CIA, 2018). The reinforcing loop between population and births provide growth to the population.

Energy demand: is defined as energy in kcal per person per day, which is assumed to be 1700 kcal per person per day.

Required food supply: is defined as energy in kcal, based on the population variables from the affected areas which is energy demand times the population in the respective regions.

Death rate: is defined by the average number of deaths per year (Meadows, et al., 1974). It is assumed that the initial death rate is the same in both region A and region B: 9.6/1000 people per year (CIA, 2018). The number of people in need of food assistance can influence the death rate. If the food supply gap is bigger than the **threshold for humanitarian food assistance**:

[61] Appendix C, Red Cross Movement #3, #4, Peacekeeper MINUSMA #4
[62] Appendix C, Peacekeeper MINUSMA #1

more than 15% of the required food supply of 1700 kcal/person/day, the death rate is increased with 1.5/10.000/day (WFP, 2012).

Internally displaced people: Halfway the harvest season, around September, farmers will assess the agricultural prospects of that year. In case of severe food shortages, plans will be made to make it till the next harvest season. Members of families will leave their farms in search for labor elsewhere (Adamo, 2011; Haile, 2005). In this model it is assumed that all internally displaced people move between region A and region B. In 2018, the net migration in Mopti was 0; zero people migrated to other countries and 0 people migrated from other countries (DTM, 2018). To keep this model highly aggregated, it is assumed that people move within the region and do not migrate to other areas outside the region.
Following the Integrated Food Security Phase Classification System, as defined by the FAO (2012), when the **threshold for coping strategy** is reached, when more than 20% of the population consumes less than the required energy demand of 1700 kcal/person/day, households will have to adapt a coping strategy. This is an uncertain factor. For sake of simplification, just after assessing the agricultural prospects of that year in September, if more than 20% of the population does not get the required energy demand, one person out of every family will become Internally Displaced and look for labor elsewhere to provide for his family. The rest of the family stays with the farm. In Mopti, the size of an average household is 12 people. Hence in this model the **willingness to move** is 1/12 of every household and will become internally displaced when more than 20% consumes less than the required food supply (DTM, 2018).

Conflict: Despite the peace agreement in 2015, clashes and attacks between communities and by unidentified armed groups continue to force thousands of people to leave their homes and become internally displaced. It is assumed that if the population of a region consists of more than 5% internal displaced people, this results in conflict (FAO, 2008). Conflict due to **violence and armed groups** cause mass movements of people[63]. In this model it is assumed that due to violence and armed groups, the willingness to move is 4 times more than in case of food insecurity: ⅓ of a region will move from one region to the other.
Physical barrier to food: Conflict due to violence and armed groups can severely undermine most coping strategies, by for instance burning down farms, which decrease the physical access to food production by 24% (Tranchant & Masset, 2018).

Precipitation: It is assumed that monthly rainfall is evenly distributed amongst every day within a month. Therefore, during the rainy season, there are no days without precipitation**.** With limited climate inputs this model is not very accurate. The calculations for effective rainfall are simplified by using the CROPWATS developed by the FAO (Allen et al., 1998) to calculate crop yields. The precipitation inputs used in this model are retrieved from three different sources (Appendix B2).

Effective rainfall: The calculations for effective rainfall are simplified by using the CROPWATS developed by the FAO to calculate crop yields (Allen et al., 1998). When precipitation is less 250 mm: P<250mm: Peff = P (125-0.2P)/125. When precipitation is more than 250mm: P>250:Peff=(125+0.1P)

Food production: According to the Global Food Security Strategy Country Plan for Mali, which is written by all US Government agencies involved in food security, in a good rainfall year, Mali produces sufficient food (maize, millet, rice and sorghum) to feed its population (USG, 2018). Hence it is assumed that in case of average to above average precipitation, the maximum potential yield will be produced. In a **good rainfall year** with average to above average rainfall, Mali produces sufficient food to feed its population (USG, 2018). By calibrating the model, the assumption is made that with an annual rainfall between 900 and 1100 mm, it

[63] Appendix C, Red Cross Movement #4

is a good year and 100% of the required food supply in a region will be produced (Gianni et al., 2016; USG, 2018).
The physical and economic barriers to food decrease the output of food production.

Food supply: Is the difference between food production and consumption of food.

Consumption of food: Is calculated as the required food supply, unless the food supply is less than the required food supply. In that case, the total food supply is consumed.

Food supply gap: Is calculated as the required food supply minus the consumption of food minus access to food. It is assumed that if the sum of the food supply is less than the minimum daily food requirements, the mortality rate is increased, leading to a reduction in required food supply.

Economic barrier to food: If the food supply gap gets bigger, households may experience economic shocks, which decreasing access to food production by 10% (Tranchant & Masset, 2018).

The trigger for humanitarian food assistance: In this model is when more than 15% of the population consumes less than the energy demand of 1700 kcal/person/day (FAO, 2008).

Information available: Ideally, when humanitarian food assistance is triggered, sufficient food assistance will be provided to decrease the food supply gap to zero. However, a time delay exists in this process, where output lags behind its input. When information is available, a period of time is needed for the relief teams to reach the people in need of food assistance and deliver humanitarian food assistance. Due to safety issues, lack of capabilities and scarce resources, humanitarian organizations have little information in conflict-affects areas or situations of displacement, to help the most vulnerable people in need of food assistance (UN OCHA, 2017). Information sharing will lead to faster available information. In their paper on quantifying communication effects in disaster response logistics, Diedrichs, Phelps and Isihari (2015) define an information delay as the difference between when the demand for humanitarian assistance is generated and the relief teams are aware of it. When information is available, a period of time is needed for the relief teams to reach the place of where humanitarian food assistance is needed the most. This will be referred to as delay time, since very little is known about how decisions are made (Van den Homberg, Monne & Spruit, 2016).

Humanitarian food assistance: In their paper on post-seismic supply chain risk management, Peng, Peng and Chen (2013) discuss the influence of travel time, capacity of the roads and transport delays in the performance of their system dynamics model for inventory and logistics planning. To keep this model highly aggregated, humanitarian food assistance will be referred to as delay time, since very little is known about how decisions are made (Van den Homberg, Monne & Spruit, 2016). The duration of the delay time can affect among other things the number of people in need of humanitarian food assistance. It is assumed that in situations of conflict, the delay time is longer than in situations of peace.

Humanitarian food assistance gap: Is the difference between the food supply gap and the provided humanitarian food assistance in a region.

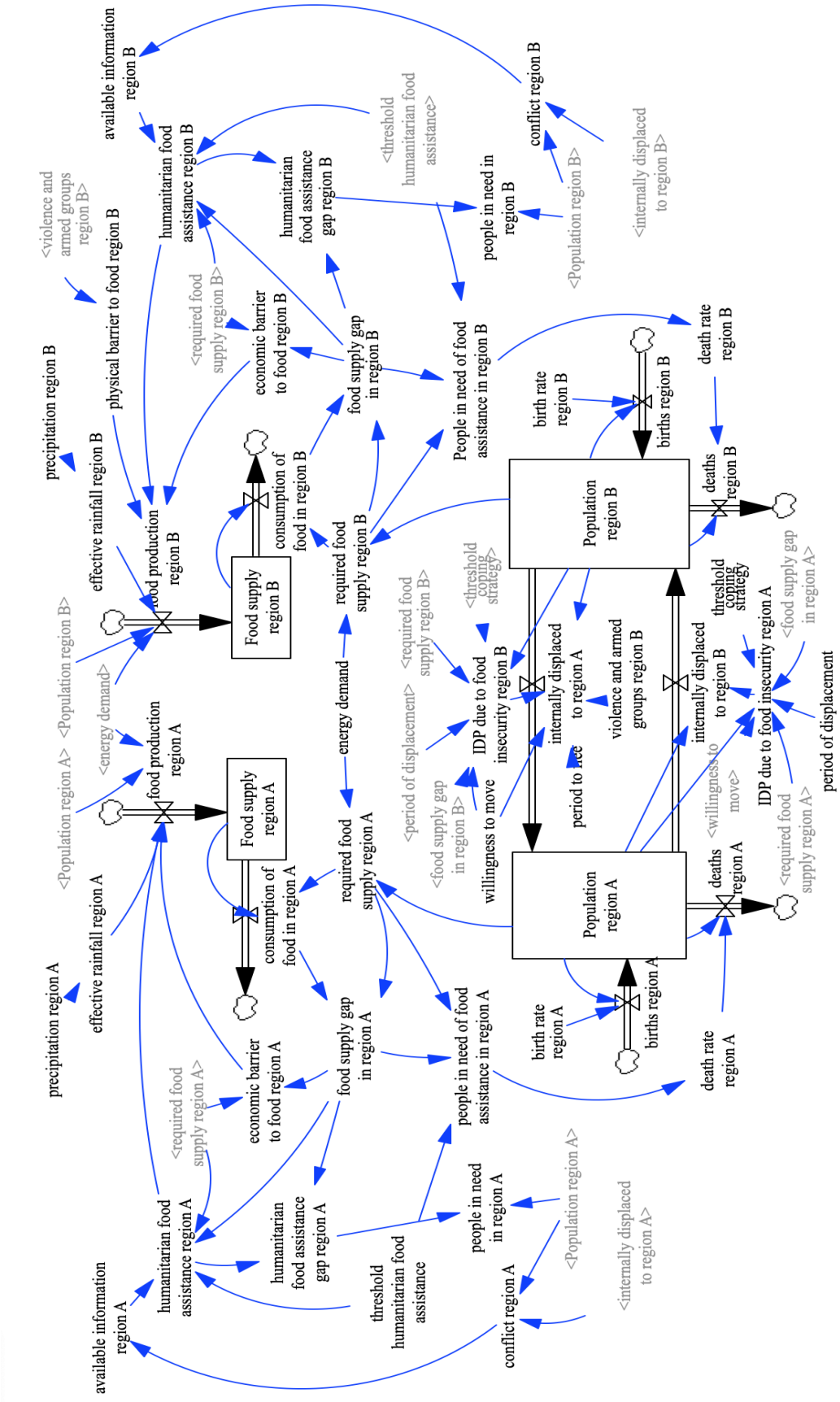

Figure 6.7. Stock-Flow Diagram of the Drought-Food insecurity -Conflict nexus in two regions in Mopti

6.2.2. Key Performance Indicators

The performance of the model is evaluated based on four Key Performance Indicators (KPIs): (1) '*Population*' [people], (2) '*Humanitarian food assistance gap*' [kcal], (3) '*People in need*' [people] and (4) '*Conflic*t' [days]. '*Population region A'* and '*Population region B*' represent the number of people in the respective regions over time. '*Humanitarian food assistance gap region A*' and '*Humanitarian food assistance gap region B*' represent the gap between the needs of the population in need of food assistance and the humanitarian food response in the respective regions, defined in kcal. '*People in need in region A*' and '*People in need in region B*' represent the number of people in need of food assistance in the respective regions. '*Conflict region A*' and '*Conflict region B'* represent the number of days a situation of conflict is experienced.

6.2.3. Verification

To verify the constructed model, three tests have been done: (1) unit verification, (2) extreme value test and (3) sensitivity analysis. In Appendix B3, the model verification is elaborated more.

(1) The first verification test is a unit test. This involves looking at the units in the model and checking whether these are consistent on the left and right side of equations across all the factors in the model. This is an iterative process as this test is continuously performed while the model is being developed. This process is stopped once the Vensim unit test generated no unit errors. The unit test did not indicate problems in the model structure

(2) The second verification test is an extreme value test with a minimum and maximum test. In the minimum value test, *'birthrate region A'* and '*birthrate region B'* are set to 0 births/day and in the maximum value test set to an extremely high value of 200/1000/365 births/person/day. The KPIs in the system reacted as expected in this process.

(3) The third verification test is a sensitivity analysis. In the sensitivity analysis, the 'threshold humanitarian food assistance' is increased and decreased by 10%. These changes did not have much impact on the KPIs. In both percentages the behavior of the KPIs remained the same.

After completing the three verification tests, it can be concluded that the model works as expected.

6.2.4. Scenarios simulation and analysis of model behavior

To demonstrate the impact of information sharing on the effective delivery of humanitarian food assistance in peacetime and in violent time, six scenarios will be explored to examine the behavior of the model, which is based on the parameterization of the Drought-Food insecurity-Conflict Nexus in Mopti, Mali. The six scenarios are identified to demonstrate the impact of the availability of information and information sharing on the effective delivery of humanitarian food assistance in peacetime and in violent time. The six scenarios are defined as follows:

(1) Good year in peacetime: In a year with average to above average rainfall, research suggests that Mali produces sufficient food to feed its population (USG, 2018).

(2) Drought in peacetime without information sharing to provide humanitarian food assistance: In this scenario, both region A and B are initially peaceful and do not experience violence from armed groups. This scenario represents a situation where the Red Cross Movement and Dutch peacekeepers do not share information. The Red Cross Movement has delayed information in peacetime and no information in times of conflict to be able to provide humanitarian food assistance.

(3) Drought in violent time without information sharing to provide humanitarian food assistance: In this scenario, region A is initially a peaceful region while region B experiences violence from armed groups. This scenario represents a situation where

6.2.4 Scenario simulation and analysis of model behavior

(4) the Red Cross Movement and Dutch peacekeepers do not share information. The Red Cross Movement has delayed information in peacetime and no information in times of conflict to be able to provide humanitarian food assistance.
(5) Drought in peacetime with information sharing to provide humanitarian food assistance: In this scenario, both region A and B are initially peaceful and do not experience violence from armed groups. This scenario represents a situation where the Red Cross Movement and Dutch peacekeepers share information. The Red Cross Movement has delayed information in peacetime and delayed information in times of conflict to be able to provide humanitarian food assistance.
(6) Drought in violent time with information sharing to provide humanitarian food assistance: In this scenario, region A is initially a peaceful region while region B experiences violence from armed groups. This scenario represents a situation where the Red Cross Movement and Dutch peacekeepers share information. The Red Cross Movement has delayed information in peacetime and delayed information in times of conflict to be able to provide humanitarian food assistance.
(7) Drought in violent time with faster information sharing to provide humanitarian food assistance. In this scenario, region A is initially a peaceful region while region B experiences violence from armed groups. This scenario represents a situation where the Red Cross Movement and Dutch peacekeepers standardized information sharing. In both peacetime and in times of conflict information is faster available to the Red Cross Movement to provide humanitarian food assistance.

To simulate a complete year, the System Dynamics model is run for 365 days with a time step of 1 day and the Euler integration method. The outputs of the simulated scenarios represent the behavior of the model, which is based on the many assumptions in section 6.2.1 and may therefore not accurately reflect reality, but give a high level view of the systems behavior. The specific changes in code for each scenario are presented in Appendix B4. The six scenarios are explored by analyzing the behavior of the four KPIs: (1) '*Population*' [people], (2) '*Humanitarian food assistance gap*' [kcal], (3) '*People in need*' [people] and (4) '*Conflict*' [days]. The specific and elaborates scenario analysis is provide in appendix B5.

Findings from evaluating the model behavior of the constructed System Dynamics model which is parameterized on the Drought-Food insecurity-Conflict Nexus in Mopti, Mali, and numerous assumptions (Appendix B5), suggest that in all scenarios of a drought (scenario 2, 3, 4, 5 and 6), a *humanitarian food assistance gap* can be identified between the needs of the population in need of food assistance and the humanitarian response to meet these needs. Humanitarian food assistance is dependent on information. The quicker the Red Cross Movement has accurate and reliable information, the faster they can provide humanitarian food assistance to the most vulnerable people in need and eventually more people will survive food insecurity. In this analysis a relationship between information sharing, days of experienced conflict and food security can also be found as faster information available and therefore faster humanitarian food assistance (scenario 6) resulted in less people in need and less days of conflict compared to scenarios with delayed information sharing and therefore delayed humanitarian food assistance (scenario 4 and 5), which in turn resulted in less people in need and less days of conflict compared to scenarios without information sharing and information available to provide humanitarian food assistance and thus without humanitarian food assistance (scenario 2 and 3).

6.2.5. Section synthesis| Drought-Food insecurity-Conflict Nexus

To understand the dynamics of a slow-onset natural disaster and conflict in the case of the Drought-Food insecurity-Conflict Nexus in Mopti, Mali, section 6.2 aimed to test findings from chapter 3 and answer the sub-question '*In what way can the relationship between a slow-onset natural disaster and conflict and the role of information for humanitarian and peacekeeping organizations in a fragile state be conceptualized and modeled?.* With the help of desk

research and interviews with humanitarians from the Red Cross Movement and Dutch peacekeepers that contribute to the MINUSMA peacekeeping mission and the System Dynamics modeling approach, the main findings are as follows:

A System Dynamics model is constructed based on the parameterization of the Drought-Food insecurity-Conflict Nexus in Mopti, Mali. Findings from analyzing the model behavior confirm the in chapter 3 suggested image where disasters do not occur in a vacuum. Due to food shortages in a peaceful region, people move to other regions putting pressure on food security in those regions, which creates room for conflict and may induce people to move again. The relationship between drought fueled food insecurity and conflict is seen as a vicious cycle wherein food insecurity and conflict reinforce each other in a downward spiral, causing more and more people to be in need of humanitarian food assistance. A 'humanitarian food assistance gap' can be identified between the needs of the drought-affected population and the humanitarian food assistance the Red Cross Movement can deliver, causing more people to be in need. As humanitarian food assistance is dependent on the timeliness of information, analysis of the model behavior confirms that the sooner information is available, the sooner humanitarian food assistance can be delivered which decreases the number of people in need and subsequently more people will survive food insecurity.

Due to the volatile situation in Mali, and peacekeepers being specifically targeted by violent and armed groups, it cannot be said that improving food security will take away the incidents caused by these violent armed groups. However, improving food security may take away tensions and ultimately reduce conflict. Analysis of the model behavior confirms a relationship between the availability of information through sharing information, food security and conflict: The sooner information is available, the sooner humanitarian food assistance can be provided which improves food security and can turn the vicious cycle of food insecurity and conflict into a virtuous cycle of food security and reduced conflict in the region of Mopti, Mali.

6.3. Unraveling the Red Cross Movement – Dutch peacekeeping Data Ecosystem

To understand what the roles, responsibilities and relationships of the Red Cross Movement and Dutch peacekeepers in Mopti are, how they collect and use data and information and to analyze how information exchange takes place, this section aims to answer the sub-question *'Which parties are involved in the humanitarian-peacekeeping data ecosystem and what are their roles, responsibilities and relationships?'.* Adopted from Oliveira and Lóscio's (2018) definition of a data ecosystem and Van den Homberg and Susha's (2018) definition of a humanitarian data ecosystem, a humanitarian-peacekeeping data ecosystem in a fragile state that is prone to both slow-onset natural disasters and conflict, consists of three components: (1) information demanders and suppliers, (2) information demand and supply and (3) information sharing infrastructure. This analysis is performed by conducting desk research and interviews with a set of 8 humanitarians from the Red Cross Movement and peacekeepers that contributed to the MINUSMA mission in Mali (Appendix C). Section 6.3.1 elaborates on the information demanders and suppliers, which are in this case the Red Cross Movement and Dutch MINUSMA peacekeepers. Section 6.3.2 elaborates on the information demand and supply in the context of drought fueled food insecurity and conflict in Mopti, Mali. Section 6.3.3 elaborates on the information sharing infrastructure and section 6.3.4 will conclude with the main findings.

6.3.1. Information demanders and suppliers

This section will give an overview of the parties and organizations involved in the Drought-Food insecurity-Conflict Nexus in Mopti and involved parties and their mandates in the Red Cross Movement in section 6.3.1 and for Dutch peacekeepers that contribute to the MINUSMA missions in section 6.3.2. Considering that the Red Cross Movement and MINUSMA

peacekeeping are both complex institutions, section 6.4 will unravel the formal and informal rules and governance of humanitarian and peacekeeping organizations, which may lead to possible barriers for both organizations to share information with each other.

6.3.1.1 Red Cross Movement

Observations from an interview with a humanitarian from the Red Cross Movement suggest that in case of drought fueled food insecurity in Mali, The Red Cross Movement does not have to wait for the government to declare a state of calamity and appeal for international humanitarian assistance before it can intervene[64]. In case of an ongoing food insecurity program in a region, this program will inform farmers about the drought and its implications. The International Humanitarian Law states that the Red Cross or Red Crescent emblem is the respected sign of protection. The Red Cross and Red Crescent Movement is the largest humanitarian network in the world with approximately 100 million members, volunteers and supporters worldwide. The Red Cross and Red Crescent Movement constitutes of three components: the International Committee of the Red Cross (ICRC), International Federation of Red Cross and Red Crescent Societies (IFRC), and national Red Cross and Red Crescent Societies (ICRC, 2018). These three components operate with a mission to prevent and alleviate human suffering worldwide wherever the needs may be, protect life and health, and to ensure respect for human being, particularly in times of armed conflict and other emergencies. For reasons of independence, ICRC and IFRC are standing invitees and not member of the IASC (UN OCHA, 2018c). It is important to clarify the distinction between ICRC and IFRC.

International Committee of the Red Cross (ICRC) is the lead agency to respond to victims of armed conflict and other situations of violence. The ICRC also responds to disasters in conflict-affected areas, as the effects of a disaster are intensified in conflict-affected zones. The ICRC helps people by providing water, healthcare, and protection of civilians, restoring links with family and helping detainees. In order to do so, the ICRC works closely with Croix-Rouge Malienne (ICRC, 2018). Due to its unique position and mandate, ICRC is often the only humanitarian organization able to operate in situations of conflict and able to access vulnerable populations.

International Federation of the Red Cross and Red Crescent Societies (IFRC) is responsible for the preparation and response to disasters in non-conflict situations by coordinating and delivering humanitarian aid in the aftermath of disasters. The IFRC aims to improve the lives of vulnerable people by conducting relief operations in the response to a disaster, in combination with disaster preparedness and capacity building programs. The IFRC co-leads the Global Shelter Cluster together with UNHCR (UN OCHA, 2018c). In case of natural disasters, IFRC takes the lead, and in case of conflict situation, UNHCR. IFRC also works in close cooperation with National RCRC Societies (IFRC, 2018a).

Croix-Rouge Malienne (CRM): In case of a food security crisis in a fragile state, ICRC and IFRC will work closely together with the CRM to distribute food and cash to people whose lives have been roiled by conflict, armed violence and drought fueled food insecurity (ICRC, 2018). Even though CRM works closely with the government, CRM is independent and not controlled or directed by the government. The Malian government should recognize CRM as a legal entity and allow them to operate according to the fundamental humanitarian principles (UN OCHA, 2018c).

Currently the Netherlands Red Cross, ICRC and IFRC are working closely with the CRM and other parties in the Global Food Security Cluster, to distribute food, cash and basic household necessities in Mali. Together they aim to improve the lives of those whose lives have been

[64] Appendix C, Red Cross Movement #4

roiled by conflict, armed violence and drought (ICRC, 2018). They have strong relationships with both WFP and FAO in combatting food insecurity and contributing to the Zero Hunger SDG. According to UN OCHA's 3W Qui Fait Quoi Ou, by the end of 2018, a total of 46 humanitarian organizations was active and fighting food insecurity in Mopti (Humanitarianresponse.info, 2018a).

6.3.1.2 Dutch peacekeepers

Member states of the UN including the Netherlands take part in various UN Peacekeeping missions.
The Ministry of Foreign Affairs of the Kingdom of the Netherlands is tasked with promoting sustainable economic growth of developing countries and developing worldwide work on the themes of security and the rule of law, water, food security and sexual and reproductive health and rights. To promote the international legal order on behalf of the Netherlands, for example by preparing peace missions together with the Dutch Ministry of Defence (Ministry of Foreign Affairs, 2018).

The Ministry of Defence of the Kingdom of the Netherlands has three main tasks: Protect Dutch territory and that of allies, International legal order and stability and Childcare in the event of disasters and crises. In addition to protection against a possible threat from outside, the Ministry of Defence is also available for foreign operations in a NATO, UN or EU context. Examples of this are the contributions of Dutch military to the UN peacekeeping missions MINUSMA in Mali (Ministry of Defence, 2018).

Since the start of the MINUSMA mission, peacekeepers have been working to stabilize the situation in Mali after the Tuareg rebellion in 2012 was followed by a jihadist insurgency. MINUSMA is still working to an extent with Operation Barkhane, the French anti-terrorist contingent set up in Chad that originated as Operational Serval in northern Mali to expel the Islamic Jihadists from the region. MINUSMA has a broad mandate, but it's main role is to help the Malian government carry out a peace agreement, referred to as the Algiers Accord, signed in June 2015 between the government and former Tuareg rebels (UNP, 2018b). In support of the Malian government, MINUSMA's mandate contributes to the creation of a secure environment for safe, civilian-led delivery of humanitarian assistance, in accordance to the humanitarian principles as well as voluntary, safe and dignified return/integration/resettlement of internally displaced people in close coordination with humanitarian organizations, contributing to the creation of a secure and safe environment for projects aimed at stabilizing Mali (MINUSMA, 2018). Progress has however been slow.

Since 2014, Dutch troops have been deployed to Mali as part of the UN peacekeeping mission called MINUSMA (Military Spectator, 2015). MINSUMA is highly dependent on the information flows. They serve as a basis for making decisions about their operations. What kind of information is collected, depends on the information needs, which are formally given by the ASIFU Headquarters (HQ) in Bamako, who gets information requirements from the Force Commander and the Head of the Mission. ASIFU HQ consists of two main components: an Analysis Fusion Cell (AFC) and Collection Coordination and Intelligence Requirements (CCIR), several liaison officers and one civilian advisor from the Dutch Ministry of Foreign Affairs.

The Dutch peacekeepers are dedicated to gather information to support the mandate of the MINUSMA mission[65]. In an interview with a JOC staff member, MINUSMA's intelligence architecture that collects information from the different mission components, it has been found that the Dutch peacekeepers produce accurate, quick, correct and high quality information products and have the highest technology to acquire it[66]. The Netherlands has a number of

[65] Appendix C, Peacekeeper MINUSMA #1, #2, #3, #4
[66] Appendix C, Peacekeeper MINUSMA #2

officers at the headquarters to supervise these processes. All information flows from MINUSMA come together at the headquarters in Bamako, at the ASIFU HQ, which was initially an initiative of the Netherlands and later assisted by Sweden, Denmark, Germany, Estonia and Finland. ASIFU analyzes the information together with the information from the Dutch Intelligence, Surveillance & Reconnaissance company (ISR-coy) and forwards it up to the Force Commander as well as to support the analysis of JMAC.

6.3.2. Information demand and supply

The aim of this section is to enhance understanding of the fragmented data-ecosystem in the Drought-Food insecurity-Conflict Nexus in Mali. Paring information demand and supply can help to identify overlaps and gaps. Information demand and supply capture the acquisition of information as well as the availability of information (Van den Homberg & Susha, 2018). This section will elaborate on the information demand and supply in the Drought-Food insecurity-Conflict Nexus in Mopti: for the Red Cross Movement to provide humanitarian food assistance in section 6.3.2.1 and for Dutch peacekeepers that contribute to the MINUSMA mission in section 6.3.2.2.

6.3.2.1 Information demand and supply Red Cross Movement

the Red Cross Movement to provide humanitarian food assistance, information is needed. Despite the deteriorating situation of conflict in Mopti, monitors and early warning systems for food insecurity are still in place. All the concerned parties receive quarterly food security indicators, based on rainfall, food prices etcetera[67]. Three to six months prior to a drought, these indicators can already predict that a drought is coming and three months in advance, the indicators can tell this with reliable statistics.

Cadre Harmonise (CH) is a national and regional food crisis prevention system. It is a comprehensive analytical framework that aims to prevent food crises by taking various indicators for food security into account as well as the inference of contributing factors. Similar to the Integrated Food Security Phase Classification (IPC), CH relies on existing food security information systems (IPC, 2016). The Permanent Interstate Committee for Drought Control in the Sahel (CILSS) provides an integrated phase classification system equivalent to IPC (IPC, 2016). The threshold for humanitarian response is when the food insecurity reaches phase 2 or higher as defined by the Integrated Food Security Phase Classification (IPC) and CILSS (FAO, 2008). Ideally, when humanitarian food assistance is triggered, sufficient food assistance will be provided to decrease the food supply gap to zero. Observations from interviews with humanitarians from the Red Cross Movement suggest that if there is a drought in peacetime, the analysis combines information from weather data with satellite pictures to know which area is experiencing drought, in this case the Red Cross Movement has all the information it needs[68]. However, in the onset of a conflict, this may be different. To make sense of what is actually going on in those areas and to find out how many people are exactly in need of food assistance, the Red Cross Movement needs to go into the field and perform assessments. When Croix-Rouge Malienne (CRM) wants to deploy staff to do an assessment to provide humanitarian food assistance to the most vulnerable people in need in situation of conflict, CRM has to ask ICRC permission to access the conflict zone. Observations from interviews with humanitarians from the Red Cross Movement suggest that ICRC may give CRM clearance to enter the zone with a certain timeframe, or deny access without adding more information as to why. Observations from a humanitarian of the Red Cross Movement in the field, indicate that *in case ICRC denies permission, but the president of CRM who is a local gives the local CRM staff permission to enter a conflict affected zone, local CRM will listen to their own president and ignore the ICRCs advice, not knowing that they are risking their own lives.*

[67] Appendix C, Red Cross Movement #4
[68] Appendix C, Red Cross Movement #4

6.3.2.1 Information demand and supply Red Cross Movement

Observations from interviews indicate that due to safety issues in Mopti, the difficulties to access marsh areas, lack of capabilities, scarce resources, limited local government data, limited access to internet and limited information sharing with other parties[69], the Red Cross Movement has limited information in conflict-affects areas or situations of displacement, to meet the needs of the most vulnerable people in need of food assistance in Mopti[70]. This may make the affected people in these regions even more vulnerable.

6.3.2.2 Information demand and supply Dutch peacekeepers

The MINSUMA peacekeeping mission is highly dependent on the information flows. They serve as a basis for making decisions about their operations. The Dutch peacekeepers are dedicated to gather information to support the mandate of the MINUSMA mission[71]. What kind of information is collected, depends on the information needs, which are formally given by the ASIFU Headquarters (HQ) in Bamako, who gets information requirements from the Force Commander and the Head of the Mission. The goal of this information gathering is ideally to provide predictive values of conflict for the long term. The Dutch peacekeepers use high technology tools in terms of data collection (e.g. high technology drones and radars) and in terms of analysis (e.g. social media analysis and intelligence software) but also go into the field and interact with locals in order to gain information.

The Dutch peacekeepers have gathered a variety of issues, including geographical information as well as information regarding safety and security and refugee flows, based on the X-PMESII method: Political, Military, Economic, Social, Information channels, Infrastructure (Military Spectator, 2019). ASIFU produces a 'quarterly outlook' which is based on an extensive scenario analysis, to predict future status of Mali.

6.3.3. Information sharing infrastructure

The aim of this section is to generate insight in the various forms wherein information sharing takes place. Information can be shared in two ways; through formal and informal communication, and on different levels; local, national or international level (UN OCHA 2011); in the field, face to face or via various platforms. This section will elaborate on the coordination mechanisms and information sharing infrastructure in Mopti: through the Red Cross Movement in section 6.3.3.1, through Dutch peacekeepers that contribute to the MINUSMA mission in section 6.3.3.2 and between the Red Cross Movement and Dutch peacekeepers that contribute to the MINUSMA mission in section 6.3.3.3.

6.3.3.1. Information sharing infrastructure Red Cross Movement

Observations form interviews suggest that even though there are more sophisticated tools available, the Red Cross Movement makes use of low technology or no-technological tools such contact information lists, paper surveys, questionnaires, maps and whiteboards with updated information with other parties and oral communication with Dutch peacekeepers[72]. The platforms that were most commonly used for data and information sharing were shared Drop box folders, Skype and Facebook[73].

6.3.3.2. Information sharing infrastructure Dutch peacekeepers

Like all other contributing nations, the Dutch peacekeepers have their own Dutch Database, where others do not have access[74]. Dutch peacekeepers share information upward to ASIFU HQ and to the Force Commander: information is rarely shared downward.

[69] Appendix C, Peacekeeper MINUSMA #1, #2, #3, #4
[70] Appendix C, Red Cross Movement #4
[71] Appendix C, Peacekeeper MINUSMA #1, #2, #3, #4
[72] Appendix C, Red Cross Movement #3, Peacekeeper MINUSMA #4
[73] Appendix C, Humanitarian #1
[74] Appendix C, Peacekeeper MINUSMA #3

6.3.3.2 Information sharing infrastructure Dutch peacekeepers

MINUSMA makes use of the UN's standard database Situational Awareness Geospatial Enterprise (SAGE) which tracks and visualizes incidents and is available to headquarters, JOC and JMAC. ASIFU makes use of the Dutch system 'Theatre Independent Tactical Adaptive Armed Forces Network' (TITAAN) for secure communication of classified information (Godenberg, Soeters & Dean, 2017). SAGE and TITAAN are however not interoperable, which means that data and information would have to be entered twice. It also makes information sharing difficult between parties who do not have access to the same systems. This means that data and information would have to be entered twice. Information can only be officially shared after information is declassified or downgraded.

6.3.3.3. Information sharing infrastructure between RCM and Dutch peacekeepers

Observations from interviews suggest that Dutch peacekeepers cannot officially share information directly with humanitarians, also not with the Red Cross Movement[75]. Information exchange between Dutch peacekeepers and humanitarian organizations, takes place via UN OCHA, who organizes and coordinates the formal biweekly UN-CMCoord meetings[76]. There is no common database where peacekeepers and humanitarians share information[77]. Observations from interviews with humanitarians from the Red Cross Movement and Dutch peacekeepers suggest that communication of information takes place through either these formal meetings, or through informal face-to-face talks, emails with reports, Facebook messages or phone calls after a meeting. UN OCHA Civil-Military advisors are mostly ex-military, which make it easy for peacekeepers to talk with[78].

There are clear indicators that information sharing between the Red Cross Movement and Dutch peacekeepers is troublesome: despite the institutionalized UN-CMCoord structure that even creates a neutral ground for the Red Cross Movement and Dutch peacekeepers to interact with each other without putting the humanitarian principles at risk, there are indicators that no formal information sharing between the Red Cross Movement and the Dutch peacekeepers takes place in Mali. Dutch peacekeepers did get weekly flight notifications from the Red Cross, so they knew where the Red Cross Movement was heading. However, observations from interviews with both humanitarians from the Red Cross Movement and peacekeepers that contribute to the MINUSMA mission, suggest that no formal contact takes place between the Red Cross Movement and Dutch peacekeepers in Mali.

At the same time, there are indicators that informal information sharing does take place. Observations from interviews with Dutch peacekeepers suggest that during deployment, Dutch peacekeepers get to know international humanitarians from the Red Cross Movement. They get friendly with each other as they come across each other at parties, or sports activities, build relationships of trust and chances are that they have direct contact and informally share information, especially if they have the same nationality or if they have met during previous deployments. Both Red Cross Movement and Dutch peacekeepers rotate frequently, taking the trust and face-to-face relationships with them home[79]. Without guiding protocols or handbooks, collective memory is short as a lot of memory is lost in the current way of ad hoc information sharing.

6.3.4. Section synthesis | Data Ecosystem

To understand what the roles, responsibilities and relationships of the Red Cross Movement and Dutch peacekeepers in Mopti, Mali are, how they collect and use data and information and analyze how information exchange takes place, and to test findings of chapter 4, this section aimed to answer the sub-question *'Which parties are involved in the humanitarian-*

[75] Appendix C, Peacekeepers MINUSMA #2
[76] Appendix C, Peacekeeper MINSUMA #2, #3
[77] Appendix C, Peacekeeper MINUSMA #3
[78] Appendix C, Red Cross Movement #3, Peacekeeper MINUSMA #3
[79] Appendix C, Peacekeeper MINUSMA #1, #2, #3, #4

peacekeeping data ecosystem and what are their roles, responsibilities and relationships?'. The humanitarian-peacekeeping data ecosystem consists of three components: (1) information demanders and suppliers, (2) information demand and supply and (3) information sharing infrastructure. With the help of desk research and interviews with humanitarians from the Red Cross Movement and peacekeepers that contributed to the MINUSMA mission in Mali (Appendix C), the main findings are in threefold:

Firstly, findings suggest that the Red Cross Movement; the ICRC, IFRC and NLRC work closely together with CRM and other parties in the Global Food Security Cluster to distribute food, funds and basic household necessities in Mali. Together with 46 other humanitarian organizations they aim to improve lives of those whose lives have been roiled by conflict, armed groups and drought in Mopti (Humanitarianresponse.info, 2018a; ICRC, 2018). As suggested in chapter 4, the vast amount of humanitarian organizations, frameworks and coordination mechanisms between humanitarian organizations indicate an institutional fragmentation and fragmentation of responsibilities. In contrast, as findings suggested in chapter 4, Dutch peacekeepers that contribute to the MINUSMA mission follow a clear line of command and control and are mandated to collect information for the long-term prevention of conflict and. As suggested in chapter 4, the MINUSMA mission is a multidimensional integrated stabilization mission comprising not only military forces but also civilian personnel and participates in humanitarian activities.

Secondly, findings suggest that humanitarian food assistance is dependent on information. Observations from interviews with humanitarians from the Red Cross Movement suggest that despite the deteriorating situation of conflict in Mopti, monitors and early warning systems for food security are still in place. The Red Cross Movement receives regularly updated information about the food security situation in Mopti. Whenever a threshold for humanitarian food insecurity is reached, humanitarian food assistance is triggered. In peacetime, analysis combines information from among others weather data with satellite pictures to know where the most vulnerable drought-affected people are. In case of the onset of a conflict, this may be different. As findings in chapter 4 suggested, to make sense of what is going on in those areas and to find out how many people are exactly in need of humanitarian food assistance, the Red Cross Movement needs to go into the field and perform assessments. Findings suggest that due to safety issues in Mopti, the difficult to access marsh areas, lack of capabilities, scarce resources, limited local government data, limited access to internet and limited information sharing with other parties, the Red Cross Movement has limited information in conflict-affected areas to meet the needs of the most vulnerable people in need of humanitarian food assistance in Mopti, making the drought-affected population even more vulnerable. Dutch peacekeepers are mandated to collect information for the long-term prevention of conflict. As hunger and poverty are indicators for conflict, when the Red Cross Movement and Dutch peacekeepers would share information with each other, they might indirectly reach their own goals of increased food security and stability.

Thirdly, as findings in chapter 4 suggested, if a' humanitarian food assistance gap' is identified between the needs of the affected community and the humanitarian response to meet those needs, the Red Cross Movement can turn to Dutch peacekeepers as a 'last resort' tool, to complement their relief efforts. Sharing information with the Red Cross Movement may help turn the vicious cycle of food insecurity and conflict into a virtuous cycle of food security and stability. Despite humanitarian peacekeeping information sharing being institutionalized with the UN-CMCoord structure that creates a neutral ground for humanitarian and peacekeeping organizations to interact with each other without putting the humanitarian principles at risk, there are indicators that no formal information sharing between the Red Cross Movement and the Dutch peacekeepers takes place in Mali. At the same time, there are indicators that informal information sharing does take place. Observations from interviews suggest that during deployment, Dutch peacekeepers get to know international humanitarians from the Red Cross

Movement; this may create room for relationships and trust, especially if they have the same nationality or if they have met during previous deployments. Both Red Cross Movement and Dutch peacekeepers rotate frequently, taking the trust and face-to-face relationships with them home. As findings in chapter 4 suggested, without guiding protocols or handbooks, collective memory is short as a lot of memory is lost in the current way of ad hoc information sharing, causing institutional memory loss.

6.4. Understanding the differences in institutional rules and play of the game

Cooperation and coordination between Red Cross Movement and Dutch peacekeepers is complex, due to numerous differences between the two organizations. Both Red Cross Movement and Dutch peacekeeping organizations are complex institutions with formal and informal rules and governance structures; the rules and the play of the game. In this section, the differences between both complex institutions will be analyzed, in order to unravel possible institutional barriers for the Red Cross Movement and Dutch peacekeepers to share information with each other. This section aims to answer the sub-question *'What are possible institutional barriers for humanitarian and peacekeeping organizations to share informatio*n?'. To answer this sub-question and test the findings of chapter 5, Williamson's (2000) framework for institutional analysis will be used to analyze the differences respectively informal rules, formal rules and governance that may lead to possible barriers for both organizations to share information with each other. In this section, the application of the TOP-framework (Technological barriers, Organizational barriers, Process barriers) as proposed in chapter 5 will be tested.
This analysis is performed by conducting interviews with a set of 8 humanitarians from the Red Cross Movement and peacekeepers who contributed to the MINUSMA mission (Appendix C). The interviewees have not been steered in any direction, as the intention of the interviews is flexible, leaving room for the interviewees to express freely their concerns. Section 6.4.1 will discuss the observations regarding the differences in terms of informal rules. Section 6.4.2 will discuss the observations regarding the differences in terms of formal rules. Section 6.4.3 will discuss the observations regarding the differences in terms of governance and play of the game of information sharing. Section 6.4.4 will explore the application of the proposed TOP-framework for barrier analysis (Chapter 5) and section 6.4.5 will conclude with the main findings.

6.4.1. Level one: Observed differences in terms of informal rules of the game

Neutrality and impartiality vs. political mandate

In interviews with humanitarians from the Red Cross Movement, observations suggest that the humanitarian principles of neutrality and impartiality make it difficult for the RCM to share their painted picture of understanding[80]. Dutch peacekeepers have political and security objectives and reasons for being present in a certain area and are therefore not neutral. Findings suggest that this may lead to a possible organizational barrier that hinders information sharing between the Red Cross Movement and Dutch peacekeepers.

6.4.2. Level two: Observed differences in terms of formal rules of the game

In the scope of this research, differences in formal laws between the Red Cross Movement and Dutch peacekeepers that may hinder information sharing between both parties are not taken into account.

6.4.3. Level three: Observed differences in terms of governance and play of the game

[80] Appendix C, Red Cross Movement #3, #4

6.4.3. Level three: Observed difference in governance and play of the game

Hierarchical vs. less hierarchical

In interviews with peacekeepers that contribute to the MINUSMA mission, Dutch peacekeepers are described as disciplined and follow a clear line of command and control[81]. Observations from interviews with humanitarians from the Red Cross Movement suggest that the Red Cross Movement is less hierarchical. When Croix-Rouge Malienne (CRM) wants to deploy staff to do an assessment to provide humanitarian food assistance to the most vulnerable people in need in situation of conflict, CRM has to ask ICRC permission to access the conflict zone. Observations from interviews with humanitarians from the Red Cross Movement suggest that ICRC may give CRM clearance to enter the zone with a certain timeframe, or deny access without adding more information as to why. Observations from an interview with a humanitarian of the Red Cross Movement in the field indicated that *in case ICRC denies permission, but the president of CRM who is a local gives the local CRM staff permission to enter a conflict affected zone, local CRM will listen to their own president and ignore the ICRCs advice, not knowing that they are risking their own lives*[82]*.* Findings suggest that the Red Cross Movement does not ply the same line of command and control as Dutch peacekeepers. These differences may form possible organizational and process barriers that may hinder information sharing between the Red Cross Movement and Dutch peacekeepers.

High-tech vs. low-tech information management

Observations from interviews with Dutch peacekeepers suggest that Dutch peacekeepers make use of high technology tools in terms of information collection (e.g. high technology drones, and radars) and in terms of analysis (e.g. social media analysis and intelligence software) as well as low technology tools by going into the field and interact with locals in order to obtain information[83].

Observations from interviews with humanitarians from the Red Cross Movement in the field, suggest that even though there are more sophisticated tools available, the Red Cross Movement makes use of low-technology or no-technological tools such as paper surveys, contact information lists, questionnaires, maps and whiteboards with updated information to collect and share information with other parties[84]. The platforms that were most commonly used for data and information sharing in the humanitarian response operation were found to be shared drop box folders, Skype and Facebook[85].

There is no common database for Dutch peacekeepers and the Red Cross Movement to share information[86]. Dutch peacekeepers do have their own Dutch Database, however others do not have access to it[87]. Findings suggest that the absence of a common digitalized database may form a possible technological barrier that may hinder information sharing between the Red Cross Movement and Dutch peacekeepers.

Classification vs. do no harm

Dutch peacekeepers use classified systems to make sure information does not fall into the wrong hands[88]. Observations from interviews with humanitarians from the Red Cross Movement suggest that Red Cross Movement does not have the same level of classification systems, but is currently working on and improving its data protection policy to protect data from unauthorized people and can still learn a lot from peacekeepers[89].

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[81] Appendix C, Peacekeeper MINUSMA #1, #2, #3, #4
[82] Appendix C, Red Cross Movement #4
[83] Appendix C, Peacekeeper MINUSMA #2, #3
[84] Appendix C, Red Cross Movement #3, Peacekeeper MINUSMA #4
[85] Appendix C, Humanitarian #1
[86] Appendix C, Peacekeeper MINUSMA #3
[87] Appendix C, Peacekeeper MINUSMA #3
[88] Appendix C, Peacekeeper MINUSMA #1
[89] Appendix C, Red Cross Movement #2

6.4.3 Level three: Observed differences in terms of governance and play of the game

Top-down centralized vs. decentralized information sharing
Observations from interviews with Dutch peacekeepers suggest that Dutch peacekeepers can only officially share information if hierarchy allows this and only when it is certain that the information products are declassified or downgraded[90]. Observations from interviews with humanitarian from the Red Cross Movement suggest that the Red Cross Movement can share information as long as it is not abused or returns to sender, to not risk his or her own life or the life of the people who provided this information[91]. ICRC has found to be more reluctant with sharing information. Observations from interviews with humanitarians from the Red Cross Movement suggest that ICRC may share information regarding clearance to enter a conflict zone with a certain timeframe, or deny access without adding more information as to why[92]. These differences may form possible organizational and process barriers that may hinder information sharing between the Red Cross Movement and Dutch peacekeepers.

Ad hoc information sharing and institutional memory loss
Attitudes can create good and bad relationships. If one sees the other party as untrustworthy, this may create room for a bad relationship. If one sees the other party as potentially helpful, this may create room for a good relationship. Observations from interviews with peacekeepers that contribute to the MINUSMA mission suggest that during deployment, a relationship of trust can be gained between international humanitarians form the Red Cross Movement and Dutch peacekeepers, especially if they have the same nationality or if they have met before during a previous deployment[93]. A lot of memory is lost in the current way of information sharing. Both internationally deployed humanitarian from the Red Cross Movement and Dutch peacekeepers rotate frequently, taking the trust and face-to-face relationships with them home[94]. As information sharing is not standardized, this may form a possible process barrier that may hinder information sharing between the Red Cross Movement and Dutch peacekeepers.

Safety and security concerns
The MINUSMA peacekeeping mission is one of the most dangerous UN missions so far. Peacekeepers in Mali are threatened. Observations from interviews with humanitarians from the Red Cross Movement and Dutch peacekeepers suggest that the increase targeting of MINUSMA peacekeepers by armed groups makes the Red Cross Movement as well as other humanitarian organizations even more hesitant to interact with peacekeepers. As all peacekeepers and armed military forces wear uniforms, for outsiders it has been found to be difficult to distinguish who is who. Observations from interviews with humanitarians from the Red Cross Movement and Dutch peacekeepers suggest that the Red Cross Movement is afraid to become a target when seen or associated with peacekeepers[95]. This may form a possible process barrier for the Red Cross Movement and Dutch peacekeepers to share information.

6.4.4. Testing the TOP-Framework

This section will explore the application of the TOP-framework as proposed in chapter 5, to identify possible barriers that hinder information sharing between the Red Cross Movement and Dutch peacekeepers to share information with each other in the case of Mali. The TOP-framework is proposed to analyze barriers that may hinder information sharing, following three categories: (1) Technology, (2) Organization and (3) Process.

Table 6.1 provides an overview of the identified differences observed in the interviews with humanitarians from the Red Cross Movement and Dutch peacekeepers that contribute to the

[90] Appendix C, Peacekeeper MINUSMA #1
[91] Appendix C, Red Cross Movement #3, #4
[92] Appendix C, Red Cross Movement #3
[93] Appendix C, Peacekeeper MINUSMA #1, #2, #3, #4
[94] Appendix C, Peacekeeper MINUSMA #1, #2, #3, #4
[95] Appendix C, Red Cross Movement #3, #4, Peacekeeper MINUSMA #4

MINUSMA mission in Mali, following Williamson's (2000) framework for institutional analysis and the TOP-framework as proposed in chapter 5 to categorize possible barriers that may hinder information sharing. These findings have been verified on the 7th of February 2019, during the UN-CMCoord meeting at the Humanitarian Networks and Partnerships Week 2019 in Geneva (Appendix D).

Table 6.1: Overview of identified differences between the Red Cross Movement and Dutch peacekeepers following Williamson's (2000) framework for institutional analysis and the TOP-framework for barrier analysis

	TECHNOLOGY	ORGANIZATION	PROCESS
Level one: Differences in informal rules of the game			
Principles		• Humanitarian principles of neutrality and impartiality[96] • Dutch peacekeepers political and security objectives and are therefore not neutral	
Level two: Differences in formal rules of the game			
*	*	*	*
Level three: Differences in governance and play of the game			
Organizational structure		• Dutch peacekeepers are disciplined and follow a clear line of command & control • Red Cross Movement is less hierarchical	• CRM does not ply the same kind of command & control[97]
Information management tools	• High-tech Dutch peacekeepers[98] • Low-tech Red Cross Movement[99] • No common database to share information[100]		
Information sensitivity	• Dutch peacekeepers use classified systems to make sure information does not fall into the wrong hands[101]. Red Cross Movement does not have a similar classification system		• The Red Cross Movement aims to do no harm and is continuously improving its policy to process data responsibly, to protect data from unauthorized people, can still learn a lot from peacekeepers[102]
Data and information sharing policies		• Dutch peacekeepers can only officially share information if hierarchy allows this and it is certain that the information is declassified or downgraded[103] • Market-like structure of information sharing: Humanitarians from the Red Cross Movement share information if it is in their interest to do so, abiding the humanitarian	• No standardized information sharing policy • RCM can share information as long as it is not abused or returns to sender, does not put own life in danger or the life of the people who provided the information[104] • ICRC is more reluctant with sharing information. They may give or deny clearing to enter a conflict-affected zone, but no more

[96] Appendix C, Red Cross Movement #3, #4
[97] Appendix C, Red Cross Movement #4
[98] Appendix C, Peacekeeper MINUSMA #2, #3
[99] Appendix C, Red Cross Movement #3, Peacekeeper MINUSMA #4
[100] Appendix C, Peacekeeper MINUSMA #3
[101] Appendix C, Peacekeeper MINUSMA #1
[102] Appendix C, Red Cross Movement #2
[103] Appendix C, Red Cross Movement #3, #4, Peacekeeper MINUSMA #1
[104] Appendix C, Red Cross Movement #3

		principles	information as to why[105]
Ad hoc information sharing			• Fear and safety concerns[106] • Institutional memory loss due to frequent rotation and lack of handover[107]

** In the scope of this research, differences in formal laws between the Red Cross Movement and Dutch peacekeepers that may hinder information sharing between both parties are not taken into account*.

When looking at table 6.1, findings suggest that in the case of information sharing between the Red Cross Movement and Dutch peacekeepers in the case of Mali, as informal rules are important, there is a serious concern that the involvement of peacekeepers in military uniform and assets pose a potential threat to the core principles of impartiality, neutrality and independence that underpin the work of humanitarian organizations, regardless of how serious the humanitarian needs may be[108]. Ethical considerations are somewhat contradictory, since humanitarian response is in essence motivated by the desire to reduce human suffering worldwide, however not if it conflicts with the humanitarian principles. Hence the 'last resort' mechanism was introduced. When a 'humanitarian gap' is identified; being a gap between the needs of the most vulnerable community and the humanitarian response to meet these needs, the Red Cross Movement and Dutch peacekeepers may turn to each other as a 'last resort' tool. Following the 'Oslo Guidelines' and the 'Guidelines on the use of military and civil defense assets to support UN Humanitarian activities in complex emergencies' which are consistent with the Red Cross and Red Crescent Movement guiding documents, humanitarian and peacekeeping organizations can turn to each other as a 'last resort' to complement existing mechanisms (UN OCHA, 2012a). Despite the institutionalized UN-CMCoord structure that even creates a neutral ground for the Red Cross Movement and Dutch peacekeepers to interact with each other without putting the humanitarian principles at risk, there are indicators that no formal information sharing between the Red Cross Movement and the Dutch peacekeepers takes place in Mali.

At the same time, there are indicators that informal information sharing does take place. Observations from interviews with Dutch peacekeepers suggest that during deployment, Dutch peacekeepers get to know internationally deployed humanitarians from the Red Cross Movement[109]. They come across each other at parties, or sports activities, may build relationships of trust, which could create a basis to share information. A lot of memory is lost in the current way of information sharing. A lot of memory is lost in the current way of information sharing. Both Red Cross Movement and Dutch peacekeepers rotate frequently, taking the trust and face-to-face relationships with them home leading to institutional memory loss[110].

6.4.5. Section synthesis | Rules and play of the game

With the help of interviews with a set of 8 humanitarians from the Red Cross Movement and peacekeepers that contribute to the MINUSMA mission in Mali (Appendix C), this section aimed to answer the sub-question '*What are possible institutional barriers for humanitarian and peacekeeping organizations to share information?*'. To answer this sub-question and test the findings of chapter 5, Williamson's (2000) framework for institutional analysis is used to analyze the differences respectively in informal rules, formal rules and governance that may lead to possible barriers that may hinder information sharing between both organizations. In this section, the application of the TOP-framework (Technological barriers, Organizational

[105] Appendix C, Red Cross Movement #3
[106] Appendix C, Red Cross Movement #3, #4, Peacekeeper MINUSMA #4
[107] Appendix C, Peacekeeper MINUSMA #1, #2, #3, #4
[108] Appendix C, Red Cross Movement #3, #4, Peacekeeper MINUSMA #4
[109] Appendix C, Peacekeeper MINUSMA #1, #2, #3, #4
[110] Appendix C, Peacekeeper MINUSMA #1, #2, #3, #4

barriers, Process barriers) as proposed in chapter 5 to analyze possible barriers that hinder information sharing is tested.

Findings suggest that Williamson's (2000) framework for institutional analysis is useful to identify differences regarding informal and formal rules and governance between the Red Cross Movement and Dutch peacekeepers, which may lead to possible barriers that hinder information sharing. Findings also suggest that the TOP-framework for barrier analysis as proposed in chapter 5, is applicable to this case as the barriers for the Red Cross Movement and Dutch peacekeepers to share information can be categorized in the three categories of (T) Technology, (O) Organization and (P) Process:

(T) Technological barriers encompass interoperability and difference in technological means to share information.
Findings suggest that the difference in technological means and classification systems between the Red Cross Movement and Dutch peacekeepers in the field, as well as the absence of a common technology-based system may hinder information sharing.

(O) Organizational barriers encompass differences in culture, language and principles which may lead to prejudice, misinterpretation and misunderstanding.
Findings suggest that the humanitarian principles of neutrality and impartiality make it difficult for the Red Cross Movement to share their understanding of the context with politically mandated Dutch peacekeepers. Findings also suggest that the Red Cross Movement and Dutch peacekeepers are not up to date about each other's actions which may hinder information sharing.

(P) Process barriers encompass differences in information management and relationships with other parties to share information.
Findings suggest that the absence of a standardized information sharing policy with the high turnover of both international deployed humanitarians of the Red Cross Movement and Dutch peacekeepers, and the lack of guiding protocols to handover, lead to institutional memory loss, which hinders the effectiveness of information.

6.5. Dilemmas

As findings in section 6.4 suggest, the possible barriers that may hinder information sharing between the Red Cross Movement and Dutch peacekeepers in Mali can be categorized in three categories: (1) Technology, (2), Organization and (3) Process, following the TOP-framework for barrier analysis as proposed in chapter 5. Overcoming these barriers is not straightforward. Bearing in mind that the Red Cross Movement may share information if it abides the humanitarian principles and Dutch peacekeepers may only officially share information if it is declassified or downgraded, various considerations regarding humanitarian principles of neutrality and impartiality, as well as sensitivity of information need to be taken into account. This section will explore the possibilities to overcome the identified barriers for the Red Cross Movement and Dutch peacekeepers to share information in the case of Mali. Section 6.5.1 will explore the technological possibilities, section 6.5.2 the organizational possibilities and section 6.5.3 possibilities regarding the process of sharing information. As each possibility has pros and cons, possibilities may have undesirable effects. Section 6.5.4 will conclude with the main dilemmas the Red Cross Movement and Dutch peacekeepers face when it comes to sharing information with each other.

6.5.1. Technological possibilities

As findings in section 6.4 suggest, the technological barrier that may hinder information sharing between the Red Cross Movement and Dutch peacekeepers encompasses a difference in technological means and classification systems and the absence of a common technology-based system to share and store information. Overcoming the technological barrier entails some kind of data and information-sharing system where also remote humanitarians from the Red Cross Movement and Dutch peacekeepers can share and store information The following

6.5.1 Technological possibilities

technological possibilities have been identified:

Decentralized neutral system: The Red Cross Movement and Dutch peacekeepers can choose to create a neutral centralized system that is open on request and where both parties can store and share non-classified information after access has been granted may adhere the humanitarian principles. Relevant information about people in need can be extremely helpful for the Red Cross Movement in the field as well as for remote humanitarians[111]. Information that is being used for the coordination of actions of either humanitarian response operations or peacekeeping missions is intended for specific purposes.
Yet, this same information can become a threat, endangering these same people, if not handled with care or falls in the hands of malevolent groups. If access is granted to the wrong person or information falls into the wrong hands, it can put these same people who the Red Cross Movement seeks to serve, at risk. Everyone can use information for his own biased purposes. There is a risk of political deduction and abused analysis of information.

Centralized secure system: The Red Cross Movement and Dutch peacekeepers can choose to create a centralized secure, coded system where humanitarians from the Red Cross Movement and Dutch peacekeepers can store and share information with each other at the same level of confidentiality and classifications. However, such a centralized system tightens the connection between the Red Cross Movement and Dutch peacekeepers.
As the situation in Mali is volatile and peacekeepers are specific targeted by violent groups, knowledge that the Red Cross Movement might have a shared database with peacekeepers could make humanitarians from the Red Cross Movement also a potential target.

Findings from this section suggest that there are technological possibilities, however vulnerability goes hand in hand with these technical solutions. Section 6.5.2 and section 6.5.3 will therefore explore institutional possibilities.

6.5.2. Organizational possibilities

As findings in section 6.4 suggest, humanitarian principles of neutrality and impartiality make it difficult for the Red Cross Movement to share their understanding of the context.

Share or don't share information: The Red Cross Movement and Dutch peacekeepers can either choose to share information or not share information with each other. Not sharing information may make the most vulnerable people even more vulnerable. At the same time, observations from interviews with humanitarians from the Red Cross Movement suggest that there are serious concerns that the involvement of Dutch peacekeepers pose a potential threat to the core principles of impartiality, neutrality and independence that underpin the work of humanitarian organizations[112].

Last resort & UN-CMCoord: Findings suggest that whenever a 'humanitarian' gap is identified; being a gap between the needs of the most vulnerable community and the humanitarian response to meet those needs, the Red Cross Movement can turn to Dutch peacekeepers as a 'last resort' tool. Despite the institutionalized UN-CMCoord meetings that even create a neutral ground for the Red Cross Movement and Dutch peacekeepers to interact with each other without putting the humanitarian principles at risk, there are indicators that no formal information sharing between the Red Cross Movement and Dutch peacekeepers takes place in Mali. However, the situation in Mali is so volatile that peacekeepers are specific targeted by violent groups. When humanitarians from the Red Cross Movement are seen or associated with Dutch peacekeepers in Mali, this could make them a potential target too. By

[111] Appendix C, Red Cross Movement #2
[112] Appendix C, Red Cross Movement #3, #4, Peacekeeper MINUSMA #4

assessing the safety of each situation, humanitarians from the Red Cross Movement can determine the possibilities of each specific situation.

6.5.3. Process possibilities

Findings in section 6.4 suggest that the current way of ad hoc information sharing between the Red Cross Movement and Dutch peacekeepers is not long lasting as internationally deployed humanitarians from the Red Cross Movement and Dutch peacekeepers rotate frequently.

Standardized information sharing: A possibility to overcome the process barriers is to standardized information sharing between the Red Cross Movement and Dutch peacekeepers. Standardizing information sharing may make information sharing easier for both parties, as this entails guidelines and protocols for the Red Cross Movement and Dutch peacekeepers to follow. For this to work, this however also entails some kind of technology-based system as suggested in section 6.5.1.

Ad hoc information sharing: The current way of ad hoc information sharing is based on interest, relationships and trust to share information. As internationally deployed humanitarians from the Red Cross Movement and Dutch peacekeepers rotate frequently, this leads to institutional memory loss. If internationally deployed humanitarians from the Red Cross Movement and Dutch peacekeepers would invest in the handover to their successor including contact data or introducing their contact persons to them, this may help make these relationships longer lasting and reduce memory loss. The level of trust is however closely aligned with the perceived risk of harm that information sharing could cause, either to the Red Cross Movement, the affected people or the ability for the Dutch peacekeepers to accomplish their mission goals. As the situation in Mali is so volatile that peacekeepers are specific targeted by violent groups, when humanitarians from the Red Cross Movement are seen or associated with Dutch peacekeepers in Mali, this could make them a potential target too. By assessing the safety of each situation, humanitarians from the Red Cross Movement can determine the possibilities of each specific situation.

6.5.4. Section synthesis | Dilemmas

This section aimed to answer the sub-question: '*What are possibilities for humanitarian and peacekeeping organizations to share information in the case of Mali*?' As findings in section 6.4 suggest, the identified barriers that may hinder information sharing between the Red Cross Movement and Dutch peacekeepers in Mali can be categorized following the TOP-framework for barrier analysis as proposed in chapter 5: (1) Technology, (2), Organization and (3) Process. Overcoming the identified technological, organizational and process barriers is not straightforward. As each possibility may have undesirable effects, the Red Cross Movement and Dutch peacekeepers are clearly in dilemma over sharing information.

The organizational barriers that may hinder information sharing between the Red Cross Movement and Dutch peacekeepers encompass differences in culture, language and principle that may lead to prejudice, misinterpretation and misunderstanding. Findings suggest that the Red Cross Movement and Dutch peacekeepers clearly face a dilemma when it comes to sharing and not sharing information.

Share information	**or**	**Don't share information**
+ Last resort & UN-CMCoord - Concerns about humanitarian principles of neutrality and impartiality? Safety?		-Making the most vulnerable people even more vulnerable

Findings suggest that the Red Cross Movement and Dutch peacekeepers face a dilemma when it comes to overcoming process barriers that may hinder information sharing. These

process barriers encompass the lack of a standardized information sharing policy and the current way of ad hoc information sharing which is based on interest, relationships and trust. A possibility for the Red Cross Movement and Dutch peacekeepers to overcome the identified process barriers is to standardize information sharing. Another possibility is to not standardize information sharing, and keep on informally sharing information, which leads to institutional memory loss. Findings suggest that the Red Cross Movement and Dutch peacekeepers are in dilemma when it comes to overcoming the process barrier:

Standardized information sharing +Clear guidelines and protocols -Technology-based system	**or**	**Ad hoc, informal information sharing** -Institutional memory loss -Safety?

As standardizing the information sharing policy entails some kind of technology-based system, findings suggest that the Red Cross Movement and Dutch peacekeepers are in dilemma when it comes to overcoming the technological barrier that may hinder information sharing. Findings suggest that the technological barrier encompasses difference in technological means in the field and classification systems as well as the absence of a common technology-based system to share and store information. Overcoming the technological barrier entails some kind of data and information-sharing system where also remote humanitarians from the Red Cross Movement and Dutch peacekeepers can share and store information, which leads to the following dilemma:

A decentralized neutral system +Common database to share information -Risk of information falling in wrong hands e.g. malevolent groups, political deduction or abused analysis of information	**or**	**A centralized coded secure system** +Common database to share information -Dutch peacekeepers are specific targeted by violent groups. Knowledge about a shared system between the Red Cross Movement and Dutch peacekeepers may put RCM in danger too

Findings suggest that vulnerability of the technological solutions need to be considered when it comes to technological solutions. The situation in Mali is so volatile that peacekeepers are specifically targeted by violent groups. When humanitarians from the Red Cross Movement are seen or associated with Dutch peacekeepers in Mali, this could make them a potential target too. Safety and security are recurring concerns in Mali when it comes to sharing or not sharing information.

6.6. Chapter synthesis | Case Study

In this chapter, a case study is performed in order to test the findings of chapter 3, 4 and 5 and answer the sub-question 'What are possibilities for humanitarian and peacekeeping organizations to share information in the case of Mali?'. The focus of the case study is information sharing between the Red Cross Movement and Dutch peacekeepers in the context of drought fueled food insecurity and conflict in the case of Mali (Section 6.1). With the help of desk research, literature review, System Dynamics modeling and conducting interviews with humanitarians from the Red Cross Movement as well as peacekeepers who contributed to the MINUSMA UN peacekeeping mission in Mali, this case study is performed. The case study consists of four components (1) Understanding the Drought-Food insecurity-Conflict Nexus is Mopti, Mali, (2) Unraveling the Red Cross Movement – Dutch peacekeeping Data Ecosystem, (3) Understanding the differences in institutional rules and play of the game (4) Applying the TOP-framework.

Understanding the Drought-Food insecurity-Conflict Nexus

To understand the dynamics of a slow-onset natural disaster and conflict in the case of the Drought-Food insecurity-Conflict Nexus in Mopti, Mali, section 6.2 aimed to test findings from chapter 3 and answer the sub-question '*In what way can the relationship between a slow-onset natural disasters and conflict and the relationship of information for humanitarian and*

peacekeeping organizations be conceptualized and modeled?. With the help of desk research and interviews with humanitarians from the Red Cross Movement and Dutch peacekeepers (Appendix C) and the System Dynamics modeling approach, the main findings are as follows:

Findings from analyzing the model behavior confirm the in chapter 3 suggested image where disasters do not occur in a vacuum. Due to food shortages in a peaceful region, people move to other regions putting pressure on food security in those regions, which creates room for conflict and may induce people to move again. The relationship between drought fueled food insecurity and conflict is seen as a vicious cycle wherein food insecurity and conflict reinforce each other in a downward spiral, causing more and more people to be in need of humanitarian food assistance. A 'humanitarian food assistance gap' can be identified between the needs of the drought-affected population and the humanitarian food assistance the Red Cross Movement can deliver, causing more people to be in need. As humanitarian food assistance is dependent on the timeliness of information, analysis of the model behavior confirms that the sooner information is available, the sooner humanitarian food assistance can be delivered which decreases the number of people in need and subsequently more people will survive food insecurity.

Due to the volatile situation in Mali, and peacekeepers being specifically targeted by violent and armed groups, it cannot be said that improving food security will take away the incidents caused by these violent armed groups. However, improving food security may take away tensions and ultimately reduce conflict. Analysis of the model behavior confirms a relationship between the availability of information through sharing information, food security and conflict: The sooner information is available, the sooner humanitarian food assistance can be provided which improves food security and can turn the vicious cycle of food insecurity and conflict into a virtuous cycle of food security and reduced conflict in the region of Mopti, Mali.

Understanding the Red Cross Movement – Dutch peacekeeping Data Ecosystem
To understand what the roles, responsibilities and relationships of the Red Cross Movement and Dutch peacekeepers in Mopti, Mali are, how they collect and use data and information and analyze how information exchange takes place, and to test findings of chapter 4, section 6.3 aimed to answer the sub-question *'Which parties are involved in the humanitarian-peacekeeping data ecosystem and what are their roles, responsibilities and relationships?'.* The humanitarian-peacekeeping data ecosystem consists of three components: (1) information demanders and suppliers, (2) information demand and supply and (3) information sharing infrastructure. With the help of desk research and interviews with humanitarians from the Red Cross Movement and peacekeepers that contributed to the MINUSMA mission in Mali (Appendix C), the main findings are in threefold:

Firstly, findings suggest that the Red Cross Movement; the ICRC, IFRC and NLRC work closely together with CRM and other parties in the Global Food Security Cluster to distribute food, funds and basic household necessities in Mali. Together with 46 other humanitarian organizations they aim to improve lives of those whose lives have been roiled by conflict, armed groups and drought in Mopti (Humanitarianresponse.info, 2018a; ICRC, 2018). As suggested in chapter 4, the vast amount of humanitarian organizations, frameworks and coordination mechanisms between humanitarian organizations indicate an institutional fragmentation and fragmentation of responsibilities. In contrast, as findings suggested in chapter 4, Dutch peacekeepers that contribute to the MINUSMA mission are mandated to collect information for the long-term prevention of conflict and follow a clear line of command and control. As suggested in chapter 4, the MINUSMA mission is a multidimensional integrated stabilization mission comprising not only military forces but also civilian personnel and participates in humanitarian activities.

Secondly, as findings in chapter 4 suggested, humanitarian food assistance is dependent on information. Observations from interviews with humanitarians from the Red Cross Movement suggest that despite the deteriorating situation of conflict in Mopti, monitors and early warning systems for food security are still in place. The Red Cross Movement receives regularly updated information about the food security situation in Mopti. Whenever a threshold for humanitarian food insecurity is reached, humanitarian food assistance is triggered. In peacetime, analysis combines information from among others weather data with satellite pictures to know where the most vulnerable drought-affected people are. In case of the onset of a conflict, this may be different. As findings in chapter 4 suggested, to make sense of what is going on in those areas and to find out how many people are exactly in need of humanitarian food assistance, the Red Cross Movement needs to go into the field and perform assessments. Findings suggest that due to safety issues in Mopti, the difficult to access marsh areas, lack of capabilities, scarce resources, limited local government data, limited access to internet and limited information sharing with other parties, the Red Cross Movement has limited information in conflict-affected areas to meet the needs of the most vulnerable people in need of humanitarian food assistance in Mopti, making the drought-affected population even more vulnerable. Dutch peacekeepers are mandated to collect information for the long-term prevention of conflict. As hunger and poverty are indicators for conflict, when the Red Cross Movement and Dutch peacekeepers would share information with each other, they might indirectly reach their own goals of increased food security and stability.

Thirdly, as findings in chapter 4 suggested, if a' humanitarian food assistance gap' is identified between the needs of the affected community and the humanitarian response to meet those needs, the Red Cross Movement can turn to Dutch peacekeepers as a 'last resort' tool, to complement their relief efforts. Sharing information with the Red Cross Movement may help turn the vicious cycle of food insecurity and conflict into a virtuous cycle of food security and stability. Despite humanitarian peacekeeping information sharing being institutionalized with the UN-CMCoord structure that creates a neutral ground for humanitarian and peacekeeping organizations to interact with each other without putting the humanitarian principles at risk, there are indicators that no formal information sharing between the Red Cross Movement and the Dutch peacekeepers takes place in Mali. At the same time, there are indicators that informal information sharing does take place. Observations from interviews suggest that during deployment, Dutch peacekeepers get to know international humanitarians from the Red Cross Movement; this may create room for relationships and trust, especially if they have the same nationality or if they have met during previous deployments. Both Red Cross Movement and Dutch peacekeepers rotate frequently, taking the trust and face-to-face relationships with them home. As findings in chapter 4 suggested, without guiding protocols or handbooks, collective memory is short as a lot of memory is lost in the current way of ad hoc information sharing, causing institutional memory loss.

Unraveling the differences in institutional rules and play of the game

Cooperation and coordination between Red Cross Movement and Dutch peacekeepers is complex, due to numerous differences between the two organizations. In order to unravel differences in institutional rules and governance that may lead to possible barriers that hinder information sharing, section 6.4 aimed to answer the sub-question: '*What are possible institutional barriers for humanitarian and peacekeeping organizations to share information?*'. To answer this sub-question and test the findings of chapter 5, with the help of interviews with humanitarians from the Red Cross Movement and peacekeepers that contributed to the MINUSMA mission in Mali (Appendix C), section 6.4 analyzed the differences in informal and formal rules and governance following Williamson's (2000) framework for institutional analysis. Section 6.4 also tested the application of the TOP-framework for barrier analysis as proposed in chapter 5.

As findings in chapter 5 suggested, Williamson's (2000) framework for institutional analysis is useful to identify differences regarding informal and formal rules and governance between the

Red Cross Movement and Dutch peacekeepers, which may lead to possible barriers that hinder information sharing. Findings also suggest that the TOP-framework as proposed in chapter 5, is applicable to this case as the barriers that may hinder information sharing between the Red Cross Movement and Dutch peacekeepers can be categorized in the three categories of (T) Technology, (O) Organization and (P) Process:

(T) Technological barriers encompass interoperability and difference in technological means to share information.
Findings suggest that the difference in technological means and classification systems between the Red Cross Movement and Dutch peacekeepers in the field, as well as the absence of a common technology-based system may hinder information sharing.

(O) Organizational barriers encompass differences in culture, language and principles which may lead to prejudice, misinterpretation and misunderstanding.
Findings suggest that the humanitarian principles of neutrality and impartiality make it difficult for the Red Cross Movement to share their understanding of the context with politically mandated Dutch peacekeepers. Findings also suggest that the Red Cross Movement and Dutch peacekeepers are not up to date about each other's actions which may hinder information sharing.

(P) Process barriers encompass differences in information management and relationships with other parties to share information.
Findings suggest that the absence of a standardized information sharing policy with the high turnover of both international deployed humanitarians of the Red Cross Movement and Dutch peacekeepers, and the lack of guiding protocols to handover, lead to institutional memory loss, which hinders the effectiveness of information.

Dilemmas

Section 6.5 aimed to answer the sub-question: '*What are possibilities for humanitarian and peacekeeping organizations to share information in the case of Mali*?' As findings in section 6.4 suggest, the identified barriers that may hinder information sharing between the Red Cross Movement and Dutch peacekeepers in Mali can be categorized following the TOP-framework as proposed in chapter 5: (1) Technology, (2), Organization and (3) Process. Overcoming the identified technological, organizational and process barriers is not straightforward. Various considerations regarding humanitarian principles of neutrality and impartiality need to be taken into account, as well as sensitivity of information. As each possibility may have undesirable effects, the Red Cross Movement and Dutch peacekeepers clearly face a dilemma over sharing information.

Findings suggest that the Red Cross Movement and Dutch peacekeepers face a dilemma when it comes to sharing and not sharing information:

Share information	**or**	**Don't share information**
+ Last resort & UN-CMCoord -Concerns about humanitarian principles of neutrality and impartiality? Safety?		-Making the most vulnerable people even more vulnerable

Findings suggest that the Red Cross Movement and Dutch peacekeepers face a dilemma when it comes to overcoming process barriers that may hinder information sharing. These process barriers encompass the lack of a standardized information sharing policy and the current way of ad hoc information sharing which is based on interest, relationships and trust.
A possibility for the Red Cross Movement and Dutch peacekeepers to overcome the identified process barriers is to standardize information sharing. This however entails some kind of technology-based system. Another possibility is to not standardize information sharing, and keep on informally sharing information, which leads to institutional memory loss. Findings suggest that the Red Cross Movement and Dutch peacekeepers face a dilemma when it comes to overcoming the process barrier:

Standardized information sharing +Clear guidelines and protocols	**or**	**Ad hoc, informal information sharing** -Institutional memory loss -Safety?

As standardizing the information sharing policy entails some kind of technology-based system, findings suggest that the Red Cross Movement and Dutch peacekeepers are in dilemma when it comes to overcoming the technological barrier that may hinder information sharing. Findings suggest that the technological barrier encompasses difference in technological means in the field and classification systems as well as the absence of a common technology-based system to share and store information. Overcoming the technological barrier entails some kind of data and information-sharing system where also remote humanitarians from the Red Cross Movement and Dutch peacekeepers can share and store information, which leads to the following dilemma:

A decentralized neutral system +Common database to share information -Risk of information falling in wrong hands e.g. malevolent groups, political deduction or abused analysis of information	**or**	**A centralized coded secure system** +Common database to share information -Dutch peacekeepers are specifically targeted by violent groups. Knowledge about a shared system between the Red Cross Movement and Dutch peacekeepers may put RCM in danger too

Findings suggest that vulnerability of the technological solutions need to be considered when it comes to technological solutions. The situation in Mali is however so volatile that peacekeepers are specifically targeted by violent groups. When humanitarians from the Red Cross Movement are seen or associated with Dutch peacekeepers in Mali, this could make them a potential target too. Safety and security are recurrent concerns in Mali when it comes to sharing or not sharing information.

7

Limitations

In this chapter the limitations of this research will be discussed. In section 7.1 the limitations of the research approach will be discussed and in section 7.2 the limitations of the modeling approach will be discussed.

7.1. Limitations research approach

Due to exploratory nature of this study, a clear framework to fill the identified gaps is lacking. Information sharing between humanitarian and peacekeeping organizations has been found to be a challenging topic. The quality of desk research, literature review and conducting interviews goes hand in hand with the available literature and knowledge shared, which is limited on this topic. Without access to actual data sets the Dutch peacekeepers have, this research cannot say anything about the effect of information sharing or the value of their information. *Assumption: information shared serves to support its owner's mission. However, this is a fundamental aspect of information sharing.*

Interviews are useful qualitative technique for researchers interested in understanding individuals' cognitive and conceptual visions. Qualitative methods are mainly concerned with exploration; this gives room for interviewees to address issues, which they feel relevant to the topics being raised by the researcher. Ideally more interviewees would have been included in this research, since interviews only provide the personal vision and perception of a small part of the whole. It is a snapshot of information shared by a single person in time. It is well possible that other interviewees would have answered other questions. The partial validation of the research findings is another limitation of this research. As only a set of 6 humanitarians and peacekeepers is consulted. Therefore, further empirical research is recommended in a form of survey research for the organizations by using multivariate analysis to validate the findings of this research.

Although interviews are useful qualitative methods, these interviews have been conducted in the Netherlands, far away from fragile states that are prone to slow onset natural disasters and conflict. Extensive field research may benefit this research greatly.

There are hundreds of humanitarian organizations and each organization is driven by its own mandate as well as different ethical and moral perspectives. The results may inherent some limitations in terms of validity. Therefore, further empirical research is recommended in a form of survey research for the organizations by using multivariate analysis to validate the findings of this research.

This research solely focuses on information sharing between humanitarian and peacekeeping organizations. However, affected state governments play a great role too. Affected states focus on managing the problem within their borders. Politics could thus influence or constrain information sharing. Governments, like people, are reluctant to disclose negative information and attempt to manage information flow to the public.

7.2. Limitations modeling approach

The System Dynamics model is a simplified representation of a part of reality. With a focus solely on the relationship between food security and conflict, ethical and political and economic factors as well as state capacity are not taken into account. In reality, these factors may be of influence on the performance of the system. Subsidy programs for agricultural supplies, seeds and fertilizers, distribution of agricultural equipment and hydro-agricultural development schemes have not been taken into account. Different usages of land sectors and allocation of arable land is not taken into account in this model. Rising priced are an indicator for actual and perceived food scarcity triggers, however income inequalities also play a large part in this.

Main assumptions:

- Significant population changes in a region do not have an impact on the agricultural productivity
- Food supply is solely for the purpose of human consumption. Livestock and fish are not incorporated in this model
- Rainfall is the main driver for rainfed agriculture. Within the scope of this research as rainfall has been found to be the only variable with consistent data, variables as temperature, types of soil, types of crops/food to be produces (which use different levels of water), crop water requirements, evapotranspiration, soil fertility, pests and farm practices are not accounted in this model
- All people in this model are equally vulnerable, as a distinction between age groups and gender have not been incorporated in this model
- The required food supply is every day 1700 kcal per person per day. Even after a period where consumption falls far below 1700 kcal per person per day, the required amount does not increase
- Only one coping strategy has been incorporated in this model
- In this model there are two stages; conflict and peace. There is no distinction between the severities and different levels of conflict
- Humanitarian food assistance reaches the targeted population
- Humanitarian food assistance is only dependent on information and a delay time
- Information available is only dependent on time, in times of conflict the delay is bigger than in times of peace

External food assistance can, if not conflict sensitive, easily become a contributing factor in the causation of cleft or can prolong existing conflicts, this has however not been incorporated into the model.
Food aid often ends up in the hands of the warring, rather than the targeted civilian population, which may cause hostilities to continue. A conflict sensitive approach is needed which takes a holistic view of conflict prevention, relief and resolution and post conflict peace building in account

8

Conclusion & Discussion

This chapter will present the conclusions of this thesis as well as its societal and academic contributions. This research aimed to identify and enhance the understanding of differences between humanitarian and peacekeeping organizations in order to unravel barriers that may hinder information sharing in fragile states that are prone to slow-onset natural disasters and conflict. The main question of this research has been formulated as follows:

> **'What are the main dilemmas humanitarian and peacekeeping organizations face when it comes to sharing information in fragile states that are prone to slow-onset natural disasters and conflict?'**

Within the academic world, humanitarian - peacekeeping interaction is a relatively new field of research. As one of the first attempts to explore this field, chapter 1 identified several knowledge gaps based on literature review and desk research. Due to exploratory nature of this study, a clear framework to fill the identified gaps is lacking. To explore and identify the complexities of information sharing between the humanitarian and peacekeeping organizations in fragile states that are prone to slow-onset natural disasters and conflict, this research makes use of an **exploratory iterative design.** The theoretical outcomes of the literature review have been combined with findings from attending conferences and conducting interviews in combination with a System Dynamics modeling approach. Four sub-questions have been identified in order to answer the main research question. Due to the exploratory nature of this research and to be able to conduct a more in-depth and detailed examination of the phenomenon, a case study is conducted. The focus of the case study is information sharing between the Red Cross Movement and Dutch peacekeepers who contribute to the MINUSMA peacekeeping mission in Mali in the context of drought fueled food insecurity and conflict. The goal of the case study is to test the findings of sub-question 1, 2 and 3 in chapter 3, 4 and 5 and add to that by answering sub-question 4 in chapter 6.

Section 8.1 will discuss the answer to sub-question 1, section 8.2 will discuss the answer to sub-question 2, section 8.3 will discuss the answer to sub-question 3 and section 8.4 will discuss the answer to sub-question 4. Section 8.5 will discuss the societal contribution of this research and section 8.6 will discuss the scientific contribution of this study. Section 8.6 will discuss recommendations for future research.

8.1. Answering sub-question 1

Sub-conclusion: '**In what way can the relationship between a slow-onset natural disaster and conflict and the role of information for humanitarian and peacekeeping organizations in a fragile state be conceptualized and modeled?**'. With the help of desk research, literature review and a System Dynamics modeling approach in chapter 3 findings suggest that in fragile states where coping strategies are limited, drought fueled food insecurity has an influence on conflict and conflict has an influence on food insecurity. In a fragile state the relationship can be seen as a vicious cycle of cause and effect wherein drought fueled food insecurity and conflict reinforce each other in a downward spiral; causing more and more human suffering. Improving food security can reduce tensions, contribute to a more stable

environment and transform the vicious cycle of food insecurity and conflict in a virtuous cycle of food security and stability that reduces drivers of conflict.

Findings suggest that humanitarian food assistance can benefit people in need of food assistance and alleviate their suffering from food shortages. Information is vital in providing humanitarian assistance to the most vulnerable people and help them recover. The sooner right information is available at the right place, the earlier humanitarian organizations can intervene to reduce human suffering and help prevent the downward spiral of increased vulnerability to future disastrous events and risks of violent conflicts. Findings suggest that that budgets and resources of humanitarian organizations are scarce, hindering them from reaching all people in need of humanitarian food assistance. There is a need to identify which areas are the most affected and to identify the people that are the most in need of humanitarian food assistance (NLRC, 2017). To find the most vulnerable people, humanitarians need to go into the drought-affected areas, interview people and assess their needs. This process takes a lot of time and is often unsafe and costly (Van den Homberg, Monne & Spruit, 2016). Especially in conflict-affected areas information collection has found to be dangerous or not possible at all. Conflict safety and security issues hinder humanitarian organizations to perform assessments and deliver humanitarian food assistance to the most vulnerable people in need.

Findings suggest that when deployed to regions that are prone to conflict, peacekeeping organizations collect a lot of information to gain insight into what is going on, in order to intervene and contribute to the long-term prevention of conflict (UNP, 2018b). At the same time, the presence of peacekeeping organizations in a region reduces conflict (Di Salvatore & Ruggeri, 2017). By sharing information with humanitarian organizations that aim to alleviate human suffering from food shortages, peacekeeping organizations may indirectly reach their own goals of reduced conflict. By helping each other and sharing information, both humanitarian and peacekeeping organizations could indirectly reach their own goals.

In the case study in chapter 6, the conceptualized Causal Loop Diagram model in chapter 3 has been improved and formalized into a Stock-Flow diagram based on the parameterization of the case on Mopti, Mali (Section 6.2). By constructing the System Dynamics model, which is based on the parametrization of the Drought-Food insecurity-Conflict Nexus in Mopti, Mali and a series of assumptions, the relationship between drought fueled food insecurity and conflict in Mopti and the role of information for the Red Cross Movement and Dutch peacekeepers has been analyzed.

Findings from analyzing the model behavior confirm the in chapter 3 suggested image where disasters do not occur in a vacuum. Due to food shortages in a peaceful region, people move to other regions putting pressure on food security in those regions, which creates room for conflict and may induce people to move again. The relationship between drought fueled food insecurity and conflict is seen as a vicious cycle wherein food insecurity and conflict reinforce each other in a downward spiral, causing more and more people to be in need of humanitarian food assistance. A ‘humanitarian food assistance gap’ can be identified between the needs of the drought-affected population and the humanitarian food assistance the Red Cross Movement can deliver, causing more people to be in need. As humanitarian food assistance is dependent on the timeliness of information, analysis of the model behavior confirms that the sooner information is available, the sooner humanitarian food assistance can be delivered which decreases the number of people in need and subsequently more people will survive food insecurity.

Due to the volatile situation in Mali, and peacekeepers being specifically targeted by violent and armed groups, it cannot be said that improving food security will take away the incidents caused by these violent armed groups. However, improving food security may take away tensions and ultimately reduce conflict. Analysis of the model behavior confirms a relationship between the availability of information through sharing information, food security and conflict:

The sooner information is available, the sooner humanitarian food assistance can be provided which improves food security and can turn the vicious cycle of food insecurity and conflict into a virtuous cycle of food security and reduced conflict in the region of Mopti, Mali.

8.2. Answering sub-question 2

Sub-conclusion **'Which parties are involved in the humanitarian-peacekeeping data ecosystem and what are their roles, responsibilities and relationships?'.** To help understand the relationships between humanitarian and peacekeeping organizations and how information exchange takes place, this sub-question consists of two parts: (1) involved parties and their mandates in humanitarian response operations and peacekeeping missions and (2) humanitarian-peacekeeping data ecosystem. Adopted from Oliveira and Lóscio's (2018) definition of a data ecosystem and Van den Homberg and Susha's (2018) definition of a humanitarian data ecosystem, a humanitarian-peacekeeping data ecosystem in a fragile state that is prone to both slow-onset natural disasters and conflict, consists of three components: (1) Information demanders and suppliers, (2) information demand and supply and (3) information sharing infrastructure.

In chapter 4, findings suggest that there is no single organization or entity that decides who does what and where, or who controls a humanitarian relief operation (Balcik et al., 2010). The vast amount of organizations, frameworks and coordination mechanisms between humanitarian organizations indicate an institutional fragmentation and fragmentation of responsibilities. Findings suggest that humanitarian organizations are often reluctant to share information with other humanitarian organizations, to keep a competitive advantage in attracting attention and donor funding (Balcik et al., 2010; Stephenson, 2005; Underwood, 2016).
In contrast, findings suggest that peacekeeping missions are centralized with a clear line of authority. The head of the peacekeeping mission decides in which direction information is required and in which direction information must be collected, this is captured in a peacekeeping intelligence cycle. Findings suggest that peacekeeping missions are becoming increasing multidimensional, comprising not only military forces, but also civilian personnel and are increasingly participating in humanitarian activities (Egnell, 2013; Foo, 2012). However, humanitarian and peacekeeping organizations often cover different geographical areas as peacekeepers are deployed to some of the most dangerous areas, protecting the most vulnerable people. Both peacekeepers and humanitarians might not be well informed or familiar with the activities of the other party. This may lead to prejudice and misunderstandings.

Findings suggest that planning a response to slow-onset natural disasters is done on a regular basis: early warning systems and the coordination of response give humanitarian organizations time to provide humanitarian assistance to the most vulnerable people in need (Hurt, 2011). To find the most vulnerable people, humanitarians need to go into the drought-affected areas, interview people and assess their needs. Findings suggest that especially in conflict-affected areas information collection may be dangerous or not possible at all. Combined with limited local government data, not much use of Internet and limited information sharing, chances are that assessments are incomplete or unreliable, which subsequently affects accurate decision-making and may make the most vulnerable people even more vulnerable. When deployed to regions that are prone to conflict, peacekeeping organizations collect a lot of information to gain insight into what is going on, in order to intervene and contribute to the long-term prevention of conflict. By sharing information with humanitarian organizations that aim to alleviate human suffering from food shortages, peacekeeping organizations may indirectly reach their own goals of reduced conflict.

Findings suggest that whenever there is room for cooperation or coordination and a 'humanitarian gap' is identified, humanitarian and peacekeeping organizations can turn to each other as a 'last resort' tool, to meet the needs of the affected population (De Coning & Friis,

2011; CCOE, 2018; UN OCHA, 2012a). Data and information are sensitive, especially in conflict-affected areas where knowledge can be used as power of leverage. Despite peacekeeping organizations having an image of only using closed classified systems for data and information sharing, there are examples of peacekeeping systems that handle unclassified, for public release information. There is however no common database where both peacekeepers and humanitarians can share their information. UN-CMCoord has been found to be an institutionalized structure where humanitarian and peacekeeping organizations can interact on neutral ground that does not put humanitarian principles at risk (UN OCHA, 2017). Information sharing between humanitarian and peacekeeping organizations happens at these organized meetings, face-to-face, via emails with reports or phone calls. Information exchange also takes place in informal meetings. This has been found to be a non-durable information sharing relationship, since both humanitarian and peacekeeping staff turnover every four to six months. However, without any clear protocols or guidebooks that organize handover, this causes institutional memory loss; information and personal relationships are lost when people leave (UN DPKO, 2012; Van de Walle & Comes, 2015).

In the case study in chapter 6, on information sharing between the Red Cross Movement and Dutch peacekeepers in Mopti, Mali, findings suggest that the Red Cross Movement; the ICRC, IFRC and NLRC work closely together with CRM and other parties in the Global Food Security Cluster to distribute food, funds and basic household necessities in Mali. Together with 46 other humanitarian organizations they aim to improve lives of those whose lives have been roiled by conflict, armed groups and drought in Mopti (Humanitarianresponse.info, 2018a; ICRC, 2018). As suggested in chapter 4, the vast amount of humanitarian organizations, frameworks and coordination mechanisms between humanitarian organizations indicate an institutional fragmentation and fragmentation of responsibilities. In contrast, as findings suggested in chapter 4, Dutch peacekeepers that contribute to the MINUSMA mission are mandated to collect information for the long-term prevention of conflict and follow a clear line of command and control. As suggested in chapter 4, the MINUSMA mission is a multidimensional integrated stabilization mission comprising not only military forces but also civilian personnel and participates in humanitarian activities.

As findings in chapter 4 suggested, humanitarian food assistance is dependent on information. Observations from interviews with humanitarians from the Red Cross Movement suggest that despite the deteriorating situation of conflict in Mopti, monitors and early warning systems for food security are still in place. The Red Cross Movement receives regularly updated information about the food security situation in Mopti. Whenever a threshold for humanitarian food insecurity is reached, humanitarian food assistance is triggered. In peacetime, analysis combines information from among others weather data with satellite pictures to determine where the most vulnerable drought-affected people are. In case of the onset of a conflict, this may be different. As findings in chapter 4 suggested, to make sense of what is going on in those areas and to find out how many people are exactly in need of humanitarian food assistance, the Red Cross Movement needs to go into the field and perform assessments. Findings suggest that due to safety issues in Mopti, the difficult to access marsh areas, lack of capabilities, scarce resources, limited local government data, limited access to internet and limited information sharing with other parties, the Red Cross Movement has limited information in conflict-affected areas to meet the needs of the most vulnerable people in need of humanitarian food assistance in Mopti, making the drought-affected population even more vulnerable. Dutch peacekeepers are mandated to collect information for the long-term prevention of conflict. As hunger and poverty are indicators for conflict, when the Red Cross Movement and Dutch peacekeepers would share information with each other, they might indirectly reach their own goals of increased food security and stability.

As findings in chapter 4 suggested, if a' humanitarian food assistance gap' is identified between the needs of the affected community and the humanitarian response to meet those needs, the Red Cross Movement can turn to Dutch peacekeepers as a 'last resort' tool, to

complement their relief efforts. Sharing information with the Red Cross Movement may help turn the vicious cycle of food insecurity and conflict into a virtuous cycle of food security and stability. Despite humanitarian peacekeeping information sharing being institutionalized with the UN-CMCoord structure that creates a neutral ground for humanitarian and peacekeeping organizations to interact with each other without putting the humanitarian principles at risk, there are indicators that no formal information sharing between the Red Cross Movement and the Dutch peacekeepers takes place in Mali. At the same time, there are indicators that informal information sharing does take place. Observations from interviews suggest that during deployment, Dutch peacekeepers get to know international humanitarians from the Red Cross Movement; this may create room for relationships and trust, especially if they have the same nationality or if they have met during previous deployments. Both Red Cross Movement and Dutch peacekeepers rotate frequently, taking the trust and face-to-face relationships with them home. As findings in chapter 4 suggested, without guiding protocols or handbooks, collective memory is short as a lot of memory is lost in the current way of ad hoc information sharing, causing institutional memory loss.

8.3. Answering sub-question 3

Sub-conclusion **'What are possible institutional barriers for humanitarian and peacekeeping organizations to share information?'.** Cooperation and coordination between humanitarian and peacekeeping organizations is complex due to numerous differences between the two institutions. In order to unravel possible institutional barriers that may hinder information sharing between humanitarian and peacekeeping organizations, the differences between both institutions have been analyzed following Williamson's (2000) framework for institutional analysis. This framework includes the informal and formal institutional rules as well as the governance or play of the game. With the help of desk research, literature review and interviews with a set of 15 humanitarians, peacekeepers and interface (between both) (Appendix C), the differences in terms of informal rules, formal rules and governance have been analyzed. As differences may lead to potential barriers, knowledge about the possible barriers may help identify opportunities to overcome them. Table 8.1 provides an overview of the identified differences between humanitarian and peacekeeping organizations.

Table 8.1: Overview of identified differences between humanitarian and peacekeeping organizations following Williamson's (2000) framework for institutional analysis

	Humanitarian Organizations	**Peacekeeping Organizations**
Level one: Differences in informal rules of the game		
Goals	• Determined by the mission: to reduce human suffering worldwide[113]	• Determined by the mission: peacekeepers are often sent in order to prevent escalation of the conflict, this can be one sided[114]
Motivations	• Long term commitment to address whatever needs the most vulnerable may have, on all sides of a conflict[115]	• Political-related objectives or national security-related objectives[116] • Peacekeepers are told to be there[117]
Values	• Humanitarian aid contributes to basic human rights and must be distributed solely on the basis of need[118]	• Peacekeeping activities aim at contributing to basic human rights and democratization[119]

[113] (UN OCHA, 2018)
[114] (UNP, 2018)
[115] (Metcalfe et al., 2012)
[116] Appendix C, Peacekeeper #12, #15, #16
[117] (UNP, 2018)
[118] (UN OCHA, 2012)
[119] Appendix C, Peacekeeper #13

8.3 Answering sub-question 3

	Humanitarian Organizations	Peacekeeping Organizations
Ways to accomplish goals	• Humanitarians often place themselves midst of the local population with few boundaries. Due to closeness, they incorporate local cultural modes[120]	• Peacekeepers are concerned with maintaining objectivity which can lead to maintaining distance from the local population[121]
Principles	• Abiding the core humanitarian principles: humanity, impartiality, neutrality, independence, voluntary service, unity and universality[122] • Can turn to peacekeepers as 'last resort'[123]	• Consent of the parties involved, non-use of force - except in self-defense and defense of the mandate, impartial when dealing with parties to the conflict, however not neutral in executing the missions mandate[124]
Level two: Differences in formal rules of the game		
International Law	• International Humanitarian Rights Law: people in need can claim assistance[125] • International Humanitarian Law: can support people in need, also in hostile environments[126]	• International Law: Sovereignty, nonintervention, nonuse of force[127] • UN Charter: responsible for maintaining international peace and security[128]
Level three: Differences in governance and play of the game		
Organizational structure	• Horizontal structure, decentralized, decisions are often made in a more or less informal setting through consensus[129]	• Hierarchical with clear line of authority and discipline, defined in mandates and doctrines, centralized, top down command and control[130]
Information management	• The mission, tasks and goals define information needs[131] • Data and information are used to inform decision making to provide humanitarian assistance to the most vulnerable people in need[132] • Information is collected internally and externally through field assessments and secondary sources by a myriad of people, abiding the humanitarian principles[133]	• The head of the mission determines in which direction information is needed and must be collected[134] • Data and information are used to inform interventions, test assumptions, and identify potential barriers to buy-in on parties[135] • A lot of information is gathered through different systems, with different tools and by a myriad of people[136]
Security and classification	• Sensitivity: Information as source of power, confidentiality needed[137] • Do no harm, data responsibility[138]	• Sensitivity: Information as source of power, confidentiality needed[139] • Classification system[140] risk of over-classification[141]

[120] (Rijksoverheid, 2014)
[121] (Rijksoverheid, 2014), Appendix C, Peacekeeper #13
[122] (UN OCHA, 2012)
[123] (UN OCHA, 2012)
[124] (UNP, 2018)
[125] (UN, 2018)
[126] (GSDRC, 2013)
[127] (UN, 1945)
[128] (UNP, 2018)
[129] (Egnell, 2013; Franke, 2006; Metcalfe et al., 2012)
[130] (Franke, 2006)
[131] (UN OCHA, 2016)
[132] (UN OCHA, 2016)
[133] (UN OCHA, 2016; UN OCHA, 2002)
[134] (Franke, 2006; Frerks et al., 2006; UNDPKO, 2017), Appendix C, Peacekeeper #12, #13, #16
[135] Appendix C, Peacekeeper #13, #16
[136] Appendix C, Peacekeeper #5, #8, #13, #14, Interface #1
[137] (UNDPKO, 2017), Appendix C, Peacekeeper #5, #8 #11 #12, Interface #1, #2, #3
[138] (UN OCHA, 2016)
[139] (UNDPKO, 2017), Appendix C, Peacekeeper #5, #8 #11 #12, Interface #1, #2, #3
[140] (UN DPKO, 2017).
[141] Appendix C, Peacekeeper #5, #8

	Humanitarian Organizations	Peacekeeping Organizations
Information sharing policies	• Market-like structure of information sharing. Information is shared horizontally when and if it is in their best interest to do so[142] • Information is shared abiding the humanitarian principles including 'last resort'[143] • Sensitivity of information; this will not be shared, or only on request with trustworthy partners[144]	• Information is shared one way up[145] • Top decides what to share with the affected state or humanitarian organizations and what not; if it is classified as 'for public release only'[146] • Sensitivity of information; this will not be shared, or only on request with trustworthy partners[147]
Ad hoc information sharing	• High rotation rate of internationally deployed humanitarians, no guiding protocols or overlap to handover knowledge and contacts[148]	• High rotation rate of internationally deployed peacekeepers, no guiding protocols or overlap to handover knowledge and contacts[149]
Language[150]	• Different terminology and words meaning different things, which may lead to misinterpretation	• Different terminology and words meaning different things, which may lead to misinterpretation

Looking at level one and the differences in informal rules between humanitarian and peacekeeping organizations, findings suggest that differences in goals, motivations, values and ways to accomplish goals may lead to prejudice and misunderstanding and misconception. Findings also suggest that for humanitarian organizations to work together with peacekeeping organizations, this may be contrary to the humanitarian principles of neutrality, impartiality and independence as peacekeeping organizations have political objectives and are therefore not neutral. This may form a possible organizational barrier for humanitarian and peacekeeping organizations to share information with each other.
Looking at level two, in the scope of this research,

Looking at level three and the differences in governance between humanitarian and peacekeeping organizations, findings suggest that differences in organizational structure and language may form possible organizational barriers for humanitarian and peacekeeping organizations to share information with each other. Findings also suggest that differences in information management, information security and classification and ad hoc relationships may form possible barriers regarding the process of sharing information between humanitarian and peacekeeping organizations. Lastly findings suggest that the lack of a common database and difference in technological means may form possible technological barriers for humanitarian and peacekeeping organizations to share information with each other.

The institutional barriers for humanitarian and peacekeeping organizations to share information with each other can be grouped together in three categories: (1) Technological barriers, (2) Organizational barriers and (3) Process barriers. Therefore, the following framework has been proposed to identify barriers that may hinder information sharing between humanitarian and peacekeeping organizations: the Technology-Organization-Process (TOP) Framework.

(T) Technological barriers encompass interoperability and differences in technological means to share information

[142] (Balcik et al., 2010; Stephenson, 2005; Underwood, 2016; UN OCHA, 2012)
[143] (UN OCHA, 2012), Appendix C, Humanitarian #1
[144] (UNDPKO, 2017), Appendix C, Peacekeeper #5, #8 #11 #12, Interface #1, #2, #3
[145] Appendix C, Peacekeeper #5
[146] (UN DPKO, 2017), Appendix C, Peacekeeper #12, #13, #16
[147] (UNDPKO, 2017), Appendix C, Peacekeeper #5, #8 #11 #12, Interface #1, #2, #3
[148] (Van de Walle & Comes, 2015)
[149] (UNDPKO, 2015), Appendix C, Peacekeeper #5, #6, #9, #13
[150] (CCOE, 2018; PAX, 2018), Appendix C, Peacekeeper #11, Interface #1, #2

(O) Organizational barriers encompass differences in culture, language and principles, which may lead to prejudice, misinterpretation and misunderstanding
(P) Process barriers encompass differences in information management, information security and classification and relationships with other parties to share information.

In the case study in chapter 6, Williamson's (2000) framework for institutional analysis has been useful to identify differences regarding informal and formal rules and governance between the Red Cross Movement and Dutch peacekeepers, which may lead to possible barriers that hinder information sharing. Findings also suggest that the TOP-framework as proposed in chapter 5, is applicable to this case as the barriers that may hinder information sharing between the Red Cross Movement and Dutch peacekeepers can be categorized in the three categories of (1) Technology, (2) Organization and (3) Process:

(T) Technological barriers encompass interoperability and difference in technological means to share information.
Findings suggest that the difference in technological means and classification systems between the Red Cross Movement and Dutch peacekeepers in the field, as well as the absence of a common technology-based system may hinder information sharing.
(O) Organizational barriers encompass differences in culture, language and principles which may lead to prejudice, misinterpretation and misunderstanding.
Findings suggest that the humanitarian principles of neutrality and impartiality make it difficult for the Red Cross Movement to share their understanding of the context with politically mandated Dutch peacekeepers. Findings also suggest that the Red Cross Movement and Dutch peacekeepers are not up to date about each other's actions which may hinder information sharing.
(P) Process barriers encompass differences in information management and relationships with other parties to share information.
Findings suggest that the absence of a standardized information sharing policy with the high turnover of both international deployed humanitarians of the Red Cross Movement and Dutch peacekeepers, and the lack of guiding protocols to handover, lead to institutional memory loss, which hinders the effectiveness of information.

8.4. Answering sub-question 4

Sub-conclusion **'What are the possibilities for humanitarian and peacekeeping organizations to share information in the case study on Mopti, Mali?'** As findings in section 6.4 suggest, the identified barriers that may hinder information sharing between the Red Cross Movement and Dutch peacekeepers in Mali can be categorized following the TOP-framework as proposed in chapter 5: (1) Technology, (2), Organization and (3) Process.
Overcoming the identified technological, organizational and process barriers is not straightforward. Bearing in mind that humanitarian organizations will only share information abiding the humanitarian principles of neutrality and impartiality and peacekeeping organizations may only officially share data and information if it is declassified or downgraded. As each possibility may have undesirable effects, the Red Cross Movement and Dutch peacekeepers clearly face a dilemma over sharing information.

Findings suggest that the Red Cross Movement and Dutch peacekeepers face a dilemma when it comes to sharing and not sharing information:

Share information	**or**	**Don't share information**
+Last resort & UN-CMCoord -Concerns about humanitarian principles of neutrality and impartiality? Safety?		-Making the most vulnerable people even more vulnerable

Findings suggest that the Red Cross Movement and Dutch peacekeepers face a dilemma when it comes to overcoming process barriers that may hinder information sharing. These

process barriers encompass the lack of a standardized information sharing policy and the current way of ad hoc information sharing which is based on interest, relationships and trust.

A possibility for the Red Cross Movement and Dutch peacekeepers to overcome the identified process barriers is to standardize information sharing. This however entails some kind of technology-based system. Another possibility is to not standardize information sharing, and keep on informally sharing information, which leads to institutional memory loss. Findings suggest that the Red Cross Movement and Dutch peacekeepers face a dilemma when it comes to overcoming the process barrier:

Standardized information sharing	**or**	**Ad hoc, informal information sharing**
+Clear guidelines and protocols -Technology-based system		-Institutional memory loss -Safety?

As standardizing the information sharing policy entails some kind of technology-based system, findings suggest that the Red Cross Movement and Dutch peacekeepers are in dilemma when it comes to overcoming the technological barrier that may hinder information sharing. Findings suggest that the technological barrier encompasses difference in technological means in the field and classification systems as well as the absence of a common technology-based system to share and store information. Overcoming the technological barrier entails some kind of data and information-sharing system where also remote humanitarians from the Red Cross Movement and Dutch peacekeepers can share and store information, which leads to the following dilemma:

A decentralized neutral system	**or**	**A centralized coded secure system**
+Common database -Risk of information falling in wrong hands e.g. malevolent groups, political deduction or abused analysis of information		+Common database Dutch peacekeepers are specific targeted by violent groups. Knowledge about a shared system between the Red Cross Movement and Dutch peacekeepers may put RCM in danger too

Findings suggest that vulnerability of the technological solutions need to be considered when it comes to technological solutions. The situation in Mali is however so volatile that peacekeepers are specifically targeted by violent groups. When humanitarians from the Red Cross Movement are seen or associated with Dutch peacekeepers in Mali, this could make them a potential target too. By assessing the safety of each situation, humanitarians from the Red Cross Movement can determine the possibilities of each specific situation: in a bigger area, the social control may for example be big enough to interact safely. Safety and security are recurring concerns in Mali when it comes to sharing or not sharing information.

8.5. Answering the main research question

> **'What are the main dilemmas humanitarian and peacekeeping organizations face when it comes to sharing information in fragile states that are prone to slow-onset natural disasters and conflict?'**

Bearing in mind that humanitarian organizations will only share information abiding the humanitarian principles of neutrality and impartiality and peacekeeping organizations may only officially share data and information if it is declassified or downgraded. Findings of this research suggest that the main dilemmas for humanitarian and peacekeeping organizations to share information are visualized in figure 8.1.

8.5 Answering the main research question

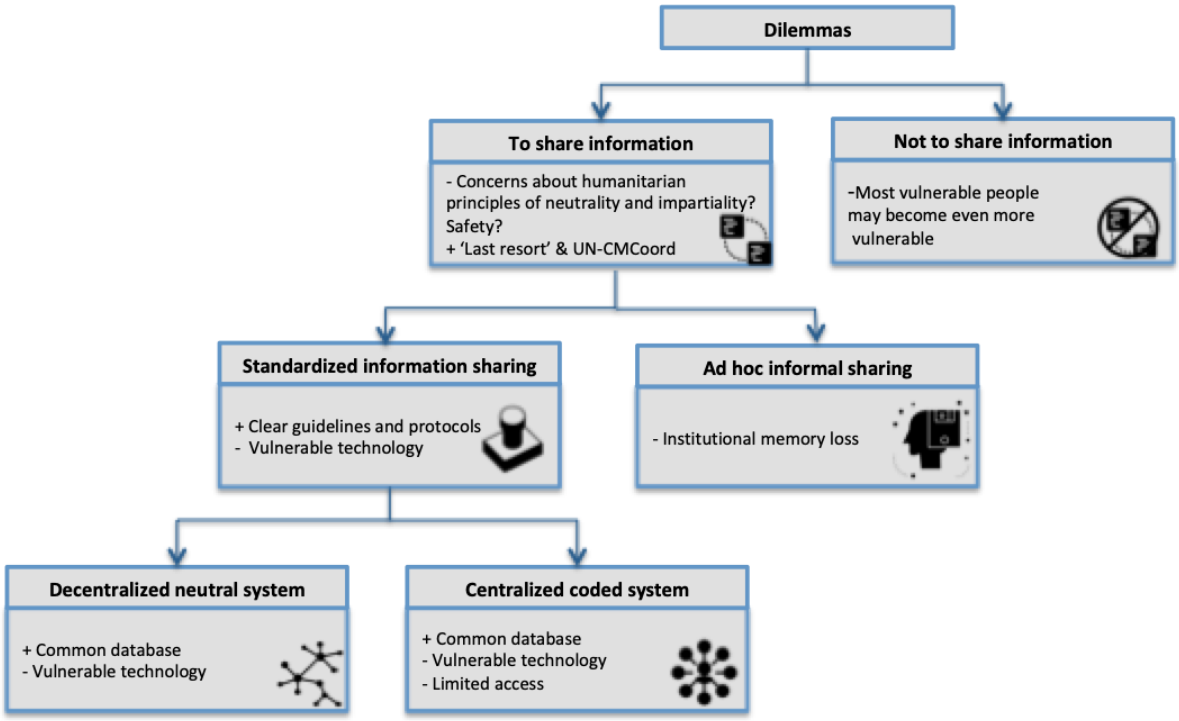

Figure 8.1 Main dilemmas humanitarian and peacekeeping organizations face when it comes to sharing information

To share or not to share: Findings suggest that humanitarians and peacekeepers are in dilemma when it comes to sharing and not sharing information. Not sharing information may make the most vulnerable people even more vulnerable. At the same time, findings suggest that there are serious concerns that the involvement of peacekeepers pose a potential threat to the core principles of neutrality and impartiality that underpin the work of humanitarians. Findings suggest that safety and security are recurring issues when it comes to sharing or not sharing information between humanitarians and peacekeepers.
The 'last resort' tool and the institutionalized UN-CMCoord meetings are existing mechanisms where humanitarians and peacekeepers can interact and share information with each other, without compromising the humanitarian principles of neutrality and impartiality.

To standardize or not to standardize: Findings suggest that humanitarian and peacekeeping organizations face a dilemma when it comes to standardizing and not standardizing information sharing. As conflict hinders information sharing, standardizing information sharing may make information sharing easier due to clear guidelines and protocols. Standardizing information sharing entails some kind of technology-based system where humanitarians and peacekeepers can store and share data and information. The alternative is to not standardize information sharing, which is ad hoc information sharing. Findings suggest that this leads to institutional memory loss as ad hoc information sharing is based on interest, relationships and trust. Internationally deployed humanitarians and peacekeepers have a high rotation frequency, taking their face-to-face contacts and relationships with them home when they leave.

Decentralized neutral system or centralized secure system: Standardizing information sharing between humanitarian and peacekeeping organizations entails some kind of data and

information-sharing system where also remote humanitarians peacekeepers can share and store information. A decentralized system can be outsourced to a third party, open on request and after access is granted, non-classified information can be stored and shared. Relevant information about people in need can be extremely helpful for the humanitarians in the field as well as for remote humanitarians. Information that is being used for the coordination of actions of either humanitarian response operations or peacekeeping missions is intended for specific purposes. Yet, this same information can become a threat, endangering these same people, if not handled with care or falls in the hands of malevolent groups. If access is granted to the wrong person or information falls into the wrong hands, it can put these same people who the humanitarians and peacekeepers seek to serve, at risk. Everyone can use information for his own biased purposes. There is a risk of political deduction and abused analysis of information. The alternative is a more secure coded centralized system, where humanitarians and peacekeepers can store and share data and information with each other at the same level of confidentiality and classification. For this to work, it is suggested that U9 (who is responsible for civil-military cooperation) to be in charge of the system. This is suggested to avoid U2 (intelligence and security) or U6 (communication and IT) to take ownership of the system, which may increase the chance of incoming information ending up in a classified system. A centralized secure system however, tightens the connection between humanitarian and peacekeeping organizations. Considering the potential dark side of information sharing via technology, vulnerability of the technological solutions needs to be taken into account. Information can fall into the wrong hands of e.g. malevolent groups or information can be used for political deduction or abused analysis.

Recommendations
When it comes to sharing information, there is always a risk of political deduction and abuse of information. Findings suggest that vulnerability of the technological solutions need to be considered. If shared information falls into the hands of malevolent groups, technological solutions may put at risk, the same people the humanitarians and peacekeepers seek to serve. It is recommended to further explore the institutional possibilities to share information. This can be done by strengthening the current ad hoc way of information sharing, through the existing institutionalized UN-CMCoord meetings or by using the ‘last resort’ mechanism.

To strengthen ad hoc information sharing, make relationship longer lasting and reduce memory loss, it is advised that the internationally deployed humanitarians, as well as the CIMIC peacekeepers, who are responsible for civil-military cooperation, invest in handovers to their successors. This includes contact data or introducing their contact persons to them. For this to work, a level of trust is needed. The level of trust is closely aligned with the perceived risk of harm that information sharing could cause, either to the humanitarians, the affected people or the ability for the peacekeepers to accomplish their mission goals.

Findings suggest that humanitarian and peacekeeping organizations might not be well informed or familiar with the activities of the other party. To combat prejudice, misinterpretation and misunderstanding and build trust, training, education and exercises (before deployment) can be useful mechanisms to advocate a mindset change and to educate about the use of the ‘last resort’ tool and the UN-CMCoord meetings. UN OCHA Civil-Military Coordination Service (CMCS) (Chapter 4) is currently developing programs to train humanitarians and peacekeepers before deployment. It is advised that CMCS educates humanitarians and peacekeepers before deployment on the differences between the humanitarian and peacekeeping organizations, and include examples of humanitarian tasks peacekeepers fulfill in their mission. By including safety and threat assessment tools in the program, humanitarians may improve their safety assessments enabling them to adapt to each specific situation: in a bigger area, the social control may for example be big enough to interact safely with peacekeepers.

However, even with a full picture, decision-makers need to be able to make decisions and take

action, otherwise the obtained information will be in vain.

8.6. Societal contribution

In light of the changing risks of natural disasters and security, UN Secretary-General Guterres (2018) argues that it would makes sense to strengthen the links between peacekeeping and humanitarian organizations. Sharing information between humanitarian and peacekeeping organizations may increase the efficiency and effectiveness of humanitarian response operations and peacekeeping missions, which may result in not only saving time and money but most importantly saving lives and reducing human suffering. Information sharing between humanitarian and peacekeeping organizations is however not common practice.

This is a comprehensive study on information sharing between humanitarian and peacekeeping organizations in fragile states. It includes desk research, interviewing, modeling approaches and a qualitative case study.

With the construction of the system dynamics model, the relationship between drought fueled food insecurity and conflict and the role of information and information sharing on the effectiveness of humanitarian food assistance is demonstrated As current food security prediction models only look at static factors as precipitation and food prices, this model can contribute to the field of food security prediction models by incorporating causal relations and building on common sense.

There is a huge potential to improve humanitarian response through better use of information. 510 aims to have global impact by providing new data driven solutions with new models and technologies to make humanitarian aid faster and more (cost) effective (510, 2018). For the past three years, 510 has focused on natural disasters. However the importance for working in a more efficient way in a complex situation is growing. Based on the presumption that there is often an overlap with regards to (the collection of) data by different organizations, this research explores the dilemmas humanitarians and peacekeepers face when it comes to information sharing. This research contributes to 510s aim to shape the future of humanitarian aid by identifying possible barriers that my hinder information sharing between humanitarian and peacekeeping organizations, leading to a better understanding of the complexities.

8.7. Scientific contribution

Within the academic world, humanitarian - peacekeeping interaction is a relatively new field of research. To the best of the author's knowledge, research on information sharing between humanitarian and peacekeeping organizations has not yet been covered. As one of the first attempts, this research aimed to contribute to fill that gap and therefore specifically focus on information sharing between humanitarian and peacekeeping organizations and contributing to the fields of peacekeeping and humanitarian organizations and response. To study the complexity of information sharing between humanitarian and peacekeeping organizations in the context of a fragile state that is prone to slow-onset natural disasters and conflict, this study was performed from a system dynamics and institutional perspective.

From a system dynamics perspective, the interplay of a simplified case of drought fueled food insecurity and conflict has been studied as well as the relationship with information for humanitarian and peacekeeping organizations. To the best of the authors' knowledge, the dynamics of a slow-onset natural disaster and conflict have not yet been linked in one model, as well as the implications for humanitarian and peacekeeping organizations.

Several parties are involved in humanitarian response operation and peacekeeping mission in a fragile state that is prone to slow-onset natural disasters and conflict. To understand what the roles and relationships are of the parties involved, how they collect and use data and

information and how information exchange takes place, the definition of a humanitarian-peacekeeping data ecosystem is built on Oliveira and Loscio's (2018) definition of a data ecosystem and Van den Homberg and Susha's (2018) definition of a humanitarian data ecosystem. A humanitarian-peacekeeping data ecosystem consists of three components: (1) involved parties and their mandates, (2) information demand and supply and (3) information sharing infrastructure.

On the basis of this exploratory study, this research has combined unique findings from interviews with and observations from a variety of experienced humanitarians and peacekeepers.

During the exploratory study to identify the complexity of information sharing between humanitarian and peacekeeping organizations, a theoretical framework for barrier analysis has been proposed; the TOP-framework which categorizes barriers that may hinder information sharing in (T) Technological barriers, (O) Organizational barriers and (P) Process barriers. With this framework, this research contributes to organizational studies with regards to the complexity of information sharing between humanitarian and peacekeeping organizations, compared to inter-organizational information sharing. Successor researchers are encouraged to use this TOP-framework in future research and explore the possibilities to use this framework in other fields.

8.8. Recommendations for future research

Interviews are a useful qualitative technique for researchers interested in understanding individuals' cognitive and conceptual visions. Qualitative methods are mainly concerned with exploration; this gives room for interviewees to address issues, which they feel relevant to the topics being raised by the researcher. The partial validation of the research findings is a limitation of this research, as only a set of 6 humanitarians and peacekeepers is consulted. Therefore, further empirical research is recommended in a form of survey research for the organizations by using multivariate analysis to validate the findings of this research. As there are hundreds of humanitarian organizations out there, all with their own goals and motivations, further research is recommended to build on this research. Additional research is suggested to validate the outcomes of this research.

This research solely focuses on information sharing between humanitarian and peacekeeping organizations. However, affected state governments play a great role too. Affected states focus on managing the problem within their borders. Politics could thus influence or constrain information sharing. Governments, like people, are reluctant to disclose negative information and attempt to manage information flow to the public. Future research is recommended to include other parties.

To improve the system dynamics model, further research is recommended by incorporating

- A more accurate model of food production based on temperature, soil, types of crops, water usage, etcetera
- A more accurate model for required food supply per person. It is possible that when the required food supply is more than the actual consumption, the required food supply should increase. Required food supply is measured in kcal per person per day, however, adding nutritious values would make this model more accurate
- A logistics model for humanitarian organizations to respond to the humanitarian needs, based on environmental factors, their capacity and information to respond
- Collaborate with TNO Marvel- semi qualitative policy analysis
- Adding ethical, political and economic factors, subsidiary programs or other coping strategies

Lastly, during the exploratory study to identify the complexity of information sharing between humanitarian and peacekeeping organizations, a theoretical framework has been proposed to

analyze barriers. Successor researchers are encouraged to use this TOP-framework, which categorizes barriers that may hinder information sharing in (T) Technological barriers, (O) Organizational barriers and (P) Process barriers in future research and explore the possibilities to use this framework in other fields.

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APPENDIX A. Humanitarian information needs

Table A.1 and A.2 show examples of humanitarian decision-makers information needs.

Table A.1. Humanitarian decision-makers information needs (Comes et al., 2015).

Information about	**Questions**
Emergency Situation	• What is the impact and scope of the disaster? • Is assistance needed? Has the government appealed for international assistance? • What geographical areas are affected? • What has been damaged; infrastructure, housing, existing humanitarian efforts, resilience? • What was the baseline situation (before the response) and what has changed (worsened) and where?
Affected population	• How many people have been affected and how? • Where (geographically) are the affected people? • What is the status of the affected people; are they displaced, vulnerable, etcetera? • What are the characteristics of the affected; ethnicity, socio/economic, gender, etcetera?
Information availability	• What information is available, both baseline (pre-emergency) data and updates on the current situation? • What are the existing sources of information? • How accurate is the information?
Context	• What is the local socio-political context; political situation, cultural norms, etcetera? • What is the expected response of the government? Are there restrictions or sensitivities? • What natural resources are available? What are the harvest/crop cycles? Seasonal changes? • What is the skillset of the community and its cohesion? • What were the previous responses to disasters, coping mechanisms?
Publication and media	• What is the public perception, awareness and attention? • What is the media and donor perception?
Perception	• What is the general political will for the response, including local and international • How do we balance capacity against expectation? Which beneficiaries, donors, media?
Need	• How many people are there in need? • What are the types of need (e.g. food, water, healthcare, shelter, protection, etcetera)? • Livestock affected? • What are the lifesaving needs and other needs? • What are the gaps in the response?
Priorities	• Which geographic areas are the most critical? • What are the priority sectors, such as healthcare, shelter, etcetera?
Information sources and gaps	• Does response community agree on number of people in each type of need? • What are the sources of our information and the extent of assessments?

Table A.2. Humanitarian decision-makers information needs (Van den Homberg, Monne & Spruit, 2018)

CRISIS IMPACT	OPERATIONAL ENVIRONMENT
Baseline context	**Coordination**
Livelihoods	Coordination groups at local and national level
Vulnerabilities	Response Activities NGOs and government
Hazard identification (location, timing)	*Response activities private sector*
Socioeconomic context	Community leaders
Political (local governance) and religious context	Gap analysis between capacities and needs
Community Preparedness (such as Security/evacuation plans)	Presence of NGO workers
Preparedness of people	Staff skills
Village and ward boundaries (location of households)	Telephone numbers
Damage and needs	*Communication channels*
WASH needs	*Incidents registration*
Health needs	*Evacuation routes*
Education needs (closed schools)	**Capacity**
Food security needs (stoves, firewood)	Stock of emergency items
Shelter needs (including non-food items)	Coping mechanisms of affected communities
Needs of subgroups (elderly, children)	Local agricultural and fishery situation
Number of people affected	Local market situation
Livestock affected	Institutional capacity
Type of damage to houses	Staff skills and training
Number of damaged houses	Burying strategies
Number of destroyed houses	**Service locations (during the flooding)**
Losses of private belongings	Shelters for humans
Number of people dead	Shelters for cattle
Number of people injured	Doctors
People in need of rescue	Medicine distribution points/shops
Submerged houses	Food buying and selling places
Damage to infrastructure	Labor opportunities
Damage to health facilities	Drinking water locations
Damage to public buildings	Emergency items
Affected medical personnel	*Meeting points*
Number of people saved	*Pickup points*
Displaced people	**Security and access**
Impacted area	News
Flood situation	Accessibility
Flood news	*Security*
Flood duration	*Mobile phone coverage*
Earlier predictions	
Time of inundation	
Inundated area	
Drainage and irrigation systems	
Flood trend analysis	
Water quality	
River embankment erosion	

APPENDIX B. System Dynamics

This section elaborates on the System Dynamics modeling approach, used in this research. Section B.1 elaborated on the background of System Dynamics, section B.2 on the model specification and code used to construct the System Dynamics model in the case study in chapter 6 and section B.3 elaborates on the verification of the model and section B.4. on the specific changes in code used for each scenario.

B.1. Background

The System Dynamics approach that is used in this research is developed by J. Forrester (MIT) and is a technique to simulate complex, non-linear, multi-loop feedback system (1993). The purpose of System Dynamics is to clarify the behavior of a system as a function of time and the underlying structure. It is used to model the structure of a complex system and simulate holistic, long-term and dynamic complex behavior, to understand the behavior of the system over time. System Dynamics is not used for exact prediction.

The System Dynamics approach is an appropriate methodology to gain insight into the relations between drought, food security and conflict and the role of information for humanitarian organizations. Humanitarian operations are characterized by complexity due to uncertainty, multiple actors and time pressure as well as resource constraints (UNISDR, 2009). Decision making within humanitarian organizations is generally based on experience and intuition. Given the levels of complexity, this may be insufficient to cope. System dynamics is a methodology that was developed to study systems with similar characteristics, e.g. uncertainty, multiple actors, and time pressure. A time delay exists in a process where output lags behind its input. For example, when information is available, a period of time is needed for the relief teams to reach the place of the disaster. In this research, this will be referred to as delay time, since very little is know about how decisions are made (Van den Homberg, Monne & Spruit, 2018). In this model, humanitarian organizations need information and time to provide humanitarian aid. The duration of the delay time can affect among other things the number of people in need of humanitarian food assistance.

Steps to be taken in the System Dynamics modeling approach are:

1. Problem identification and definition (Chapter 1 & 3)
2. System conceptualization (Chapter 3)
3. Model specification, formalization and verification (Chapter 6)
4. Analysis of behavior (Chapter 6)
5. Model evaluation (Chapter 6)

Within this analysis a conceptual model is made of the relationship between a slow-onset natural disaster and conflict and the role of information for humanitarian and peacekeeping organizations in a fragile state (Chapter 3) by deconstructing into causal loop diagrams (CLDs). The conceptual model has been improved and formalized following the parameterization of the case study on Mopti, Mali and deconstructed into a System Dynamics (SD) model (Chapter 6) with stocks (entities that accumulate or deplete over time) and flows (the rate of change in a stock). To better demonstrate the interaction and interdependencies of factors, the effects will be quantified that changing each one of these factors can have in the system. The System Dynamics software used in this analysis is Vensim.

B.2. Model specification

To understand the implications of and the relationship between drought, food security and conflict, two regions in Mopti are deconstructed into a formalized System Dynamics (SD) model (Chapter 6) with stocks (entities that accumulate or deplete over time) and flows (the rate of change in a stock). To better demonstrate the relationship and interdependencies of factors,

region A is a peaceful region and region B a violent region. The effects that each one of these factors can have in the system are quantified. This approach is based on estimated food availability in Mopti, a calculation of calories available per capita that is based on the estimated population. The two indicators for food supply are rainfall and food access. The specifics and code used per variable in the stock-flow System Dynamics model are as follows:

(1) Precipitation region A and B

Several weather sites showed different precipitation values in Mopti in 2018. In this study, the average of three sources has been used as input for the precipitation in both regions A and B (Table B.1). It is assumed that the monthly rainfall is evenly distributed over the days of the months; hence a Step function is used:

- Precipitation region A: STEP(0,0)+STEP(0.1/30,60)+STEP(4.3/30,91)+STEP(18.8/31,121)+STEP(34.5/30,152)+STEP(74.3/31,182)+STEP(27.3/30,0)-STEP(75.9/31,244)-STEP(64.2/30,274)-STEP(18.2/31,305)+STEP(0.5/30,0) [mm/day]
- Precipitation region B: STEP(0,0)+STEP(0.1/30,60)+STEP(4.3/30,91)+STEP(18.8/31,121)+STEP(34.5/30,152)+STEP(74.3/31,182)+STEP(27.3/30,0)-STEP(75.9/31,244)-STEP(64.2/30,274)-STEP(18.2/31,305)+STEP(0.5/30,0) [mm/day]

Table B.1. Rainfall in Mopti, Mali in 2018

Month	Days of the year	Climate Data.org[151]	Climate Data.eu[152]	Mopti Climatemps[153]	Average used in this model
January	1-31	0	0	0	0
February	32-59	0	0	0.1	0
March	60-90	0	0	0.4	0.1
April	91-120	4	5	4.3	4.4
May	121-151	23	23	23.5	23.2
June	152-181	58	56	56.1	56.7
July	182-212	141	125	127	131
August	213-243	166	153	155.8	158.3
September	244-273	85	82	80.1	82.4
October	274-304	18	18	18.5	18.2
November	305-334	0	0	0.3	0.1
December	335-365	0	1	0.7	0.6
Total	Year	495	463	466.8	474.9

(2) Effective rainfall region A and B

- Effective rainfall region: IF THEN ELSE (precipitation region A<250, precipitation region A*(125-0.2*precipitation region A)/125, (125+0.1*precipitation region A)) [mm/day]
- Effective rainfall region B: IF THEN ELSE (precipitation region B<250, precipitation region A*(125-0.2*precipitation region A)/125, (125+0.1*precipitation region A)) [mm/day]

(3) Food production region A and B

- Food production region A: MIN(MAX(0,((effective rainfall region A/ watersupply good year*(Population region A*energy demand))*economic barrier to food region A+ humanitarian food assistance region A)),Population region A*energy demand) [kcal/day]
- Food production region B: MIN(MAX(0,((effective rainfall region B/watersupply good year*(Population region B*energy demand))*physical barrier to food region B+

[151] Climate Data.org: https://en.climate-data.org/africa/mali/mopti/mopti-714797/#climate-table
[152] Climate Data.eu: https://climatedata.eu/climate.php?loc=mlxx0005&lang=en
[153] Mopti Climatemps: http://www.mopti.climatemps.com/precipitation.php

humanitarian food assistance region B*economic barrier to food region B)),Population region B*energy demand) [kcal/day]

(4) Food supply region A and B
- Food supply region A: Food production region A-consumption of food in region A
- Food supply region B: Food production region B-consumption of food in region B

(5) Consumption of food region A and B
- Consumption of food region A: MIN (required food supply region A, Food supply region A) [kcal/day]
- Consumption of food region B: MIN (required food supply region B, Food supply region B) [kcal/day]

(6) Required food supply region A and B
- Required food supply region A: energy demand*Population region A [kcal/day]
- Required food supply region B: energy demand*Population region B [kcal/day]

(7) Energy demand
- Energy demand: 1700 [kcal/person/day]

(8) Population region A and B
- Population region A: births region A+ Internally displaced to region A-deaths region A-internally displaced to region B
  initial value: 350000 [persons]
- Population region B: births region B+ internally displaced to region B-deaths region A-internally displaced to region A
  initial value: 350000 [persons]

(9) Births region A and B
- Births region A: Population region A*birth rate region A [person/day]
- Births region B: Population region B*birth rate region B [person/day]

(10) Birth rate region A and B
- Birth rate region A: 43.2/1000/365
- Birth rate region B: 43.2/1000/365

(11) Deaths region A and B
- Death region A: Population region A*death rate region A [person/day]
- Death region B: Population region B*death rate region B [person/day]

(12) Death rate region A and B
- Death rate region A: (9.6/1000/365)+(1.5/10000*people in need of food assistance in region A)
- Death rate region B: (9.6/1000/365)+(1.5/10000*people in need of food assistance in region B)

(13) Internally displaced to region A and B
- Internally displaced to region B: MIN(IDP due to food insecurity region A, Population region A) [person/day]
- Internally displaced to region A: MIN((IF THEN ELSE(violence and armed groups region B=1, DELAY1(4*willingness to move*Population region B,period to flee), 0):OR:IDP due to food insecurity region B),Population region B) [person/day]

(14) IDP due to food insecurity region A

- IDP due to food insecurity region A: IF THEN ELSE(food supply gap in region A>threshold coping strategy*required food supply region A,DELAY1(willingness to move*Population region A,period of displacement), 0) [person/day]

(15) Period of displacement
- Period of displacement: 180 [days]

(16) Threshold coping strategy
- Threshold coping strategy: 0.2

(17) Period to flee
- Period to flee: 7

(18) Willingness to move
- Willingness to move: 1/12

(19) Food supply gap region A and B
- Food supply gap region A: required food supply region A-consumption of food in region A [kcal/day]
- Food supply gap region B: required food supply region B-consumption of food in region B [kcal/day]

(20) People in need of food assistance region A and B
- People in need of food assistance region A: IF THEN ELSE(food supply gap in region A>threshold humanitarian food assistance*required food supply region A,1,0) [person/day]
- People in need of food assistance region B: IF THEN ELSE(food supply gap in region B>threshold humanitarian food assistance*required food supply region B,1,0) [person/day]

(21) Economic barrier to food region A and B
- Economic barrier to food region A: IF THEN ELSE(food supply gap in region A >0.15*required food supply region A,0.9,1)
- Economic barrier to food region B: IF THEN ELSE(food supply gap in region B >0.15*required food supply region B,0.9,1)

(23) Threshold humanitarian food assistance
- Threshold humanitarian food assistance: 0.15

(24) People in need region A and B
- People in need region A: humanitarian food assistance gap region A/Population region A [person/day]
- People in need region B: humanitarian food assistance gap region B/Population region B [person/day]

(25) Conflict region A and B
- Conflict region A: IF THEN ELSE(internally displaced to region A>0.05*Population region A,1,0)
- Conflict region B: IF THEN ELSE(internally displaced to region B>0.05*Population region B,1,0)

(26) Physical barrier to food region B
- Physical barrier to food region B: IF THEN ELSE(violence and armed groups region B=1,0.76,1

B.3. Verification

To verify the model, two tests have been done: (1) unit verification, (2) extreme value test, (3) sensitivity analysis.

(1) The first verification test is a unit test. This involves looking at the units in the model and checking whether these are consistent on the left and right side of equations across all the factors in the model.

This is an iterative process as this test is continuously performed while the model is being developed. This process is stopped once the Vensim unit test generated no unit errors. The unit test did not indicate problems in the model structure.

(2) The second verification test is an extreme value test with a minimum and maximum test. In the minimum value test, *'birthrate region A'* and '*birthrate region B'* are set to 0 births/day and in the maximum value test set to an extremely high value of 200/1000/365 births/person/day. Figure B.1 and B.2 show the behavior of the four key performance indicators: (1) '*Population*' [people], (2) '*Humanitarian food assistance gap*' [kcal], (3) '*People in need*' [people] and (4) '*Conflict*' [days] in both regions, in the minimum and maximum value tests.

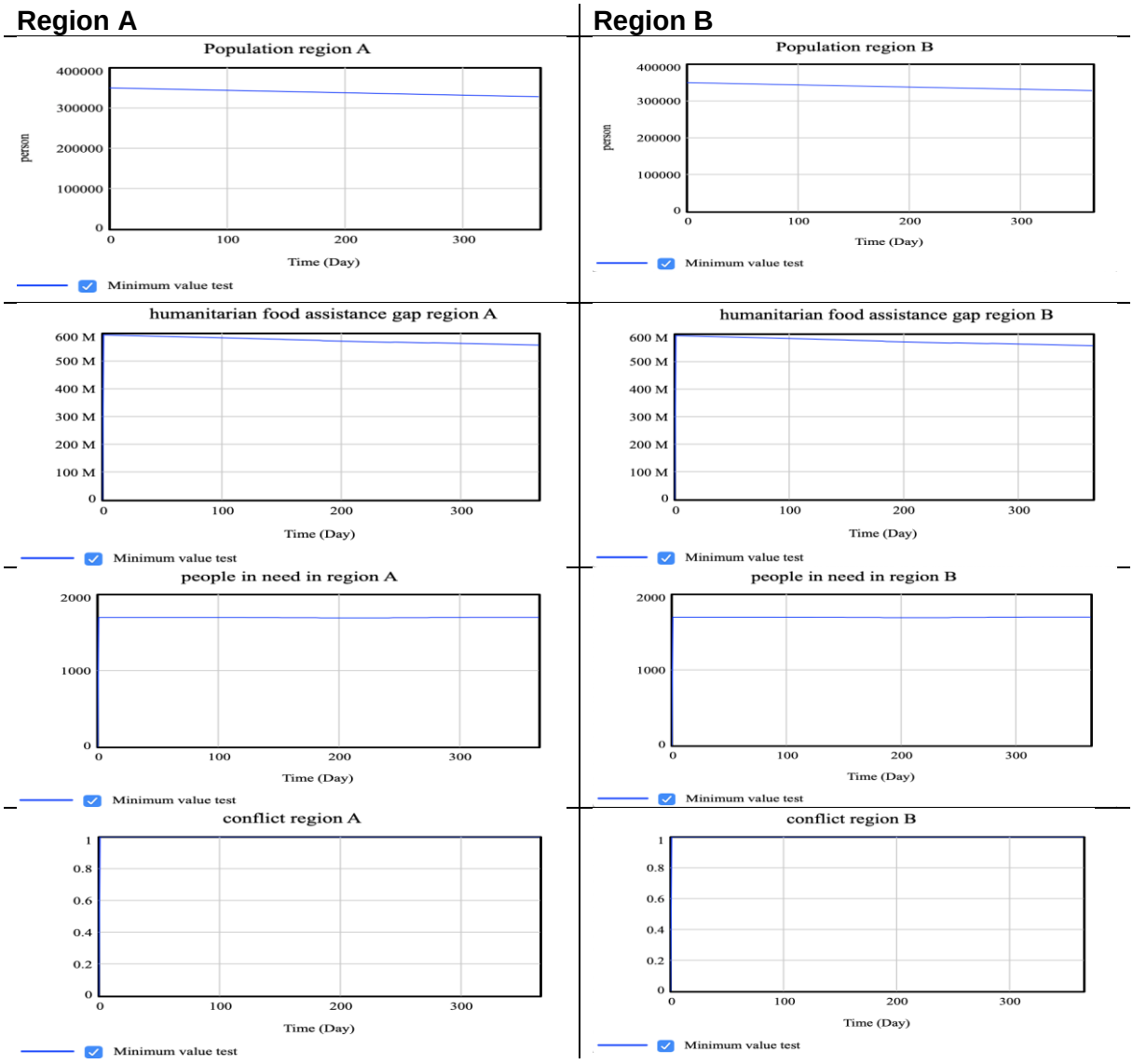

Figure B.1. Minimum value test

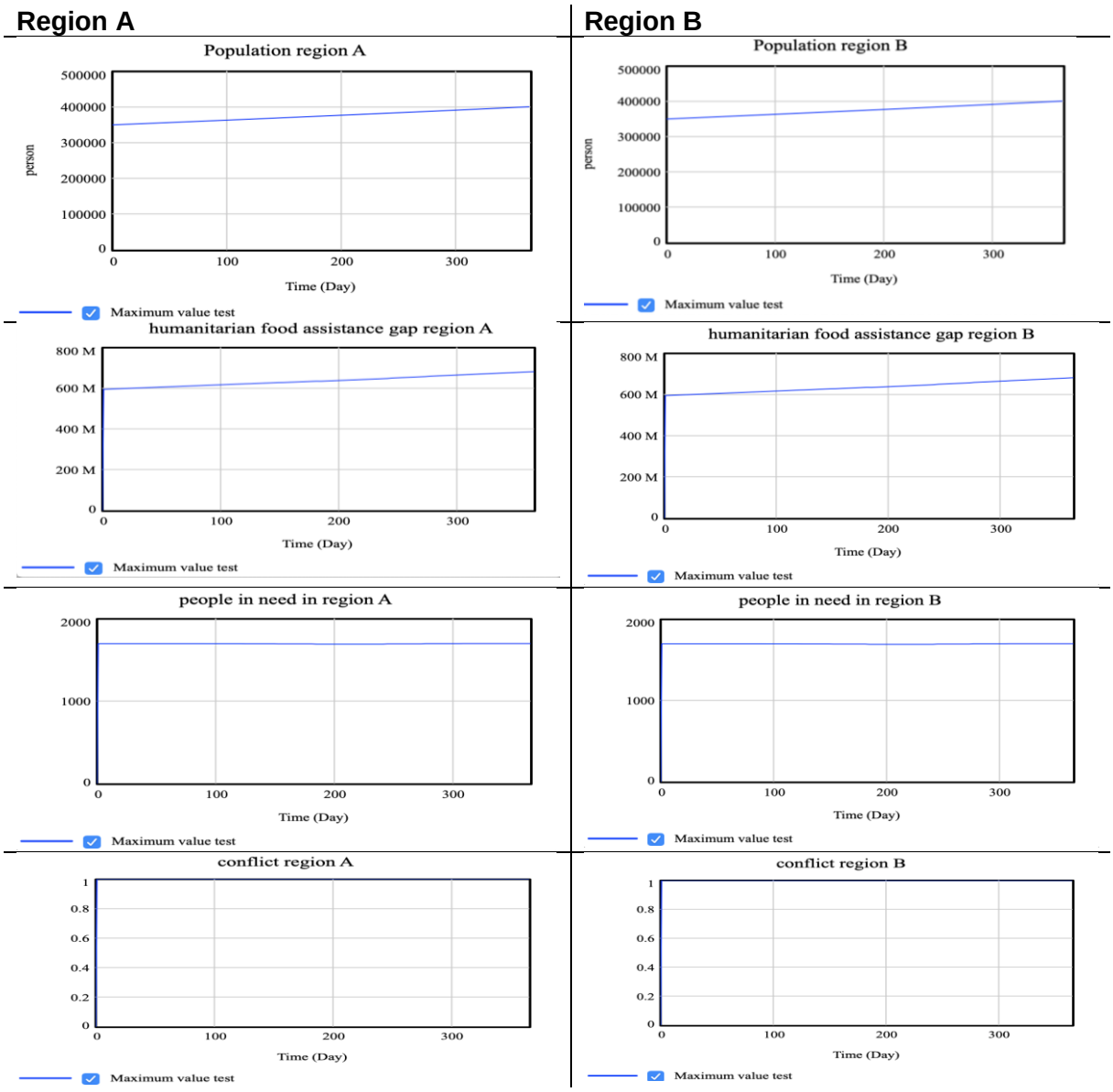

Figure B.2. Maximum value test

Analysis of the results of the minimum and maximum value test shown in figure B.1 and B.2, suggest that the KPIs in the system reacted as expected in this process of the minimum and maximum value test.

(3) The third verification test is a sensitivity analysis. In the sensitivity analysis, the 'threshold humanitarian food assistance' is increased and decreased by 10%. Figure B.3 shows the behavior of the four key performance indicators: (1) '*Population*' [people], (2) '*Humanitarian food assistance gap*' [kcal], (3) '*People in need*' [people] and (4) '*Conflict*' [days] in both regions, in the sensitivity tests.

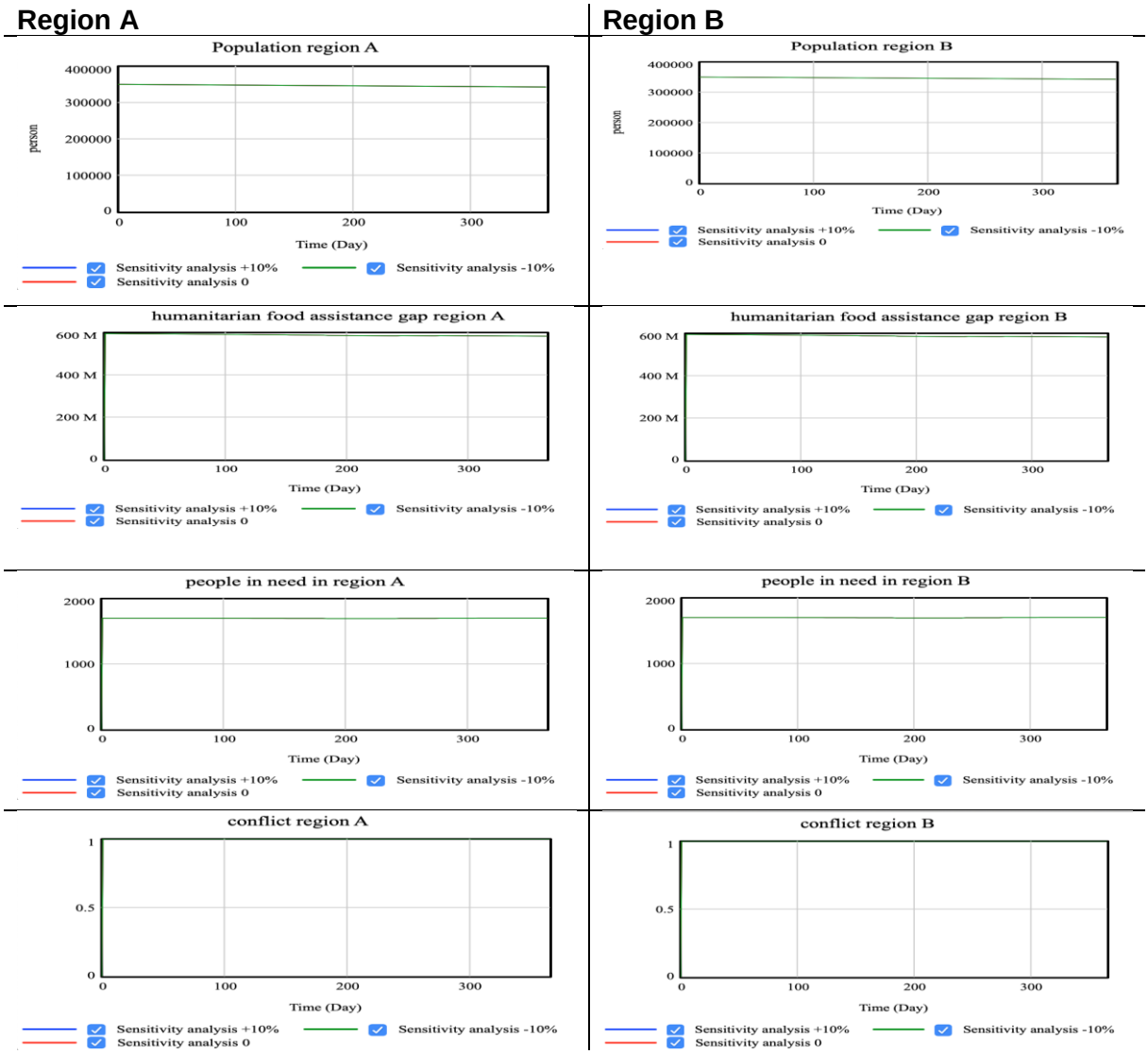

Figure B.3. Sensitivity test

Analysis of the results of the sensitivity test shown in figure B.3, suggest that these change in *threshold humanitarian food assistance* did not have much impact on the KPIs. In both percentages the behavior of the KPIs remained the same.
After completing the three verification tests, it can be concluded that there are no errors in the model and that the model works as expected.

B.4. Set-up Scenarios

To simulate a complete year, the System Dynamics model is run for 365 days with a time step of 1 day and the Euler integration method. In this section, the specific changes made for each scenario will be described. To demonstrate the impact of information sharing on the effective delivery of humanitarian food assistance in peacetime and in violent time, six scenarios will be explored to examine the behavior of the model, which is based on the parameterization of the Drought-Food insecurity-Conflict Nexus in Mopti, Mali.

The six scenarios are identified to demonstrate the impact of the availability of information and information sharing on the effective delivery of humanitarian food assistance in peacetime and in violent time. The six scenarios are defined as follows: (1) Good year without drought in peacetime, (2) Drought in peacetime without information sharing to provide humanitarian food assistance, (3) Drought in violent time without information sharing to provide humanitarian food

assistance (4) Drought in peacetime with information sharing to provide humanitarian food assistance, (5) Drought in violent time with information sharing to provide humanitarian food assistance and (6) Drought in violent time with faster information sharing to provide humanitarian food assistance.

The six scenarios are determined as follows: (1) Good year in peacetime, (2) Drought in peacetime without information sharing to provide humanitarian food assistance, (3) Drought in violent time without information sharing to provide humanitarian food assistance, (4) Drought in peacetime with information sharing to provide humanitarian food assistance, (5) Drought in peacetime with information sharing to provide humanitarian food assistance and (6) Drought in violent time with faster information sharing to provide humanitarian food assistance. The analysis of the model behavior of each scenario is described in appendix B5.

(1)Good year in peacetime
In a year with average to above average rainfall, research suggests that Mali produces sufficient food to feed its population (USG, 2018).

- Water supply good year: 1098/365 [mm/day]
- Precipitation region A: 0 [mm/day]
- Effective rainfall region A: 0 [mm/day]
- Precipitation region B: 0 [mm/day]
- Effective rainfall region B: 0 [mm/day]
- Violence and armed groups region B: 0

(2)Drought in peacetime without information sharing to provide humanitarian food assistance
In this scenario, both region A and B are initially peaceful and do not experience violence from armed groups. This scenario represents a situation where the Red Cross Movement and Dutch peacekeepers do not share information. The Red Cross Movement has delayed information in peacetime and no information in times of conflict to be able to provide humanitarian food assistance.

- Precipitation region A: STEP(0,0)+STEP(0.1/30,60)+STEP(4.3/30,91)+STEP(18.8/31,121)+STEP(34.5/30,152)+STEP(74.3/31,182)+STEP(27.3/30,0)-STEP(75.9/31,244)-STEP(64.2/30,274)-STEP(18.2/31,305)+STEP(0.5/30,0) [mm/day]
- Effective rainfall region A: IF THEN ELSE (precipitation region A<250, precipitation region A*(125-0.2*precipitation region A)/125,(125+0.1*precipitation region A)) [mm/day]
- Precipitation region B: STEP(0,0)+STEP(0.1/30,60)+STEP(4.3/30,91)+STEP(18.8/31,121)+STEP(34.5/30,152)+STEP(74.3/31,182)+STEP(27.3/30,0)-STEP(75.9/31,244)-STEP(64.2/30,274)-STEP(18.2/31,305)+STEP(0.5/30,0) [mm/day]
- Effective rainfall region B: IF THEN ELSE (precipitation region B<250, precipitation region B*(125-0.2*precipitation region B)/125,(125+0.1*precipitation region B)) [mm/day]
- Violence and armed groups region B: 0
- Available information region A:0
- Available information region B:0
- Humanitarian food assistance region A: IF THEN ELSE(food supply gap in region A>threshold humanitarian food assistance*required food supply region A, available information region A,0) [kcal/day]
- Humanitarian food assistance region B: IF THEN ELSE(food supply gap in region B>threshold humanitarian food assistance*required food supply region B, available information region B,0) [kcal/day]

(3)Drought in violent time without information sharing to provide humanitarian food assistance

In this scenario, region A is initially a peaceful region while region B experiences violence from armed groups. This scenario represents a situation where the Red Cross Movement and Dutch peacekeepers do not share information. The Red Cross Movement has delayed information in peacetime and no information in times of conflict to be able to provide humanitarian food assistance.

- Precipitation region A: STEP(0,0)+STEP(0.1/30,60)+STEP(4.3/30,91)+STEP(18.8/31,121)+STEP(34.5/30,152)+STEP(74.3/31,182)+STEP(27.3/30,0)- STEP(75.9/31,244)-STEP(64.2/30,274)-STEP(18.2/31,305)+STEP(0.5/30,0) [mm/day]
- Effective rainfall region A: IF THEN ELSE (precipitation region A<250, precipitation region A*(125-0.2*precipitation region A)/125,(125+0.1*precipitation region A)) [mm/day]
- Precipitation region B: STEP(0,0)+STEP(0.1/30,60)+STEP(4.3/30,91)+STEP(18.8/31,121)+STEP(34.5/30,152)+STEP(74.3/31,182)+STEP(27.3/30,0)- STEP(75.9/31,244)-STEP(64.2/30,274)-STEP(18.2/31,305)+STEP(0.5/30,0) [mm/day]
- Effective rainfall region B: IF THEN ELSE (precipitation region B<250, precipitation region B*(125-0.2*precipitation region B)/125,(125+0.1*precipitation region B)) [mm/day]
- Violence and armed groups region B: STEP(1,50)-STEP(1,70)
- Available information region A:0
- Available information region B:0
- Humanitarian food assistance region A: IF THEN ELSE(food supply gap in region A>threshold humanitarian food assistance*required food supply region A, available information region A,0) [kcal/day]
- Humanitarian food assistance region B: IF THEN ELSE(food supply gap in region B>threshold humanitarian food assistance*required food supply region B, available information region B,0) [kcal/day]

(4)Drought in peacetime with information sharing to provide humanitarian food assistance

In this scenario, both region A and B are initially peaceful and do not experience violence from armed groups. This scenario represents a situation where the Red Cross Movement and Dutch peacekeepers share information. The Red Cross Movement has delayed information in peacetime and delayed information in times of conflict to be able to provide humanitarian food assistance.

- Precipitation region A: STEP(0,0)+STEP(0.1/30,60)+STEP(4.3/30,91)+STEP(18.8/31,121)+STEP(34.5/30,152)+STEP(74.3/31,182)+STEP(27.3/30,0)- STEP(75.9/31,244)-STEP(64.2/30,274)-STEP(18.2/31,305)+STEP(0.5/30,0) [mm/day]
- Effective rainfall region A: IF THEN ELSE (precipitation region A<250, precipitation region A*(125-0.2*precipitation region A)/125,(125+0.1*precipitation region A)) [mm/day]
- Precipitation region B: STEP(0,0)+STEP(0.1/30,60)+STEP(4.3/30,91)+STEP(18.8/31,121)+STEP(34.5/30,152)+STEP(74.3/31,182)+STEP(27.3/30,0)- STEP(75.9/31,244)-STEP(64.2/30,274)-STEP(18.2/31,305)+STEP(0.5/30,0) [mm/day]
- Effective rainfall region B: IF THEN ELSE (precipitation region B<250, precipitation region B*(125-0.2*precipitation region B)/125,(125+0.1*precipitation region B))
- Violence and armed groups region B: 0 [mm/day]
- Available information region A: IF THEN ELSE(conflict region A=1 , DELAY1(0.75*food supply gap in region A ,5), DELAY1(0.75*food supply gap in region A,2)

- Available information region B: IF THEN ELSE(conflict region B=1 , DELAY1(0.75*food supply gap in region B,5), DELAY1(0.75*food supply gap in region B,2)
- Humanitarian food assistance region A: IF THEN ELSE(food supply gap in region A>threshold humanitarian food assistance*required food supply region A, available information region A,0) [kcal/day]
- Humanitarian food assistance region B: IF THEN ELSE(food supply gap in region B>threshold humanitarian food assistance*required food supply region B, available information region B,0) [kcal/day]

(5)Drought in violent time with information sharing to provide humanitarian food assistance

In this scenario, region A is initially a peaceful region while region B experiences violence from armed groups. This scenario represents a situation where the Red Cross Movement and Dutch peacekeepers share information. The Red Cross Movement has delayed information in peacetime and delayed information in times of conflict to be able to provide humanitarian food assistance.

- Precipitation region A:: STEP(0,0)+STEP(0.1/30,60)+STEP(4.3/30,91)+STEP(18.8/31,121)+STEP(34.5/30,152)+STEP(74.3/31,182)+STEP(27.3/30,0)-STEP(75.9/31,244)-STEP(64.2/30,274)-STEP(18.2/31,305)+STEP(0.5/30,0) [mm/day]
- Effective rainfall region A: IF THEN ELSE (precipitation region A<250, precipitation region A*(125-0.2*precipitation region A)/125,(125+0.1*precipitation region A)) [mm/day]
- Precipitation region B: STEP(0,0)+STEP(0.1/30,60)+STEP(4.3/30,91)+STEP(18.8/31,121)+STEP(34.5/30,152)+STEP(74.3/31,182)+STEP(27.3/30,0)-STEP(75.9/31,244)-STEP(64.2/30,274)-STEP(18.2/31,305)+STEP(0.5/30,0) [mm/day]
- Effective rainfall region B: IF THEN ELSE (precipitation region B<250, precipitation region B*(125-0.2*precipitation region B)/125,(125+0.1*precipitation region B)) [mm/day]
- Violence and armed groups region B: STEP(1,50)-STEP(1,70)
- Available information region A: IF THEN ELSE(conflict region A=1 , DELAY1(0.75*food supply gap in region A,5), DELAY1(0.75*food supply gap in region A,2)
- Available information region B: IF THEN ELSE(conflict region B=1 , DELAY1(0.75*food supply gap in region B,5), DELAY1(0.75*food supply gap in region B,2)
- Humanitarian food assistance region A: IF THEN ELSE(food supply gap in region A>threshold humanitarian food assistance*required food supply region A, available information region A,0) [kcal/day]
- Humanitarian food assistance region B: IF THEN ELSE(food supply gap in region B>threshold humanitarian food assistance*required food supply region B, available information region B,0) [kcal/day]

(6)Drought in violent time with faster information sharing to provide humanitarian food assistance

In this scenario, region A is initially a peaceful region while region B experiences violence from armed groups. This scenario represents a situation where the Red Cross Movement and Dutch peacekeepers standardized information sharing. In both peacetime and in times of conflict information is faster available to the Red Cross Movement to provide humanitarian food assistance.

- Precipitation region A: STEP(0,0)+STEP(0.1/30,60)+STEP(4.3/30,91)+STEP(18.8/31,121)+STEP(34.5/30,152)+STEP(74.3/31,182)+STEP(27.3/30,0)-STEP(75.9/31,244)-STEP(64.2/30,274)-STEP(18.2/31,305)+STEP(0.5/30,0) [mm/day]

- Effective rainfall region A: IF THEN ELSE (precipitation region A<250, precipitation region A*(125-0.2*precipitation region A)/125,(125+0.1*precipitation region A)) [mm/day]
- Precipitation region B: STEP(0,0)+STEP(0.1/30,60)+STEP(4.3/30,91)+STEP(18.8/31,121)+STEP(34.5/30,152)+STEP(74.3/31,182)+STEP(27.3/30,0)- STEP(75.9/31,244)-STEP(64.2/30,274)-STEP(18.2/31,305)+STEP(0.5/30,0) [mm/day]
- Effective rainfall region B: IF THEN ELSE (precipitation region B<250, precipitation region B*(125-0.2*precipitation region B)/125,(125+0.1*precipitation region B)) [mm/day]
- Violence and armed groups region B: STEP(1,50)-STEP(1,70)
- Available information region A: DELAY1(0.75*food supply gap in region A,1.5)
- Available information region B: DELAY1(0.75*food supply gap in region B,1.5)
- Humanitarian food assistance region A: IF THEN ELSE(food supply gap in region A>threshold humanitarian food assistance*required food supply region A, available information region A,0) [kcal/day]
- Humanitarian food assistance region B: IF THEN ELSE(food supply gap in region B>threshold humanitarian food assistance*required food supply region B, available information region B,0) [kcal/day]

B.5. Scenario Simulation | model behavior

To simulate a complete year, the System Dynamics model is run for 365 days with a time step of 1 day and the Euler integration method. The six scenarios are defined as follows: (1) Good year in peacetime, (2) Drought in peacetime without information sharing to provide humanitarian food assistance, (3) Drought in violent time without information sharing to provide humanitarian food assistance, (4) Drought in peacetime with information sharing to provide humanitarian food assistance, (5) Drought in peacetime with information sharing to provide humanitarian food assistance and (6) Drought in violent time with faster information sharing to provide humanitarian food assistance. These six scenarios are explored by analyzing the behavior of the four KPIs: (1) '*Population*' [people], (2) '*Humanitarian food assistance gap*' [kcal], (3) '*People in need*' [people] and (4) '*Conflict*' [days].

(1)Good year in peacetime

In a year with average to above average rainfall, research suggests that Mali produces sufficient food to feed its population (USG, 2018). This scenario represents a good year, with enough rainfall and water supply. Sufficient crops will grow to meet the required food supply of the populations in both region A and B.

Figure B.4 shows the behavior of the KPIs over time, respectively the behavior of the population, the humanitarian food assistance gap in kcals, the number of people in need of food and the days a situation of conflict is experienced in both regions. Since enough food is produced in both regions to meet the required food supply, the number of people in need of food and the humanitarian food assistance gap is equal to zero and zero days conflict is experienced. Bearing in mind the high birthrate, looking at Figure B.1, it can be seen that the population in both regions increase over time. Appendix B2 elaborates on the specific code used in this model and appendix B4 on the specific changes used for this scenario.

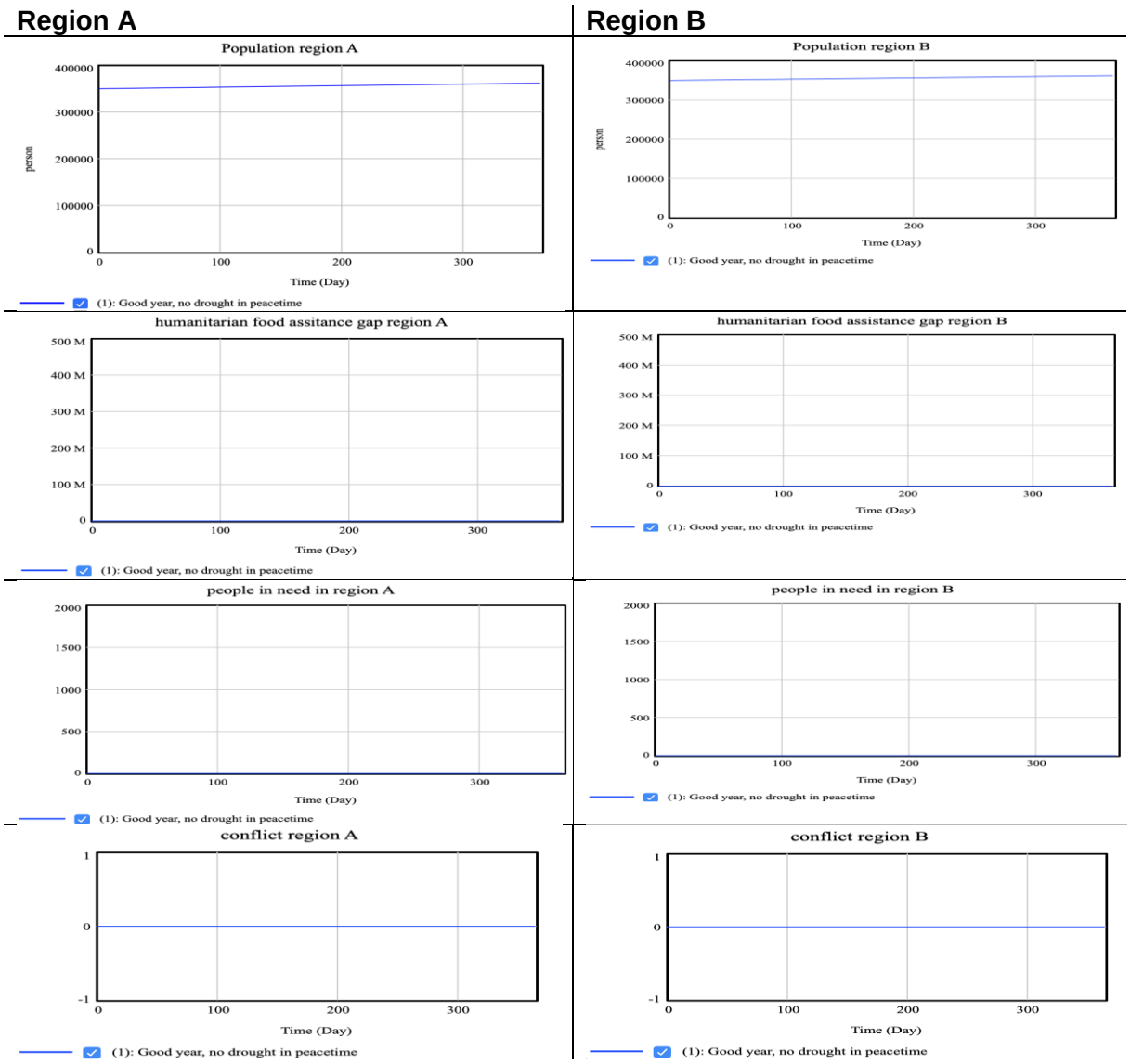

Figure B.4. Behavior of the KPIs in scenario (1) Good year, no drought in peacetime

(2)Drought in peacetime without information sharing to provide humanitarian food assistance

In this scenario, both region A and B are initially peaceful and do not experience violence from armed groups. This scenario represents a situation where the Red Cross Movement and Dutch peacekeepers do not share information. The Red Cross Movement has delayed information in peacetime and no information in times of conflict to be able to provide humanitarian food assistance.

In case of a continuous drought in both regions with limited coping strategies, if humanitarian organizations do not have information to act upon, no humanitarian food assistance is provided, the number of people in need of food increases, as well as the humanitarian food assistance gap. Figure B.5 shows that despite the high birthrate, the population in both region A and region B stays similar to the initial value, indicating that more people die as a consequence of food insecurity. In the beginning of the year, when little precipitation falls, the number of people in need of humanitarian food assistance is high. This decreases till the wettest months where enough food is produced to meet the required food supply of both populations, and increases following again a dry period. In figure B.5 it can be seen that without humanitarian food assistance, the humanitarian food assistance gap follows the same line as the people in need of humanitarian food assistance. The same can be seen when looking at ‘conflict’ in both regions. The year starts in a situation of conflict, but this resolves once the

food supply increases during the wettest months, and occurs again during the dry period. Appendix B2 elaborates on the specific code used in this model and appendix B4 on the specific changes used for this scenario.

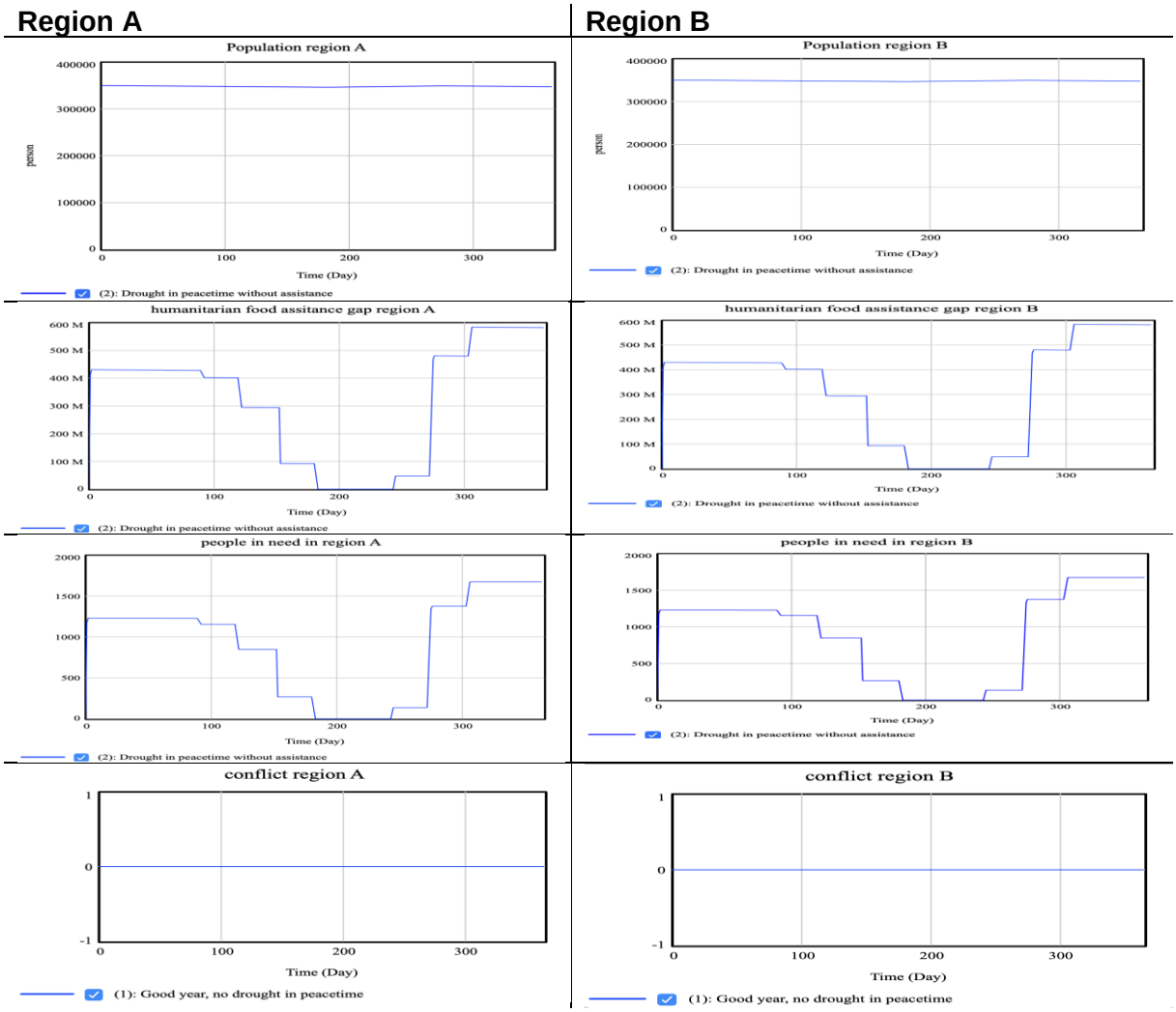

Figure B.5. Behavior of the KPIs in scenario (2) Drought in peacetime without information sharing to provide humanitarian food assistance

(3)Drought in violent time without information sharing to provide humanitarian food assistance

In this scenario, region A is initially a peaceful region while region B experiences violence from armed groups. This scenario represents a situation where the Red Cross Movement and Dutch peacekeepers do not share information. The Red Cross Movement has delayed information in peacetime and no information in times of conflict to be able to provide humanitarian food assistance.

In case of a continuous drought in both regions with limited coping strategies, if there is an outbreak of violence and armed groups in region B, no information for humanitarian organizations to act upon and no humanitarian food assistance is provided, the number of people in need of food will increase, as well as the humanitarian food assistance gap. Looking at figure B.6 it can be seen that following a violent event in region B, people move from region B to region A which puts pressure on the food security of region A. The numbers of people in need as well as the humanitarian food assistance gap increase until the wet season where more food is produced to meet the required food supply. Following the increased food insecurity in region A, people move to region B, which puts pressure on food security in region B and move again to region A, putting pressure on the food security in region A. These tensions caused by IDPs can also be seen when looking at ‘conflict’. It can be seen in figure B.6 that

without humanitarian food assistance, despite the high birthrate, there is hardly any population growth. Appendix B2 elaborates on the specific code used in this model and appendix B4 on the specific changes used for this scenario.

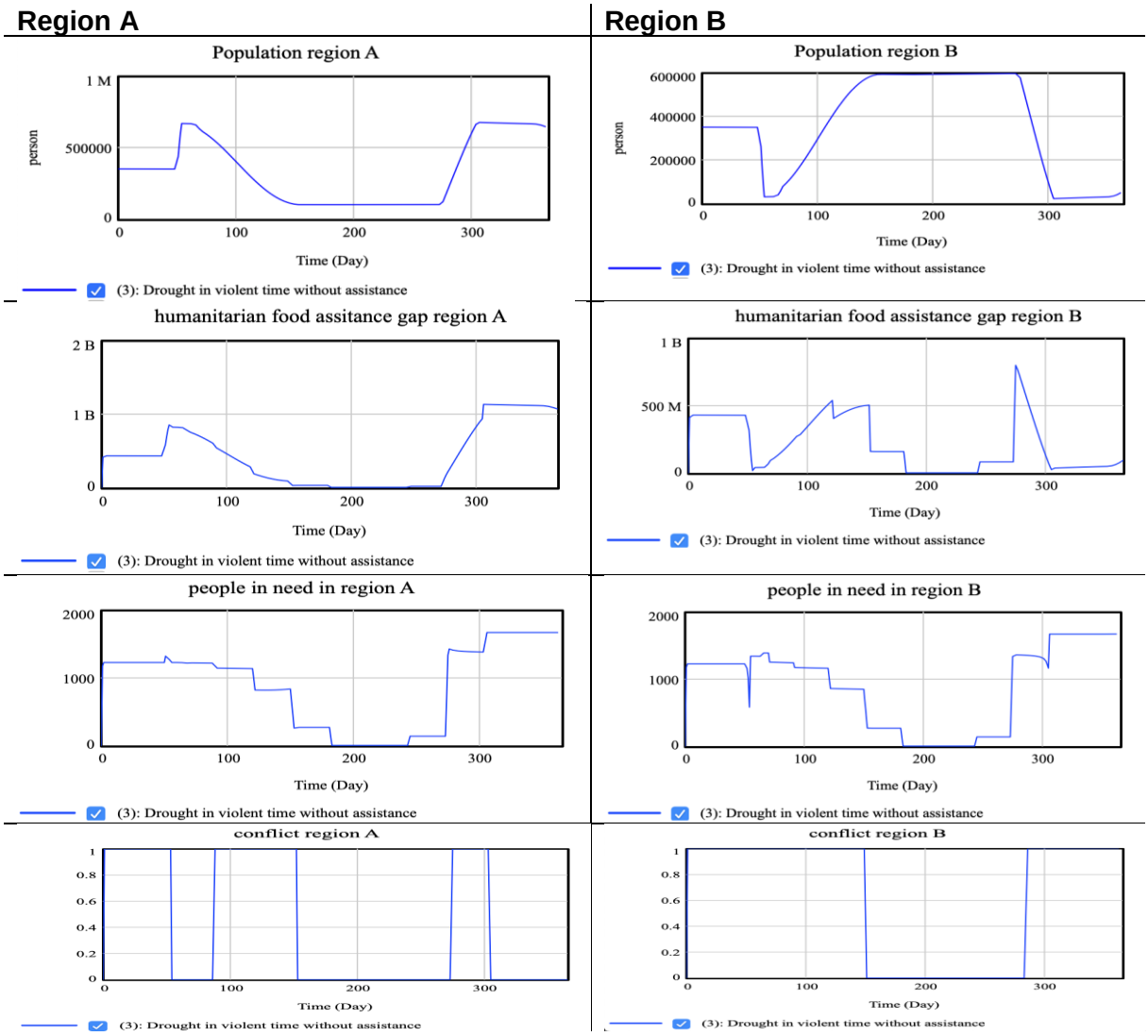

Figure B.6. Behavior of the KPIs in scenario (3) Drought in violent time without information sharing to provide humanitarian food assistance

(4)Drought in peacetime with information sharing to provide humanitarian food assistance

In this scenario, both region A and B are initially peaceful and do not experience violence from armed groups. This scenario represents a situation where the Red Cross Movement and Dutch peacekeepers share information. The Red Cross Movement has delayed information in peacetime and delayed information in times of conflict to be able to provide humanitarian food assistance.

In case of a continuous drought in both regions with limited coping strategies, when humanitarian food assistance is triggered, a time delay exists in the process of providing humanitarian food assistance to the people in need. In figure B.7 it can be seen that after the first spike of humanitarian food assistance gap in region A, the population of region A decreases while the population of region B increases. Here a spike in conflict can be seen. In figure B.7 it can also be seen that the situation of conflict in both regions follow the same direction as the number of people in need and the humanitarian food assistance gap. In both regions the number of people decrease until the wet period and increase during the drier

months. Despite the high birthrate, the population in both region A and B seem to stay stable. Appendix B2 elaborates on the specific code used in this model and appendix B4 on the specific changes used for this scenario.

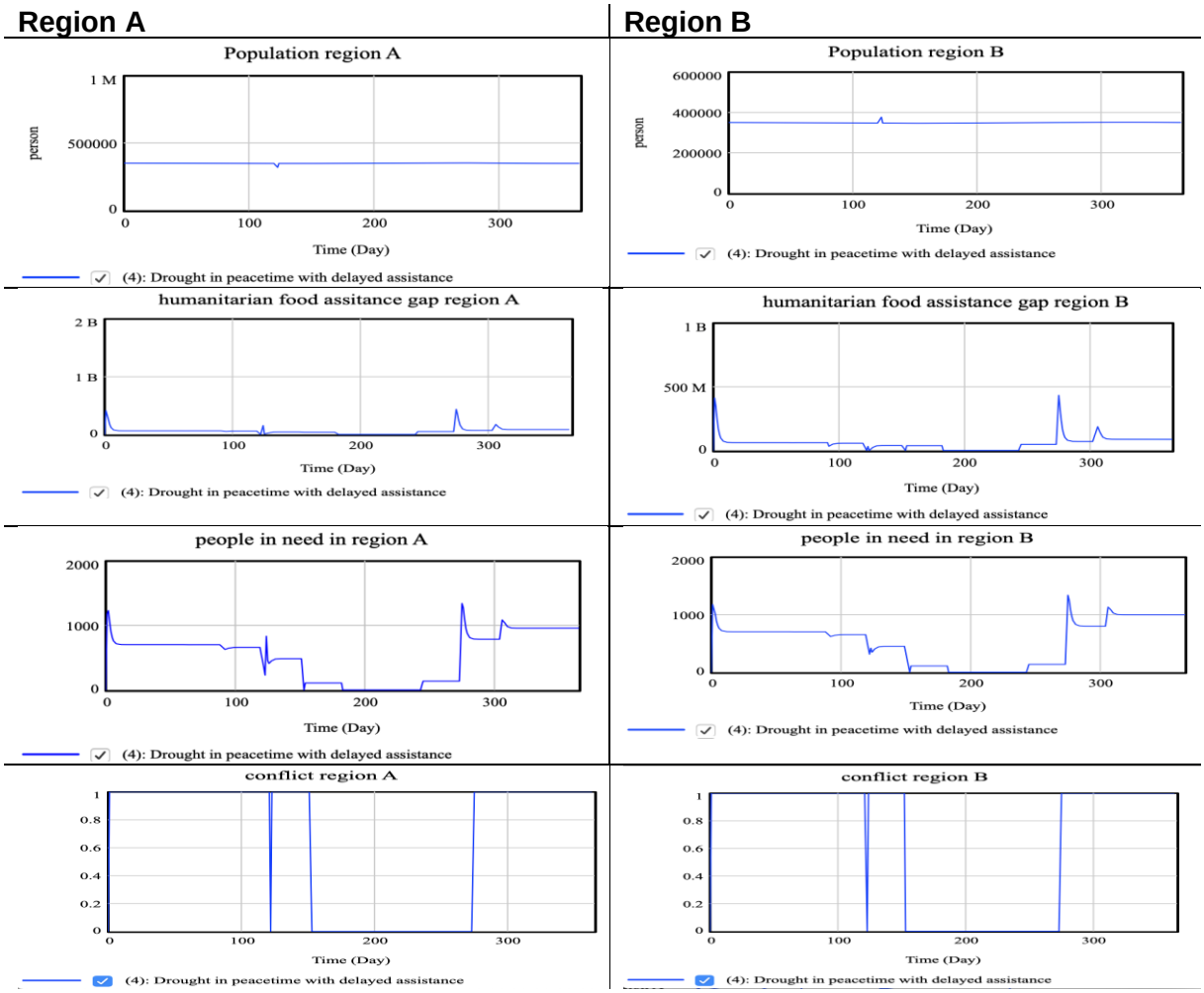

Figure B.7. Behavior of the KPIs in scenario (4) Drought in peacetime with information sharing to provide humanitarian food assistance

(5)Drought in violent time with information sharing to provide humanitarian food assistance

In this scenario, region A is initially a peaceful region while region B experiences violence from armed groups. This scenario represents a situation where the Red Cross Movement and Dutch peacekeepers share information. The Red Cross Movement has delayed information in peacetime and delayed information in times of conflict to be able to provide humanitarian food assistance.

In case of a continuous drought in both regions with limited coping strategies, if there is an outbreak of violence and armed groups in region B and humanitarian food assistance is triggered, a time delay exists in the process of providing humanitarian food assistance to the people in need. Looking at figure B.8 it can be seen that following violence in region B, people move from region B to region A which puts pressure on the food security of region A. The initial numbers of people in need are in both regions high. Looking at figure B.8, it can be seen that the number of people in need in region B drops as the number of people move from region B to A, following the outbreak of violence and conflict. Following the increased food insecurity in region A, people move to region B, which puts pressure on food security in region B and move again to region A, putting pressure on the food security in region A. It can be seen in figure B.8 that even with humanitarian food assistance, despite the high birthrate, there is hardly any

population growth. When looking at 'conflict' in region A, it can be seen that situations of conflict are increased following the violent outbreaks in region B and the population growth towards the end of the year due to increased food insecurity in region B. Appendix B2 elaborates on the specific code used in this model and appendix B4 on the specific changes used for this scenario.

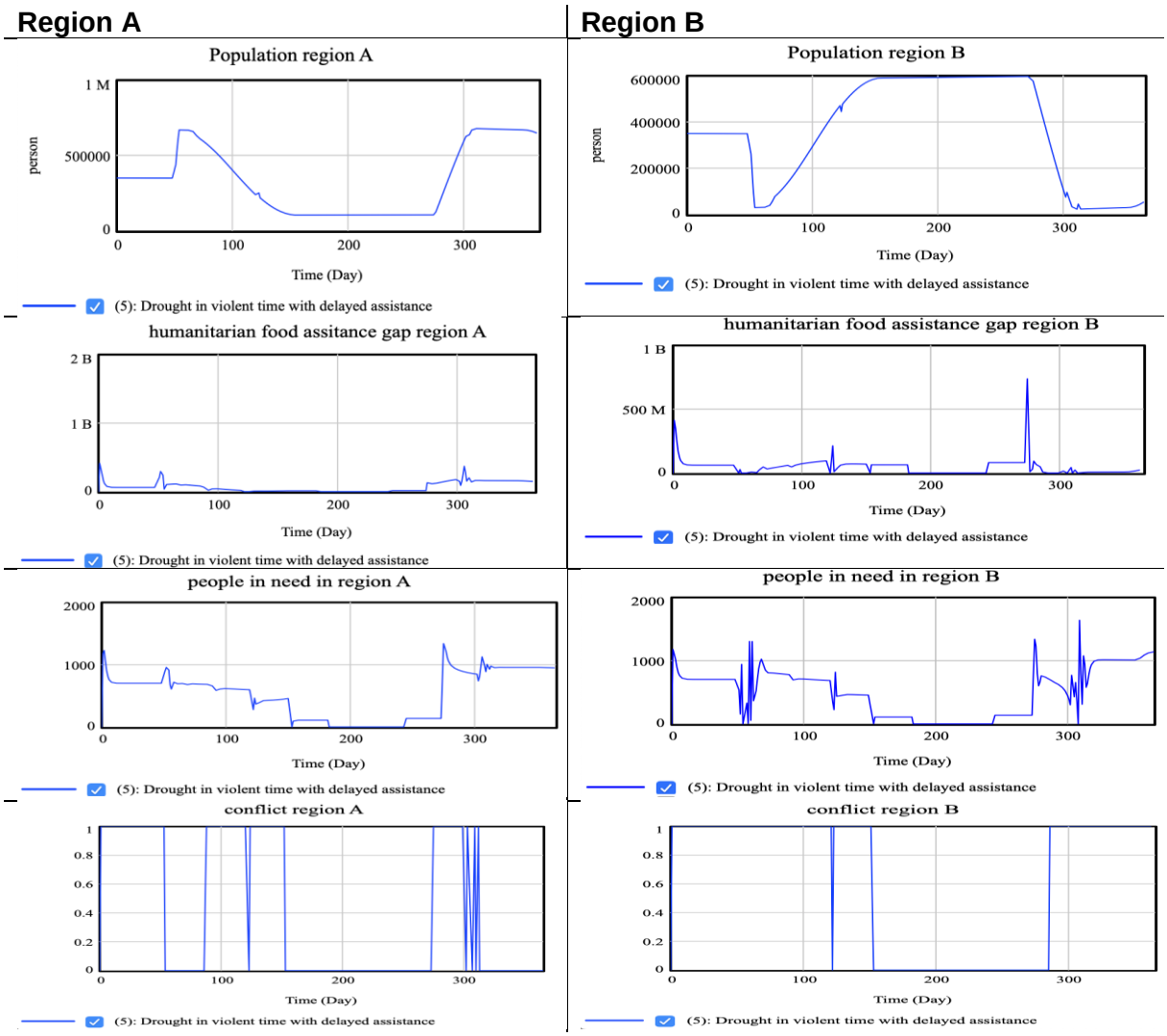

Figure B.8. Behavior of the KPIs in scenario (5) Drought in violent time with information sharing to provide humanitarian food assistance

(6)Drought in violent time and faster information sharing to provide humanitarian food assistance

In this scenario, region A is initially a peaceful region while region B experiences violence from armed groups. This scenario represents a situation where the Red Cross Movement and Dutch peacekeepers standardized information sharing. In both peacetime and in times of conflict information is faster available to the Red Cross Movement to provide humanitarian food assistance.

In case of a continuous drought in both regions with limited coping strategies, if there is an outbreak of violence and armed groups in region B and humanitarian food assistance is triggered, a time delay exists in the process of providing humanitarian food assistance to the people in need. In this scenario it is assumed that the time between the trigger for humanitarian food assistance and the relief teams to deliver humanitarian food assistance to the people in need, is faster than in scenario 4 and 5. Looking at figure B.9 it can be seen that following

violence in region B, people move from region B to region A which puts pressure on the food security of region A. The initial numbers of people in need are in both regions high. Looking at figure B.9, it can be seen that the number of people in need in region B drops as the number of people move from region B to A, following the outbreak of violence and conflict, putting pressure on the food security of region A. Following the increased food insecurity in region A, people move to region B, which puts pressure on food security in region B and move again to region A, putting pressure on the food security in region A. It can be seen in figure B.9 that even with faster humanitarian food assistance, despite the high birthrate, there is hardly any population growth. When looking at 'conflict' in region A, it can be seen that situations of conflict are increased following the violent outbreaks in region B and the population growth towards the end of the year due to increased food insecurity in region B. Appendix B2 elaborates on the specific code used in this model and appendix B4 on the specific changes used for this scenario.

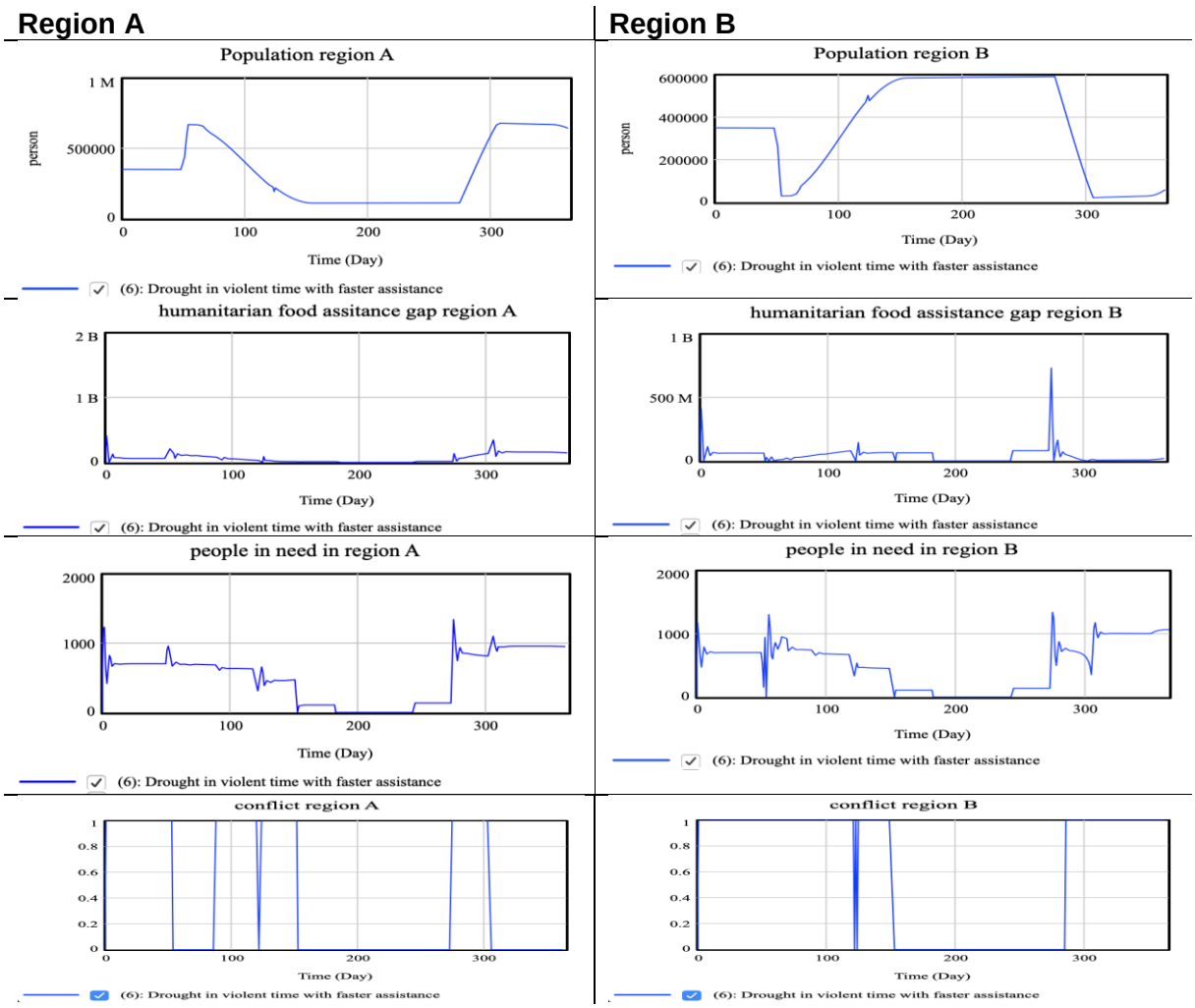

Figure B.9. Behavior of the KPIs in scenario (6) Drought in violent time with faster information sharing to provide humanitarian food assistance

Figure B.10 shows the behavior of the KPIs in all six scenarios.

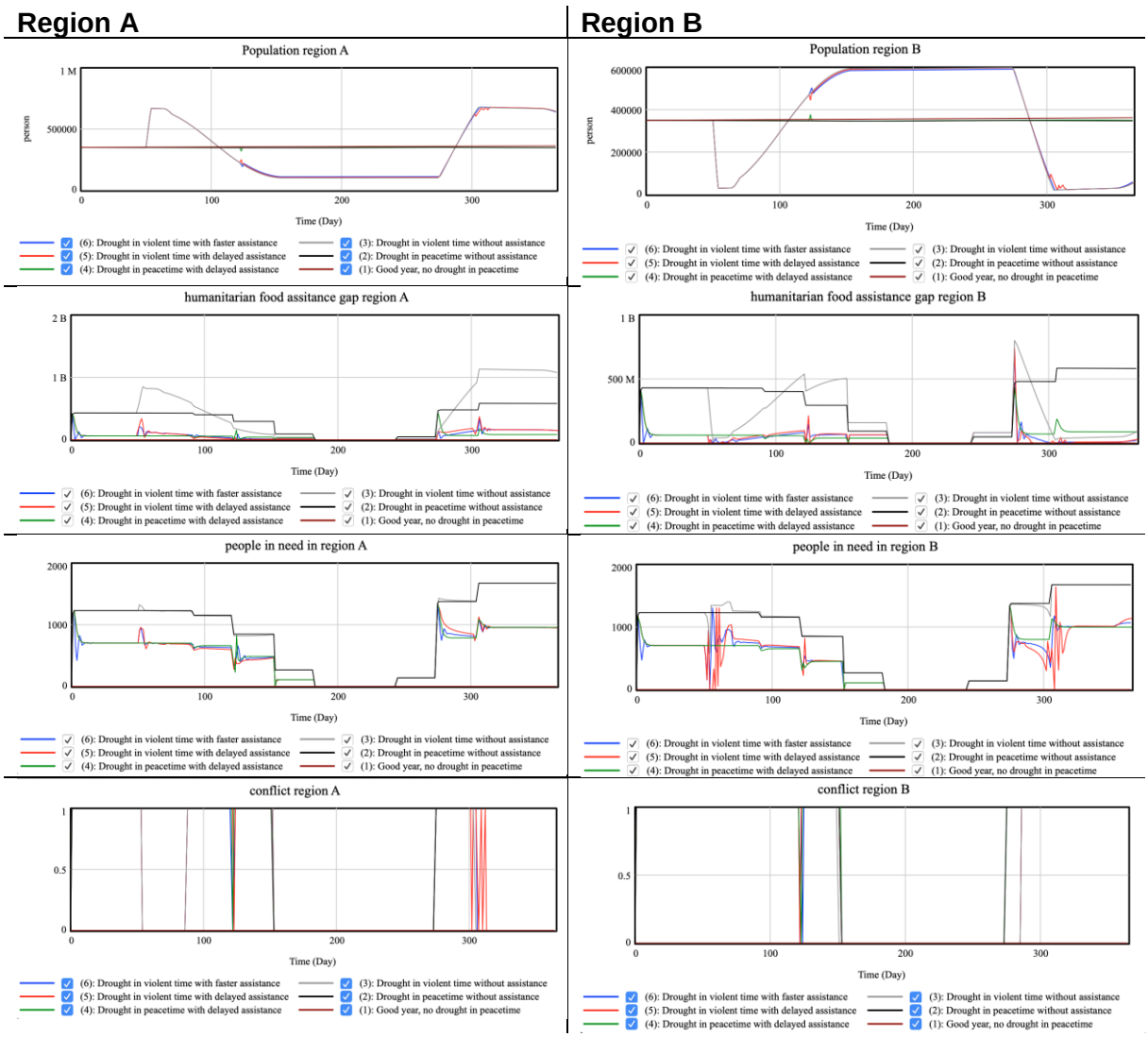

Figure B.10. Synthesis of the behavior of the KPIs in the six scenarios of the Drought-Food insecurity-Conflict Nexus

Analysis of the model behavior shows that in scenario (1) 'Good year in peacetime', sufficient food will be produced to meet the needs of the food supply in both regions A and B. People do not have to adapt a coping strategy; they will stay in their own region, without any need for humanitarian food assistance, no conflict and the population will grow rapidly. Looking at figure B.10, in scenarios (2) 'Drought in peacetime without information available to provide humanitarian food assistance' and (3) 'Drought in violent time without information available to provide humanitarian food assistance', findings suggest that during a drought, the number of *people in need* will increase and without any *humanitarian food assistance*, frequent situations of *conflict* will occur. Despite the high birthrate, the *population* will not grow. However, in the violent scenario (3), the number of *people in need*, the *humanitarian food assistance gap* and days of *conflict* are higher than in the peacetime scenario (2). In scenarios (4) 'Drought in peacetime with delayed information to provide humanitarian food assistance' and (5) 'Drought in violent time with delayed information to provide humanitarian food assistance' findings suggest that as the number of *people in need* and the *humanitarian food assistance gap* and days of experience *conflict* is higher in the violent scenario (5) than in the peacetime scenario (4), all the numbers all smaller than in scenario (2) and (3), without humanitarian food assistance. Findings of scenario (6) 'Drought in violent time with faster information available to

provide humanitarian food assistance' suggest that due to faster humanitarian food assistance, the *humanitarian food assistance gap* decreases as well as the number of *people in need*. Findings suggest a slight *population* growth in scenario (6) compared to scenario (4) and (5), scenarios with delayed information available to provide humanitarian food assistance. Findings suggest a relationship between number of days of *conflict* and food security of *people in need*, as faster humanitarian food assistance in scenario (6) results in less days of *conflict* compared to scenario (4) and (5) with delayed information available to provide humanitarian food assistance, which in turn resulted in less days of *conflict* compared to scenario (2) and (3) without information available to provide humanitarian food assistance and thus without humanitarian food assistance.

APPENDIX C. Interview Protocol and Summaries

This section elaborates on the interview protocol and summaries of the interviews. Section C.1 shows the interview invitation. Section C.2 elaborates on the interview protocol and in section C.3 the structures summaries of the interviews can be found.

C.1. Interview invitation

Dear Sir/Madam,

My name is Titia Kuipers and I am a master student Engineering & Policy Analysis at the Delft University of Technology. Currently I am conducting my thesis for 510.global, the data team of the Netherlands Red Cross and the Humanitarian Technology Lab of the Delft University of Technology.

Meaningful insights based on expertise and experience would be of great value for my research project. I would therefore like to ask you if I could ask you a couple of questions in an interview somewhere in the coming weeks?

To give an idea of what this interview is about, I will provide you with some background information of the research I am focusing on. The title of my thesis is: The role of information sharing, when natural disasters and conflict collide.

While natural disasters are getting more and more intertwined with conflict, due to a number of reasons such as climate change, humanitarian and peacekeeping organizations have increasingly overlapping tasks and scarce resources in mission areas. As the whole chain of humanitarian actions is driven by information, sharing information with other organizations may not only save time and money, but also lives.
The goal of my research is to generate insight on how information sharing between humanitarian and peacekeeping organizations can be improved, in fragile states that are prone to slow-onset natural disasters. In order to reach this goal, I am conducting a case study on Mali. I am specifically focusing on information sharing between the Red Cross Movement and the Dutch military that contribute to the MINUSMA peacekeeping mission within the context of drought, food security, internal displacement and conflict.
In Mopti for instance, while there is an ongoing conflict, people live from rain fed agriculture. Due to the rising temperatures and longer periods of drought, people are facing more and more food insecurity in this region. Since conflict and food insecurity are linked in a vicious circle of cause and effect, humanitarian and peacekeeping organizations have overlapping goals.

To generate insight on how information sharing between humanitarian and peacekeeping organizations can be improved, in fragile states that are prone to slow-onset natural disasters, I would like to ask you a couple of questions.

Could you please let me know if and when you are available? If you have any further questions, do not hesitate to contact me. Looking forward to hearing from you.

Many thanks in advance!
Kind regards,

Titia Kuipers

Graduate researcher at 510, the data team of the Netherlands Red Cross
Delft University of Technology
Skype: titiakuipers
Phone: +316-41819788

C.2. Interview protocol

1) Prior to interview

- Identify respondents
- Try out the protocol
- Send message to interviewees with short description of research and reason for interview request

2) Instructions for self

- Ask clear questions
- Determine and share the time limit for the interview
- Be flexible and open to interviewee
- Stay focused, know what you want to know
- Ask interviewee to elaborate further when you do not understand something
- Remain critical
- Summarize answers to check that you understood clearly

3) Introduction about self (keep it short)

- Background interviewer:
  - Master student Engineering and Policy Analysis at the Delft University of Technology, conducting thesis research in collaboration with 510, the data team of the Netherlands Red Cross
- Background research:
  - 510 develops data-driven models that can make humanitarian aid faster and more (cost) effective
  - For the last 3 years, 510 has focused on natural disasters
  - The importance of a more efficient way of working is however also increasing in situations that we call ‘complex emergencies’ (such as conflicts)
- Topic of research
  - The objective of this research is to generate insight on information sharing between humanitarian and peacekeeping organizations in fragile states that are prone to slow-onset natural disasters and conflict, across all phases of a disaster.

4) Interviewee selection

To provide valuable answers to the interview questions, a wide range of interviewees with specific and extensive knowledge about the humanitarian and peacekeeping information landscape in a fragile state that is prone to slow-onset natural disasters have been selected. Based on the expected presence of this kind of knowledge and expertise in combination with the aim to have a set of interviewees from a wide range of functions to be able to compare and be able to come to generic findings.

Ideally more interviewees would have been included in this research. However, it has been found that many people find this research contentious and are not open for questions, making it challenging to find suitable interviewees. Yet, several conferences were organized to bring together people with knowledge that met the criteria of specific and extensive knowledge about the humanitarian and peacekeeping information landscape in a fragile state that is prone to slow-onset natural disasters. Insights from participating in these conferences: ‘Analysis Makes the Difference’ conference (specifically the information sharing workshop) organized by the Civil-Military Cooperation Centre of Excellence October 16th, 17th and 18th, 2018 (CCOE, 2018), the ‘Climate Symposium’ organized by the Dutch Ministry of Defence on November 6th 2018 (MoD, 2018), the ‘Applying Data for Peacekeeping: Challenges & Opportunities’ organized by PAX Protection of Civilians on November 15th 2018 (PoC, 2018) in combination with the connections within 510 and the Red Cross network, the Mali platform of the

Netherlands and additional interviewees recommended to get in touch with (snowballing technique) led to the set of interviewees as in Table C.1:

5) Method of interview analysis

Due to the exploratory nature of this research, interviews range from explorative, open methods to semi-structured interviews. To analyze the interviews, structured summaries of the interviews have been created. The structured summaries allow answers to be comprehensively compared and make 'system linkages' (Friese, 2014). The linkages are a holistic approach towards understanding the qualitative data retrieved from the interviews. If they are similar, supportive or contradict each other, these factors will be linked together.

6) Interviewees

Table C.1 provides an overview of the interviewees.

Table C.1: Overview of interviewees

Category	#	Organization	Department	Interview date	Mode
Humanitarians	#1	UN OCHA	Information management	October 18th 2018	Face-to-face
Red Cross Movement	#2	NLRC	Information management	November 3rd	Face-to-face
	#3	NLRC	Information management	November 8th 2018	Face-to-face
	#4	CRM/NLRC	Food security program	December 17th 2018	Face-to-face
Peacekeepers MINUSMA	#1	MINUSMA	Civil-Military Cooperation	November 15th	Face-to-face
	#2	MINUSMA	Joint Operations Center	November 15th	Face-to-face
	#3	MINUSMA	Civil-Military Cooperation	January 9th	Face-to-face
	#4	MINUSMA	Civil Liaison	January 28th	Phone call
Peacekeeper	#5	US Joint Staff	Information Management	October 16th 2018	Face-to-face
	#6	Marine Corps	Civil-Military operation school (deputy director)	October 18th 2018	Face-to-face
	#7	Joint Force Command	Civil-Military Cooperation	October 16th 2018	Face-to-face
	#8	US Army	Special operations center of excellence	October 17th 2018	Face-to-face
	#9	PAX protection of civilians	Protection of civilians	October 18th 2018	Face-to-face
	#10	PAX protection of civilians	Protection of civilians	November 15th 2018	Face-to-face
	#11	UNMISS - South Sudan	Civil Affairs	November 15th 2018	Face-to-face
	#12	Human Security Collective	Information Management	November 15th 2018	Face-to-face
	#13	Center of Civilians in Conflict	Senior peacekeeping researcher	November 15th 2018	Face-to-face
	#14	Global Affairs Canada	International Assistance	October 18th 2018	Face-to-face
	#15	UN Department of Peace Operations	Peacekeeping Information Management Unit	November 15th 2018	Face-to-face
	#16	UN Division for Policy Evaluation and Training	Coordination	November 15th 2018	Face-to-face
Interface	#1	Civil-Military	Lessons Learned	October 16th	Face-to-face

	Cooperation Center of Excellence	& analysis	2018	
#2	Civil-Military Cooperation Center of Excellence	Lessons Learned	October 17th 2018	Face-to-face
#3	European External Action Service	External affairs	November 6th 2018	Face-to-face

C.3. Structured summaries of interviews

Table C.2. Structured summary of interview with Humanitarian #1

Humanitarian #1	**UN OCHA**	**Information Management**	**October 18th 2018**	**Face-to-face**

What is the core activity of the center for humanitarian data?

Last year, UN OCHA established a center for humanitarian data in the city of The Hague with the vision to create a future where everybody who is involved in any kind of humanitarian situation, has access to the data he/she needs whenever he/she needs it to make responsible and informed decisions. “Connecting people and data to save lives”

One of the center for hum data’s services is the Humanitarian Data Exchange (HDX) platform. The goal of this open source, freely available platform is to make humanitarian data easy to find and easy to use for analysis.

One of the focuses is to adopt shared data standards such as the Humanitarian Exchange Language (HXL). These standards have been designed to improve information sharing during a crisis without adding extra reporting burdens, by simply adding hash tags in columns in excel sheets.

With the hash tags in the excel sheets, quick charts and graphs are made automatically, and allows the data to be checked easily for errors

Are there any policy agreements, or can anybody add and take information?

Of course we have data policy agreements. You need that when you are working with partners to create a trust framework for sharing data in crisis settings. No personal data is allowed, no data that exposes people or puts them into danger, no ID of vulnerable groups.

In case of non-sensitive data, it will be publicly available, or private. In case it is uncertain, HDX connect request metadata. In case of sensitive data, it will not be shared.

Which other platform are commonly used to share data and information in a humanitarian response?

Mostly Drop box, Skype and Facebook

Now there is this one open platform, how do you plan to get people engaged and actually use it?

There are a lot of things to digest, walking the dog. But just having a platform is not everything. We need to build on people's capability to access and use data in support of humanitarian affairs, as well as in person remote training.

We also organize workshops to bring organizations together, to visualize and make it all accessible.

It is all about data science, storytelling, predictive analytics, and user experience research and data visualization of baseline information.

With this platform, it takes only 23/43 days to collect information till it can be used. The speed of collection improves situational awareness

Military are not well informed about this stuff. They feel like they have to predict everything. They should identify unclassified data that they can share and push it into this platform.

Table C.3. Structured summary of interview with Red Cross Movement #2

Humanitarian #2	NLRC	Information Management	November 3rd	Face-to-face

What is information management all about?
Since the new privacy regulations, humanitarian organizations are more and more aware of data protection and privacy and that this is an increased issue. However, the first thing they think of is protecting data and information of and about their staff members, volunteers and donors.
Information management our sector is greater than that. It also is encompassed information of the humanitarian response and beneficiaries. Key words are data responsibility and data literacy. We don't want to do any harm with the information we collect.

H**ow are you incorporating that in your work?**

We are continuously working on this and continuously improving.

Relevant information about people in need can be extremely helpful to humanitarians in the field and also to remote humanitarian. But at the same time, if this information falls into the wrong hands, it can put these people at risk.

In terms of data responsibility, I think we can learn a lot from peacekeeping or military organizations.

We are working on data protection, based on GDPR (General Data Protection Regulation), the administrative and technical aspects to protect data from unauthorized people.

We are working on the local and humanitarian context; aligning our work with local legislative requirements and not only the International Humanitarian Law and on ethical standards and principles, to be able to process data in a responsible way.

Table C.4. Structured summary of interview with Red Cross Movement #3

Humanitarian #3	NLRC	Information Management	November 8th 2018	Face-to-face

Is the humanitarian response to a slow-onset natural disaster the same as the response to a slow-onset man-made disaster like conflict? What kind of information do you need to prepare for and respond to?

In case of a natural disaster, humanitarians know what to do. We have systems to monitor certain indicators, trigger mechanisms are in place and once these triggers reach a threshold we can go into the field and take actions. Humanitarian response often waits till the situation peaks before actions are undertaken. The actions are the same in a conflict setting, only the implementation is not. Because it may be dangerous we need to have information about safety and security to protect our field staff as well as the people receiving humanitarian aid.

Does the relationship between drought, food security, internally displacement and conflict in Mali sound familiar to you?

In areas that are very agricultural dependent, you do see that due to drought and rising temperatures, people move to other areas in search for a better livelihood, leaving agriculture destitute and putting pressure on the resources of another area which may lead to conflict.

How is information shared during a humanitarian response?

Humanitarians often make use of low-technology tools, information lists with contact, surveys on paper, questionnaires to take into the field, maps, whiteboards etcetera

Which type of information would you (not) be willing to share with Dutch peacekeepers? Why? In what circumstance?

In Mali, peacekeepers are a target. Red Cross is afraid to become a target too when seen with military while they fear for their own life. All peacekeepers and military have the same uniform and

look the same. Information is always gathered with a certain lens. I would not share what I see.

Table C.5. Structured summary of interview with Red Cross Movement #4

Humanitarian #4	**CRM/NLRC**	**Food security program**	**December 17th 2018**	**Face-to-face**

Can you tell me a bit more what the Mopti region in Mali is like?

Mopti is a region between the North and South of Mali where there is conflict and people depend on rain fed agriculture. Armed groups hide here during the rainy season, which is between June and November. Little information and data is available due to conflict and not full accessible. Some areas in Mopti get flooded, other experience drought. In the north it's one big swamp. If you want information here, you need to have somebody on the other side of the river before the rainy season with a phone, to tell you what is going on. Or you have to wait till the end of the season when people can have a look to find out that there was a flood.

Does the relationship between drought, food security, internally displacement and conflict in Mopti sound familiar to you?

If there is a dry season, you would still harvest something. Maybe not 80 or 50%. Those who manage to harvest have good prices, those who have not will have higher prices. If families will not make it to the next season, they will go to town and look for labor elsewhere. They will sell everything and go and work somewhere else. Instead of three, they will maybe have two or one meal a day. It is a common strategy for whole families to work together and in tough times move away to work somewhere else. In areas that are very rainfed agricultural dependent such as Mopti, you do see that due to drought and rising temperatures, people move to other areas in search for a better livelihood, leaving agriculture destitute.

No food leads to starving and just suffering. Conflict needs someone to blame, someone guilty to his or her misery. Farmers do not have weapons, but since the Gaddafi it is super cheap. Distributors and sellers are everywhere. Boko Haram kills for money.

Due to conflict, complete farms are burnt down. Farmers are very vulnerable. They sit next to their field all night, protecting their farms, but it is a high risk. Whole villages will move at the same time.

What information do you as a food security program advisor need to prepare for and respond to a drought fueled food crisis in a fragile state like Mopti? How do you get the information you need?

In Mali the situation is a bit different. We don't have to wait till the government declares a drought. If the government does not declare a drought, Red Cross still can help beneficiaries (due to anarchy).

Conflict or no conflict, early warning systems are still in place. Fewsnet maps, ACF maps to see biomass production, with multispectral infrared satellite imagery we now can see difference between sand, crops etcetera. We don't have to wait till the cereals get to the market to see the market price to know about the situation. Quarterly we receive food security indicators. 3-6 months prior to a drought, these indicators will tell that a drought is coming and 3 months in advance we can say this with reliable statistics.

While there is an ongoing food insecurity program, this program can inform the farmers. The scientific information is available here. However, it is not always shared on the field. Due to conflict we cannot always reach them, inform them to get better seeds or provide them with short season seeds. Sometimes it takes time to get funding, but we are working on this structure.

As long as the market is working, we would distribute cash and not food. We would also preferable transfer the money by phone and not physical. For our own security and the security of the beneficiary who would then be at risk.

What would facilitate your work, to help improve or increase the help you wish to give?

In Mali, national weather stations try to show 1 week in advance weather bullets of 10 days. But sometimes the information about July comes only in November.

To farmers, 'good' or 'bad' rainy season says already a lot. But how do we get this information to

the farmers in needs?

In places where humanitarian organizations can access, farmers get improved seeds. In places with no access, farmers will not get improved seeds to make it to the next year.

Good connections and access to the farmers to inform them earlier about the next harvesting season and the implications for their food supply.

So infrastructure. Cheap access to the internet and quality of telephone network.

To what extent do you have an idea of parties that possess possibly relevant information?

We are the Red Cross; we have all the information we need. Maybe in the onset of a conflict we lack information. But in case of a drought in peacetime, with weather data and satellite pictures we know where people are. But is 20% of the village food insecure? Or 80% in need of food? Or have they all moved out? CRM will need to go in and do assessments to find this out. If it is dangerous, they will wait a day or two. ICRC will maybe give them clearance for the day, or tell them they have to be back by 3pm. They will never tell why you cannot enter the area. If the ICRC does not have sufficient detailed information about the security, they will consult the French embassy and only if they don't have sufficient detailed information, they would go to peacekeepers.

But, as local CRM staff agent asks the president of CRM who is also a local, permission to enter a region that says ok. Even though ICRC will tell them not to, they will listen to their own president. Not knowing that they are risking their lives.

CRM has to ask ICRC permission to enter an area. So we don't need peacekeepers. Peacekeepers access only superficial analysis. They don't know who are the conflicting parties. I'm not sure if they are informed about the conflict behind it.

Which type of information would you be willing to share with Dutch peacekeepers? Why? In what circumstance?

As NLRC or CRM I would be ready to share information as long as I see it will not be abused and not returned to the sender. To not risk my own life or the life of the person who gave the information.

ICRC is more reluctant to share information they have. They will only share 'do not go today' but not why you should not travel today. This may not be of added value.

Which type of information would you not be willing to share with Dutch peacekeepers? Why? In what circumstance?

So, peacekeepers have a lot of information but they don't know what they see. Who is who? If they see people moving, they don't understand the network behind it. Symptoms and not the disease. Our Red Cross principles make it difficult for us to share what we understand.

What are the main hurdles to share information?

Willingness. Or actually lack of willingness.

Which actions can be taken to make sharing of valuable information possible?

Peacekeepers make satellite images where they track moving people. Moving people is linked to political issues, however the relation between animal movement and food security can be interesting. If they show us pictures where they see dots of people and we see cows that would be interesting.

What could be possible interventions?

We would need something to get more information in the field. Mobile phone apps or weather station information in a way that farmers can understand it. We need someone who is able to read this who can get the information back to Mopti. So a technician in Mopti who is able to treat this information and send this to farmers. This person can also live in Bamako, but not in The Hague. We need to train a local, or someone from Senegal or Ivory coast.

Table C.6. Structured summary of interview with Peacekeeper MINUSMA #1

Peacekeeper #1	**MINUSMA**	**Civil-Military Cooperation**	**November 15th 2018**	**Face-to-face**

What is the core activity of the Dutch peacekeepers in Mali?

In Mali, we are dedicated to gather information to support the mission's mandate. In doing so, we have a close relationship with the government as well as the local population. Every unit feeds bits and pieces to the shared database everyone can use. That is why MINUSMA is also called an integrated approach peacekeeping mission. We engage with local communities and build trust relationships.

Peacekeepers in Mali are threatened. Civil people can also be targeted if they work closely with peacekeepers. It is vital for us to find out who the enemy is, to protect civilians but also our own people. Many peacekeepers have lost life in Mali..

104 due to hostile acts, the highest rate of all un missions. Mines, direct attacks, ambushes. Some nationalities of peacekeepers are targeted more and have a higher fatality rate, but it's approximately 90% military and 5% UNDP.

What would facilitate your work, to help improve or increase?

Change of mindset and awareness of the environment. We need to be prepared for an attack, know how to counter it and assess risks before taking actions. Improve training and achieve a threat assessment mission footprint. MINUSMA needs to have dss to make a threat assessment before civilians go or peacekeepers go without civilians. We also need to enhance accountability.

To what extent do you have an idea of parties that possess possibly relevant information?

There is an increasing pressure from governments to show positive results. Intermediate report on mandate relies heavily on data and information. A careful analysis is needed, because everything can be verified and falsified based on political interests. The UN assessed once that 85% of the MINUSMA budget went to protection of our own people and only 15% to the mandate. Our own assessment resulted in 55% own protection and 45% mandate. But after the attack on our super camp, perception changed. The UN immediately increased UN force and also mandate task.

Which type information would you be willing to share with the Red Cross Movement? Why? In what circumstance?

In Iraq the humanitarian purpose proved useful so far, but every peacekeeping missions is different. Be careful for political deduction and analysis of data and information. We need motivated and capable troops, otherwise perfect information leads to nothing. Have you heard about the 'big brains, tiny hands' already? Information is always power and leverageable for individual benefit. Also the lens that people use while gathering information differs. NGOs will get different answers in the field than peacekeepers.

Data is power but in 10 years we will have totally different data sources. In MINUSMA some people know how to use a computer, some don't. It's totally different in Africa. No matter what we can do with fancy technology. Maybe micro drones can skim in front of the convoy to detect and communicate to the 1st convoy to save lives.

Table C.7. Structured summary of interview with Peacekeeper MINUSMA #2

Peacekeeper #2	**MINUSMA**	**Joint Operations Center**	**November 15th**	**Face-to-face**

What are your core activities?

We are responsible for situational awareness. Every three months we report to the United Nations in New York and every month we have to produce an accountability report on time. Timing is crucial. But you know, military take their time to assess.

MINUSMA peacekeepers are a target. If MINUSMA is attacked, they may change their status and capture the people the attacked us. UNMAS (United Nations Mine Action Service) trains troops before deployment and also when they are on a mission.

JOC, together with legal affairs may detain people after an attack. We have then 72h to deliver the detainees to the government.

The context of Mali is so volatile. Situations change from safe-safe to continues attacks

How do you get the information you need?

JOC is an intelligence architecture that collects information from different sections. Numbers tell a lot, allowing us to step up on security. Only money and bureaucracy takes a lot of time.

When I need information, I turn to the Dutch. They have the best intelligence, super high technology, very accurate, quick and always correct. One time after an incident I needed to report to New York quickly. The Dutch gave me the information I needed for the report, only they couldn't tell who the source was. Anyway, I sent it and immediately got a reply from the Force Commander who didn't believe it because I did not disclose the source. They did their own assessment and a couple of hours later my phone rang leaving a message that I was right and the information was correct. Thank you Dutch!

What would facilitate your work, to help improve or increase?

Properly manage data, actions points, record data, regularly attend meetings by staff, focus on trends and information gaps and not on individual incidents. We have more and more data and information, but even with a 100% full picture, you need to be able to make a decision and take actions.

A mindset change, long before you get deployed. So training. The hub for African training is in Uganda. U2 and U9 need to work together.

To what extent do you have an idea of parties that possess possibly relevant information?

Every section has its own assessment criteria. Security dss is about threats towards staff, JOC is about reporting and situational awareness. Different from reporting staff perceptions, it is always subject to analysis. If two people are killed and reporters has to scale the severity on a scale of 1 to 5, reporter 1 may scale it with 1, because it happens every day, while reporter 2 may scale it on 4 because it is horrible. Also non-hostile, hostile perceptions.

What kind of information do you need?

The mission also had limited resources. If we need to choose between area one, two or three, where should we go? We need to engage more with populations to change perceptions. Information regarding people being hostile or not hostile, threatening the mission is what guides peacekeeping missions. The types of data and analysis we need includes violence and threats to our own troops and indicators for early warning (ecowas) keeping in mind the dynamics of the environment that emerges.

Which type of information would you be willing to share with the Red Cross Movement? Why? In what circumstance?

JOC cannot share information directly with humanitarian organizations; information sharing has to go via UN OCHA. OCHA is the interface between humanitarians and peacekeeping organizations. Let me know what you need, and then I can call them for you. We go to a lot of the same parties. U2 and I also can't share information, but you never know what happens if we sit next to each other.

Sharing information is difficult. Information goes one way up to the Force Commander. But information can also be shared by building trust and relations. The only thing is that once you get a good relation and the other party understands the importance, you rotate. This is always going to be a problem. Totally different perspectives between the first few and last few months of a person's deployment. The real trick is how to institutionalize this?

What do you see as the main hurdles?

When the whole team is there, the force can still interpret it on its own. Everybody can use information for his or her own biased things.

Which actions can be taken to make sharing of valuable information possible?

Recruit the right military who understands UN missions with civilians. Training, emphasizing the role of JOC, JMAC and the importance of information sharing. Also clear policies from command and control.
On the civilian side information sharing is more easily. Peacekeeping is structured to operate in silos; civil affair to civil affairs. Need to build on what already exists; civilian affairs officer. But many parallel initiative overlap. Humanitarians also don't always want to share information with us, because of their neutrality and impartiality.

Table C.8. Structured summary of interview with Peacekeeper MINUSMA #3

Peacekeeper #3	**MINUSMA**	**Civil-Military Cooperation**	**January 9th**	**Face-to-face**

What is the main thing that characterizes the MINUSMA mission?

Several different countries contribute to MINUSMA of which the majority is from African countries with different mindset, perceptions of risks and dangers than Europeans. We would you know, all sit inside an armored tank when we drive outside of the camp, they would go in a jeep and all sit outside because it's hot. When their jeep hits an IED, that's in one go a lot of people.

Our Dutch ASIFU aimed at gathering information for the long term, but what the force actually needed was information to take direct actions. It was maybe too sophisticated for the mission. JMAC civil branch: good analysis.

Which type of information would you be willing to share with the Red Cross Movement and what not?

The force would determine which information we could share with NGOs via the clusters

OCHAs civil-military affairs staff was mostly ex-military, easy to talk to. In my time we had fortnight meetings with UN OCHA clusters where we discussed information about refugee flows, food security, information about population, floods etcetera. Coordination of transportation issues that need to be resolved, information about safety and routes or that other parties should stay away but not why and never information about our plans or actions.

I never saw RCM at these OCHA meetings. We did get weekly flight notifications from the Red cross, so we knew where they were heading. So in reality, we did not have formal contact with the red cross movement. I do however know that the chief was stationed in Bamako. We knew each other from sports activities.

We have a culture where everything has to go via the boss. But at HQ; you never know what is happening. If someone should actually talk to you first before getting to your boss, but if that person and your boss have the same nationality, chances are that they know each other and have direct contact. People always find each other, on individual basis, via the phone or email.

Which actions can be taken to make sharing of valuable information possible?

We don't need information from the Red Cross Movement, but we could have an informal chat. Before deployment we get a lot of trainings, also in collaboration with the Civil Military Coordination Centre of Excellence to experience how it is as a humanitarian in such a situation. At these trainings with military and humanitarian organizations, the red cross movement is sometimes also present.

It's all about trust and relationship with certain people. Only the deployment time is so short. Colonel 1 year, HQ 6 months and troops 4 months. Once you are used to the environment, you go home again. Even though the mission stays for a longer period, collective memory is short.

Actually, humanitarians should be in the JOC. That would make things much easier. Only JOC can't share all information they have, and humanitarians probably don't want to because of their principles.

Table C.9. Structured summary of interview with Peacekeeper MINUSMA #4

Peacekeeper #4	**MINUSMA Ministry of Foreign Affairs of the Kingdom of the Netherlands**	**Civil Liaison**	**January 28th 2018**	**Phone Call**

How is Mopti like?

Mopti is an extremely complicated area with many layers of conflict and difficult to access. Especially in the northwest region access is limited and is very difficult to get to. One of the hiccups of MINUSMA is that due to lack of resources, enormous areas such as Mopti are more difficult to keep an eye on than on paper. Local MINUSMA staff will provide us with information, but also for them it is frustrating to not always be able to handle and act upon the information they have.

In the swamp area there is almost no place to land a helicopter.

Does the relationship between drought, food security, internally displacement and conflict sound familiar to you?

In areas that are very agricultural dependent, you do see that due to drought and rising temperatures, people move to other areas in search for a better livelihood, leaving agriculture destitute.

On the other side of the river there are tensions due to overpopulation, with inherently much bigger problems than 5 or 10 years ago. This is the place where once a year herders come with their cattle, for them to graze. But with more and more land intended for agriculture than 5 or 10 years ago.

What information do you need or wish to have?

The main purpose of exchanging information is to give meaning to what is seen; to find trends and trend breaks. e.g. very practical things such as was that a terrorist attack or robbery. Information from well-informed red cross would add a lot of value. In Uruzgan we had such a relationship with the RK and it worked well. This is different in Mali.

It depends largely on which countries participate and what their perceptions are.

Which type of information would you be willing to share with the Red Cross Movement? Why? In what circumstance?

If humanitarian organizations would like to share information, of course. They are usually quit shuddering, however sometimes they would sit around the table with the civil affairs person.

We tried to engage them more in our work and have invited them several times to join us on a trip/mission, but even OCHA did not want to be seen with us.

The Red Cross Movement takes it even further by not joining at meetings. Maybe they do communicate behind closed doors with the human rights branch of MINUSMA. The general sound is that they do not want to be seen with people in a military uniform.

Which type of information would you not be willing to share with the Red Cross Movement?? Why? In what circumstance?

We would never share where we will soon go to or who our interlocutors are.

What do you see as the main hurdles?

The biggest thing is the will, the will to share information.

How is information shared?

Not by phone, they can easily be tapped. Communication should happen face to face at a controlled location. Either at OCHA, UNHR and cluster meetings, UN-CMCoord.

The quality depends largely on who shows up to those meetings. Also here its garbage in, garbage out. If a peacekeeper just came from the field, but does not speak French.. This will have a negative impact on the perceptions of the humanitarians who maybe wont show up next time.

This happens a lot, that peacekeepers do not speak French. They communicate in their own

language or in English. A lot of information gets lost in translation.

Which actions can be taken to make sharing of valuable information possible?

Gao is a big city; they could easily blend in the anonymity. Also in Mopti they could enter a camp, step into a blinded car and nobody would see that they are there. In Bamako anonymity is even bigger, that is where general meetings between the UN, OCHA and NGO's take place. The only thing is that you miss the finesse per region, because the whole country is discussed here.

Should assess seriously what the situation is in a region. How is the situation? Is the social control big enough that it is safe for humanitarian and peacekeeping organizations to communicate openly with each other? If a meeting is at OCHA headquarters, humanitarians generally come more often than when the same meeting would be help at a super camp.

In the field they need to differentiate per sub region how the situation is and how safe it is to communicate openly with peacekeepers. Or of they only want to communicate in Bamako, make sure that they are well informed. Training common efforts, Dutch and German, practice how they can work together without the pressure from a disaster.

It remains human work. Make sure that people are educated and dare to communicate, and feel empowered to make their own decisions.

Table C.10. Structured summary of interview with Peacekeeper #5

Peacekeeper #5	**US Joint Staff**	**Information Management**	**October 18th 2018**	**Face-to-face**

What do you see as the biggest difference between humanitarian and peacekeeping organizations, regarding information sharing capabilities?

Humanitarian organizations have their principles and limited resources. If we want this to work, we must change the may military do business, not the way humanitarians do their business. We should share non-classified information on humanitarian platforms, following specifications based on the ISC using humanitarian standards. Humanitarian principles do not allow it the other way around. they can't adapt to the military, so the military has to adapt to them.

Supported by good humanitarian peacekeeping information sharing, the need for a military operation can maybe be prevented.

What are in your eyes the main hurdles?

The multinational environment, with multiple international organizations involved, civil-military cultural views, multiple environments, platforms, systems, multiple weekly implemented standards, multiple fragmented communities & efforts. Quite a few hurdles. Data is gathered through different systems, with different goals and by a myriad of actors.

You know, whenever the 9 (U9 or J9, the civil affairs person) gets information from an open source, once it gets into the system its classified. We need a paradigm shift, which tackles education, knowledge, laziness and maybe an atomized filter. I wouldn't say the system is broken, but abused.

What would help to overcome these hurdles?

By creating a common humanitarian-peacekeeping information process, investment in proscriptive military education, training & exercise development and collaborative humanitarian engagement.

Security at cable level exists, now also at software level on internet for instance. So when conditions change and we don't want to share certain information anymore, it shuts down automatically.

Table C.11. Structured summary of interview with Peacekeeper #6

Peacekeeper #6	Marine Corps	Civil-Military operation school	October 16h 2018	Face-to-face

What would facilitate your line of work?

For us marines, what we need are simple, bullet point messages with not too many words, applicable to any situation. Something that fits in our pockets and is easy to read. And identifying in advance what is sharable and don't make everything classified because we are military

What would help to overcome the identified hurdles?

Meta Tag documents to be and stay unclassified. In practice, we need someone to be on top of the information flow, instead of being overwhelmed by it. Somebody needs to be responsible for the system. Put ownership on the U9 otherwise U6 will own it.

In case of a bombing or other extreme event, the system should be able to lock down all documents. Senior information officer and release officer should be able to take these decisions.

Could you elaborate a bit more on the information sharing platform you use?

We are marine corps, we love putting mic and mac before everything. It's called Marcims: Marine civil-military management system: in bullet points, easy to read and graphics. This platform ensures non-waste of time and duplication of efforts. It's a daily read also for humanitarian to know where roads are blocked which is for WFP for example very important, or situational awareness in general. It uses semantic wiki-technology (without query data) and is available in read only - write only - read & write. Inputs are among others from the CIA world fact book, it does not contain any 'for official use only' information, on photos names and ranks are blacked out so it also does not contain any personal identifiable information. Marcims makes it possible to find stuff back even when you spell it differently (comparable to the HXL). In the future, Marcims would still send information up and never down, that's where the bad stuff happens.

You can find Marcims on training.marcsims.org. I can make you an account so you can access it too. We must integrate with HDX.

Palantir is an example of a system with only classified intelligence, which is not sharable.

If humanitarians would give military unclassified information to put it in a classified case, they would still be able to take it out because of the meta tagging. That's the difference between .org and .mil. You can take a copy of the former so data is on two places. Humanitarians would never even try the latter. More and more information is available; we are just trying to get our arms around it. Never do engagements to engage, and never collect Intel for the sake of collecting.

Table C.12. Structured summary of interview with Peacekeeper #7

Peacekeeper #7	Joint Force Command	Civil-Military Cooperation	October 16th 2018	Face-to-face

What are you currently working on?

We are searching for indicators for conflict to be able to make early warning mechanisms. I compare ourselves with the fire department. There is a diversity of measures you can take to combat a fire; fire trucks, fire extinguishers and smoke detectors. In every circumstance you may need a different measure. In a museum full of beautiful paintings you don't want to have sprinklers everywhere ruining the paintings.

Actions should be based on the context; sharing information with humanitarian organizations may in that sense help prevent the need for a military intervention all together.

What do you see as the main hurdles to accomplish such a fire department in this sector?

Connecting to Defence networks, development of information clearing house, security policies, reviews, labeling data, labeled with metadata, discipline will probably be automated in future but a transition is needed as well as interoperability.

Table C.13. Structured summary of interview with Peacekeeper #8

Peacekeeper #8	**US Army**	**Special Operations Centre of Excellence**	**October 17th 2018**	**Face-to-face**

What would facilitate your line of work?

Moving data to platform that others can access. Guidelines tell us what to do, but not how to do it.

How do we get to non-classified information?

You know, teams that gather information also can't share the collected information before it goes into the database, because you could derive it back to find how this information is found and that military personnel is in a certain region, potentially putting them in danger or the mission at risk. the enemy could also make use of open source data, so we must protect ourselves.

What is the importance of sharing information?

In Afghanistan, they did not share who is doing what, where and when. After many efforts, they found out that three different organizations were building primary schools. What they did not know was that there were barely enough kids for one school.

In panama "USA today" is a day late; "USA yesterday"

US told fake stuff to the Russians in the cold war, making them chase people who don't exist. Russians are now creating chaos. We spend resources on nobody getting them anyway, which prevents us from doing other stuff. I was in the Ukraine last week and within 24h, my phone was hacked by Russians. It happened while I was looking at my phone. They knew my US phone number and saw my passport, that's how fast it goes.

In Afghanistan, peacekeepers were keeping an eye on a village for months, trying to find out who is who. After four months of figuring out, they found out that somebody else already had done this assessment and someone in the mission knew exactly who was who. this information got so classified, it could not be found back.

Which actions can be taken to make sharing of valuable information possible?

It's a technical problem, not a social problem. The key things in tackling this, are information ownership and custodians, leadership and organizational structures, information standardization and information assurance (cyber security)

Table C.14. Structured summary of interview with Peacekeeper #9

Peacekeeper #9	**PAX**	**Protection of civilians**	**October 18th 2018**	**Face-to-face**

What is the core activity of your work?

We conduct a human security survey and gather data and information on indicators for conflict and violence in fragile states that are affected by conflict and share this data with military. We use evidence for international advocacy and talk with community members and authorities to facilitate constructive dialogue.

How do you collect those surveys?

We use Cobo collect surveys in areas with poor internet connection to get a sense of what is going on. We try to align policies with what is going on, on the ground. Through these surveys we have found main factors that cause conflict: poverty, hunger and rising prices.

How do you engage with military-peacekeepers?

We work with civilian affairs, but not with the person deciding on what to do with information. Engaging with military-peacekeepers is challenging due to different perceptions of relevance and applicability, depending on connections, rotation schedules, information reciprocity and depends on trust that they are able to establish.

What could help to overcome these hurdles?

We need data experts, policy makers peacekeepers and humanitarians to work together to be able to link innovation in data & peacekeeping to policy.

Table C.15. Structured summary of interview with Peacekeeper #10

Peacekeeper # 10	PAX	Protection of civilians	November 15th 2018	Face-to-face

What is the core activity of your work?

We have a monthly basis list of actions and monitor critical early warning indicators on a daily basis. Monitoring includes 20 indicators plus human rights plus information from the field plus situational awareness plus information collection in own language.

PAX needs local government permission to train enumerators and do the surveys to better understand what the needs are of the people and to act upon community's perception even though they don't always have the capacity to do so. Local authorities can signal to national authorities (not always credible partners in peace conversations)

It's very important to share information with other actors; there is a lot of interest in data, despite the fear to be not able to respond and the fear for owns security (in areas where they don't feel protected)

What is in your eyes the main hurdle?

It is difficult to get accurate data due to trust issues and specific contexts. If 70% of women respond to a survey and say that they are not safe at home, it could be because they are home more often than men, and men experience violence at other places or because they experience violence within their home

We strive to make the feedback-loop as quick as possible and push information back to the people. There are however tons of factors influencing experiences and perceptions, it's all about a moment in time. The data we gather is limited in the picture it paints, but it is still food and fuel for the broader dialogue and a start for discussion about what is happening.

An example of a feedback loop to the question if people feel that their perceptions are exposed. In the past, we tried this in dialogue, but the local police would say that we don't know what we are talking about. Now we can say things about for example 70% of the people, backed by data.

Table C.16. Structured summary of interview with Peacekeeper #11

Peacekeeper #11	UNMISS (South Sudan)	Civil Affairs	November 15th 2018	Face-to-face

Which information sharing platforms do you use?

We are reluctant of using SAGE. Input of the civil affairs is shared with JMAC, who is responsible for early warning. We don't share any contact details of identifiable information. Broader outreach we do push data back to the people. However it is difficult to get accurate data due to trust and context specific issues.

Every 3 months we make an inventory of information needs and conflict. After two, three or maybe four weeks it gets calm in the areas so no need for follow up on those issues.

What do you see as the main hurdles?

Language is definitely a thing. Peacekeepers often use the words 'intelligence gathering'. It sounds like they are spying and doesn't seem to the interest of the people. 'Situational awareness' or 'information gathering' would be more fitting. We should be careful with the counterparts from whom we get information and adapt terminology, which is not offensive.

Maybe we should call it comprehensive situational awareness.

Various mission components and organizations are working together with different goals. Mission components are often not aware of the reason for other components to gather data and information;

there is an opportunity for integration.

a lot of information is gathered through different systems, with different tools and by a myriad of actors. A lot of this data is not coded, and cannot be compared or linked to other datasets.

Which actions can be taken to make sharing of valuable information possible?

We currently do not have sophisticated mechanisms that enable data sharing and analysis. A mission wide database to enhance early warning would be an opportunity. A lot of data and information is gathered in the mission, and despite clear early warning indicators, comprehensive analysis is lacking. There is a potential for critical early warning, scenario building and use and application of open source intelligence

Table C.17. Structured summary of interview with Peacekeeper #12

Peacekeeper #12	**Humanitarian Security Collective**	**Information Management**	**November 15th 2018**	**Face-to-face**

What do you see as the main hurdles for humanitarian and peacekeeping organizations to share information?

Information gathering ends up in political game. If certain information falls into the wrong hands it could become material to support terrorism.

There is chance of fake news. The MINUSMA peacekeepers have a good relationship with the Malian government. But citizens do not see the government as their government. When peacekeepers go out in the field, engage with the local community and ask them questions. It is possible that the citizens will to give correct answers, leading to biased information.

The main fear is that information falls into the wrong hands.

Table C.18. Structured summary of interview with Peacekeeper #13

Peacekeeper #13	**Center of civilians in conflict**	**Peacekeeping research**	**November 15th 2018**	**Face-to-face**

How does peacekeeping information management work?

In peacekeeping missions, technology is limited. Information is shared with other parties through clusters. JOC is the information hub in missions and JMAC the brain, which develops integrated analysis. Within the mission uniform and high quality reporting. The mission leaders determined what information is needed. After this, information is collected following guidelines on mission priority information requirements and mission intelligence acquisition plans. Field bases staff collects and verify data and information. This ensures a strong system for managing a strong information and data driven decision-making by the mission leadership.

All the different nerves of the mission collecting and handling information come together in one database. The mission needs to confirm the quality of the source. Early warning mechanisms are trustworthy because they include three or four sources. If I won't tell who my source is, the force may not trust it and want to do the assessment themselves. It will take some time before actions can start.

What do you see as the main hurdles for peacekeeping?

Peacekeepers are concerned with maintaining objectivity, which can lead to maintaining distance from the local population, which can lead to misunderstanding and misperception between the community and the mission. Their preferred way of peacekeepers to accomplish things is the most rapid, most efficient and highest quality way. Before two conflicting communities can be brought together, a lot of effort is needed to make the dialogue work. Peacekeeping missions sometimes lack dialogues on local level, something they can benefit from humanitarian organizations

What do you see as the main hurdles regarding information sharing?

If information and data on abuse is collected in region A, and not in region B, this does not mean that there is no abuse in region B.

There are field integrated operation centers, but due to differences in ways people report, the same event can seem totally different.

In an open system you can't monitor who is putting information in, so people won't trust it.

Which actions can be taken to make sharing of valuable information possible?

In policy, protection matrixes are recommended but in practice they are not always used. This is partly due to lack of capacity or willingness. Staff rotations are another challenges. What we need it willingness and the ability to share information with each other. Especially for operational commanders it is crucial to receive the right information on time, in order to make a proper decision and risks for the population can be reduced.

Table C.19. Structured summary of interview with Peacekeeper #14

Peacekeeper #14	Global Affairs Canada	International Assistance	October 18th 2018	Face-to-face

What is the core activity of your work?

I develop exercises for military, peacekeepers, humanitarian, policy and civilians to prepare for a disaster. Do you remember the explosion in a metro station in Brussels? Not long before that happened in real life, we had an exercise, which was exactly like that. Context is essential for humanitarian and peacekeepers to connect and share information. The Viking experience for example, aims to enhance the added value of parties and understanding of the environment, including awareness, test case and exercise.

Which actions can be taken to make sharing of valuable information possible?

Information can come with a form of risk. Data and information is gathered through different systems, with different goals and by a myriad of actors. For information sharing to work, you need to trust the users but there are also operational benefits. Information sharing is very important for the different parties to effectively work together. Training, education and exercise are key to come to concrete actions.

Table C.20. Structured summary of interview with Peacekeeper #15

Peacekeeper #15	UN Department of Peace Operations	Peacekeeping information management unit	November 15th 2018	Face-to-face

How does information management work?

Peacekeepers have much more data and information than any other information-collecting organ. Information you collect however should be actionable information. Otherwise it's just to inform you like for your information. We don't want to do harm, but when you ask people what they need and you can't deliver, there is a risk of generation expectations that may not be met.

How is the supply and demand for data and information matched?

The United Nations is a politically oriented organization. We have not been set up to be a data and information shop. We don't have sufficient resources for substantive data. A systematic approach is missing, hence we are swimming in data and information.

How are you informed about the ongoing peacekeeping missions?

We receive MINUSMA fact sheets with monthly basis trends. This supports disciplined data and

information initiatives and allows for high-level conversation on strategic use of data and information in a wider context.

What would facilitate your work to help improve or increase?

Peacekeeping is political oriented activity. Member states want the UN to be more efficient but it is a double-edged sword. What information is truly useful is to know is peacekeeping is successful. A better filled human skills gap, including data analytics and data literacy.

Table C.21. Structured summary of interview with Peacekeeper #16

Peacekeeper #16	**UN Division for Policy Evaluation and Training**	**Coordination**	**November 15th 2018**	**Face-to-face**

What is the purpose of collecting data and information?

Data and information is collected to inform interventions, test assumptions, and identify potential barriers and threats to the mission.

What do you see as the main hurdles and which actions can be taken to make sharing of valuable information possible?

The main challenges lie in the political and security context. But there is also room for opportunities: by triangulating with other data sources for instance, accountability can be supported, the process can be improved and it may bolster credibility of local partners.

Table C.22. Structured summary of interview with Interface #1

Interface #1	**Civil-Military cooperation Center of Excellence**	**Lessons Learned & Analysis**	**October 16th 2018**	**Face-to-face**

How does information management work?

Information management is basically coordination based on data and information, architecture and a user interface.

How can information be shared?

In order to share information, you need a communication platform, which ideally should be used as a data repository to safeguard who takes what and who puts what in. For this to work, data and information should have metadata standards. If not in operation, military or peacekeepers are more flexible than humanitarians. Information about refugees can contain privacy-protected information. Information about detainees can contain personally identifiable information, need to take international law into account and protect for cyber war.

Which actions can be taken to make sharing of valuable information possible?

Civil military or humanitarian peacekeeping jargon needs to be common, common language and common conceptual models.

Within NATO, 29 countries can decide what information to share for command and control over various topic. A new topic about humanitarian affairs can piggyback ride on existing multilateral interoperability program approaches in unclassified information.

Software packages for command and control would be key for data and information dissemination and diffusion services to push and pull information into such an multilateral interoperability program. NATO is currently working on a new multilateral interoperability program platform.

Training and exercise are key to build trust and relationships. These exercises are mostly kinetic but always have a civil component in it. It would be beneficial if more humanitarians would join in these

exercises with military and peacekeepers.

Table C.23. Structured summary of interview with Interface #2

Interface #2	**Civil-Military Cooperation Center of Excellence**	**Lessons Learned**	**October 17th 2018**	**Face-to-face**
How does information management work? Information management is basically coordination based on data and information, architecture and a user interface. Nations decide what they want to contribute and how. NATO and FMN are currently efficient mechanisms for sharing information. What would help improve is invest in interoperability: technical components, cyber security as well as operational components and create and adhere international standards for meta tagging. **How can information be shared?** In order to share information, you need a communication platform, which ideally should be used as a data repository to safeguard who takes what and who puts what in. For this to work, data and information should have metadata standards. If not in operation, military or peacekeepers are more flexible than humanitarians. Information about refugees can contain privacy-protected information. Information about detainees can contain personally identifiable information, need to take international law into account and protect for cyber war. At a meeting where peacekeepers and military were present, a humanitarian prepared something with information and gave it to the peacekeeper. After the meeting the humanitarian noticed that he did not have a spare copy with him. The next time that guy saw the peacekeeper again, he asked it back. Only to find out that it had already gotten into the system and his own information had become classified information. **Which actions can be taken to make sharing of valuable information possible?** Civil military or humanitarian peacekeeping jargon needs to be common, common language and common conceptual models. Within NATO, 29 countries can decide what information to share for command and control covering various topics. A new topic about humanitarian affairs can piggyback ride on existing multilateral interoperability program approaches in unclassified information. Software packages for command and control would be key for data and information dissemination and diffusion services to push and pull information into such an multilateral interoperability program. NATO is currently working on a new multilateral interoperability program platform.			

Table C.24. Structured summary of interview with Interface #3

Interface #3	**European External Action Service**	**External Affairs**	**November 6th 2018**	**Face-to-face**
Do you believe the Dutch 3D approach works? I do, but I think to enhance the 3D comprehensive approach, the Dutch ministry of Defence and foreign affairs should clarify roles before deploying on a mission. **The European Union also has an early warning system for conflict; can you elaborate a bit more on this system?** The European Union has developed an European conflict early warning system tool for conflict prevention based on global conflict risk indicators. Many other organizations have their own early				

warning system in place that indicates fragile regions of interest.

Can you act immediately upon those early warnings?

We first have to discuss it with the member states. Based on that discussion we will decide where and when to intervene.

Is your early warning system publicly accessible, so other can maybe act upon it?

The data itself is not the interesting part; it's the analysis that's interesting. We however do not share our analysis with other parties. You don't want others to know what information you poses. In the end it is all about politics.

APPENDIX D. Validation

On the 7th of February, the findings of this research have been verified during the UN-CMCoord meeting at the Humanitarian Networks and Partnerships Week (HNPW) 2019 in Geneva. In this room full of civil-military coordination officers, peacekeepers and humanitarians, successes and challenges in Mali were discussed. The author took the chance to validate the findings of this research with the following people:

1. OCHA civil-military coordination officer
2. UN civil-military coordination officer
3. UN civil-military coordination officer for access and protection
4. Intercluster coordinator
5. Humanitarian advisor/civil-military coordinator
6. Food security cluster

Among others, the above-mentioned people have confirmed the findings regarding the barriers and opportunities for humanitarian and peacekeeping organizations to share information with each other. Figure D.1 shows a picture of the setting and figure D.2 provides the PowerPoint slides the author used for the validation. However, at that time, the main research question was different, the identified barriers and opportunities were the same.

Figure D.1. Validation during the UN-CMCoord meeting at the HNPW 2019

Figure D.2. Presentation during the USSG meeting at the HNPW 2019